UNIVERSITY OF CALIFORNIA,
IRVINE

Camphor, a Plastic History:
China, Taiwan, and Celluloid, 1868-1937

DISSERTATION

submitted in partial satisfaction of the requirements
for the degree of

DOCTOR OF PHILOSOPHY

in History

by

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2018

DEDICATION

To

my wife Ellen for her patience and support

and

my son Ian who has grown with this project

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ACKNOWLEDGMENTS

I would like to thank my committee members, Professors Jeffrey Wasserstrom, Emily Baum, and Qitao Guo for their support with this perhaps overly ambitious project. Jeff always had broad vision and helped me to craft this non-traditional dissertation from the beginning. Without Emily's keen insight and commentary, my dissertation would be much poorer. I thank Qitao for his support and for mentioning his family's camphor-wood box at a very opportune time. All remaining flaws in the dissertation are of course, my own.

In addition, I would like to acknowledge the friends and colleagues at Irvine who supported me along the way. My fellow "China block" cohort members: Dan Knorr, Tom Worger, and Yidi Wu were always inspiring. Laurie Dickmeyer shared research interests, sources, and more than one conference panel. Jennifer Munger always had great advice.

I would also like to thank the library and archive staff who helped and supported me during my research trips, particularly those at Academia Sincia, and the George Eastman House.

Finally, I owe thanks to my family and friends who have supported me these many years. My wife and son, my parents and siblings. My family in Taiwan, especially my father- and mother-in-law who provided living space and means of transportation during many research trips. Thanks also to Josh and Diana for their moral support. And one last thanks to Kay and Earl Guy, whose backyard camphor tree and its treehouse provided many happy childhood memories.

Financial support was provided by the UC Pacific Rim Research Program, the UC Irvine School of Humanities, and the UC Irvine Center for Asian Studies.

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ABSTRACT OF THE DISSERTATION

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Doctor of Philosophy in History

University of California, Irvine, 2018

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Until the late nineteenth century camphor, extracted from the camphor tree *cinnamomum camphora* native to southeast China, Taiwan, and Japan, was a luxury commodity used for religious and medicinal purposes. That changed with the invention of celluloid plastic, the world's first man-made plastic. From around 1870 forward camphor was used as an important industrial input to make celluloid, first for a variety of household goods, and then later as a backing for photographic roll film.

Current literature on camphor only mentions its modern industrial uses in passing, while literature on celluloid often omit its Asian origins. This dissertation seeks to fill that gap by relying on Qing dynasty records, British Parliamentary papers, archival materials from the Celluloid Manufacturing Co. and Eastman Kodak, as well as Republican-era Chinese periodicals. I argue that camphor was an essential commodity for the development of the twentieth century modern world, and that the supply of camphor was dependent upon the political and economic conditions of imperialism in East Asia.

CHAPTER ONE: INTRODUCTION

This dissertation argues that a seldom-heard of byproduct from a little-known tree in a small corner of Asia changed the world in the nineteenth century. Camphor crystals from camphor trees, then predominantly produced and exported from Taiwan, were used and required in the world's first man-made plastic: celluloid.

Camphor is probably the most important natural product that you have never heard of. Derived from a laurel tree native to Asia, for over a thousand years Chinese have recorded its use in medicine and incense, as an insect repellant, and also use of the fragrant wood of the tree itself. The US Forestry Service describes the camphor tree as a "large, round-canopied, evergreen tree" with "unusually strong branches" which is generally forty to fifty feet tall with a forty to sixty-foot canopy spread, though it can grow larger.[1]Camphor was used world-wide, commonly throughout Asia, but its use also spread to Europe by at least the fourteenth century. Its most well-known use today marks a continuation of camphor's medicinal use for the cooling and soothing effect it has on the respiratory system: it is an active ingredient in Vick's Vaporub.[2]

But it is in the nineteenth century that the use of camphor underwent the greatest change, changes that without which it would be impossible to imagine our modern world. Camphor was used to invent the world's first plastic, celluloid, and the uses of this plastic ranged from luxury goods, to children's toys, to film--where it allowed for both the popularization of personal photography and cinematography. Camphor was also an

[1] Edward F. Gilman and Dennis G. Watson, "*Cinnamomum camphora* Camphor Tree," Fact Sheet ST-167, November 1993, US Forest Service.
[2] Although now this camphor is synthetic.

ingredient in smokeless gunpowder, a compound which revolutionized military technology by allowing for automatic weapons.

The genesis of this project was my desire to pursue an economic history that would explore issues relating to imperialism in nineteenth century China. Family ties and archival access issues drew me to look at Taiwan. Nineteenth century Taiwan's three major exports were tea, sugar, and camphor. I was already familiar with works on tea, particularly Robert Paul Gardella's 1994 book *Harvesting Mountains: Fujian and the China Tea Trade, 1757-1937*.[3] And I was also familiar with Ka Chih-ming's 1995 work on rice and sugar in Taiwan, *Japanese Colonialism in Taiwan: Land Tenure, Development, and Dependency, 1895-1945*,[4] and of course Sidney Mintz's famous 1985 *Sweetness and Power*.[5] This left the subject of camphor.

My early research into camphor first led me to discover its many uses, but I was drawn to its nineteenth century industrial use in plastic, film, and smokeless gunpowder. I read R.A. Donkin's 1999 *Dragon's Brain Perfume: An Historical Geography of Camphor* that examines all species of things called "camphor" by westerners but doesn't examine

[3] Robert Paul Gardella, *Harvesting Mountains: Fujian and the China tea trade, 1757-1937*, (Berkeley, CA:University of California Press, 1994).
[4] Ka Chih-Ming, *Japanese Colonialism in Taiwan: Land Tenure, Development, and Dependency, 1895-1945*, (Boulder, Colorado: Westview Press, 1995).
[5] Sidney W. Mintz, *Sweetness and Power: The Place of Sugar in Modern History* (New York: Penguin Books, 1986).

anything after about 1600.[6] I found in Leonard Gordon's book a reference to Taiwanese camphor production, and a few paragraphs about something called the "camphor war."[7]

Exploring further I obtained a copy of Antonio Tavares' 2004 dissertation, *Crystals from the Savage Forest*,[8] which is a brilliant study of camphor production in late Qing times and under Japanese colonialism. His Marxian-influenced analysis of Japanese capitalist exploitation of Taiwan's forest resources and native Taiwanese aborigines goes hand in hand with Ka Chih-Ming's contention that the development brought about by Japanese colonialism primarily benefited Japanese.

Through Tavares I discovered Lin Man-hoang's 1997 book *Tea, Sugar, Camphor and Taiwan's Social and Economic Changes, 1860-1895.*[9] Lin details the production and export of Taiwan's three major export commodities and notes the important role of each in the development of Taiwan's economy in the late nineteenth century. Yet while Tavares and Lin both discuss camphor in detail and mention its industrial uses, they do not explore its usage in any depth.

Coming at the topic from another angle I began to read about plastics in works like Böckmann's 1921 book on celluloid, Kaufman's *The First Century of Plastics* (1963), Meikle's *American Plastic* (1995), and E.S. Steven's *Green Plastics* (2002).[10] Many of these

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[6] R.A. Donkin, *Dragon's Brain Perfume: An Historical Geography of Camphor* (Brill Press, 1999). The title refers to a Chinese term for high-quality camphor collected from the *dryobalanops aromatic* plant in Borneo. The term, 龍腦香 (longnao xiang), literally means "dragon-brain fragrance."

[7] Leonard H.D. Gordon, *Confrontation over Taiwan: Nineteenth Century China and the Powers* (Lexington Books, 2007), 67-77.

[8] Antonio C. Tavares, "Crystals from the Savage Forest: Imperialism and Capitalism in the Taiwan Camphor Industry, 1800-1945," (Princeton University), 2004.

[9] Lin Man-hoang (林滿紅), 《茶、糖、樟腦業與臺灣之社會經濟變遷（1860～1895）》[Tea, Sugar, Camphor and Taiwan's Social and Economic Changes, 1860-1895], (臺北市：聯經, 1997) [Taipei City: Lianjing, 1997].

[10] Friedrich Böckmann, *Celluloid, Its Raw Material, Manufacture, Properties and Uses. London: Scott*, 1921; Morris Kaufman, *The First Century of Plastics; Celluloid and Its Sequel*. London: Plastics Institute; distributed by Iliffe Books, 1963; Jeffrey L. Meikle, A*merican Plastic: A Cultural History*, (New Brunswick, N.J. : Rutgers

works on plastic were in a way the opposite of the books on camphor. While the scholarly production on camphor had generally not mentioned celluloid, or only casually referenced it, scholars of plastics history made little or no reference to camphor's Asian provenance. Plastics historian Robert Friedel has written extensively on the invention of celluloid. In his 1979 article on celluloid and parkesine (two names for the same plastic) he argued that one advantage of celluloid over natural substances such as shellac, gutta percha, and rubber was celluloid's independence from "exotic sources" far removed from Europe and the United States.[11] Of course celluloid was not independent of colonial and international trade, as it could not be made without camphor from Asia.

The problem before me in the literature was works on plastics did not discuss Asia enough, and those on Asia did not detail enough about plastics. Thus I set out to find a middle way, to combine a commodity study of camphor with a history of the technology it was used to make. I knew that this would require some attention to what has been called "the social life of things."[12] In his introduction to that famous 1988 volume, Arjun Appadurai argued that commodities could have "social lives" because the social interaction around the economic exchange is what created the value of the commodity.[13] Furthermore the meaning of commodities are "inscribed in their forms, their uses, their trajectories" and by following these trajectories we can gain insight into the human interactions that give life to things.[14]

University Press. 1995); E.S. Stevens, Green Plastics: An Introduction to the New Science of Biodegradable Plastics, (Princeton, NJ: Princeton University Press, 2002).

[11] Robert Friedel, "Parkesine and Celluloid: The Failure and Success of the First Modern Plastic," in A. Rupert Hall and Norman Smith, eds., *History of Technology, Fourth Annual Volume, 1979* (London: Mansell, 1979), 46.

[12] Arjun Appadurai, ed., *The Social Life of Things: Commodities in Cultural Perspective* (Cambridge: Cambridge University Press, 1988).

[13] Ibid., 3.

[14] Ibid., 5.

In the case of camphor it was given meaning through its value in religious use as incense, and in medicine for it soothing effects. Its relative global rarity due to prevalence primarily in East Asia made it an expensive luxury commodity. This was before the 1870s, when the main use of camphor was of the crystals or oil itself directly.

Appadurai points to large knowledge gaps between producers and consumers of many commodities. The producers have little idea how their products are ultimately used, as like with ores for instance, since the commodity goes through many transformations before its final use. Likewise consumers who purchase computers, copper wire, or even a butter knife have very little knowledge about how the ore was originally mined.[15] Sidney Mintz has also discussed these chemical and mechanical transformations that render commodities unrecognizable to those who knew them in nature.[16] Appadurai argues that the tension inherent in this knowledge gap is "a critical determinant of the flow of commodities" and also that large knowledge disparities often correlate with larger profits from the trade and "relative deprivation of the producing country or class."[17]

When camphor was a luxury commodity and used directly in the production of medicine or incense, it could still be in a way recognizable to the men (and it was always men in all the sources I have read) who cut down camphor trees and produced camphor crystals and oil in mountain stills. It remained recognizable by the distinctive aroma. Appadurai might see this as one example of what he described as a "series of small, overlapping circles of knowledge [linking] original producer and terminal consumer."[18]

[15] Appadurai, *The Social Life of Things*, 41
[16] Mintz, *Sweetness and Power*, xxiii.
[17] Appadurai, "Introduction," 41, 43.
[18] Ibid., 43.

But when camphor was added to nitrocellulose to make celluloid, then its character completely changed, as the transformation here was literally both chemical and mechanical. The transformation involved a chemical change combining camphor with nitrocellulose, and then a mechanical change as machines are used to heat and press the compound into sheets.

This makes camphor somewhat similar to sugar. Mintz describes how sugar was produced not for the Puerto Ricans that he lived with during his years of research, but for consumers elsewhere. While locals sucked on sugar cane, foreigners consumed processed and refined sugar, often in forms quite unrecognizable to the producers.[19] As mentioned above, Appadurai has argued these kinds of knowledge gaps tend to create profits for what I will call industrial producers, those who take the raw material and transform it into something that will be purchased by the final consumer. The ready consumers and the profits they represented to industrial producers is what Mintz says justified the "huge quantities of land, labor, and capital" that were invested into sugar production.[20] Mintz calls it a "curious crop" for having been "first domesticated in New Guinea, first processed in India, and first carried to the New World by Columbus."[21]

Mintz's "curious crop" is also a product of world history. Like with many other commodities, such as cacao, coffee, maize, and Champa rice to name a few, innovation and discovery was required in multiple locations and disparate cultures across time before the products became something that is recognizable to use. Camphor is also such an agricultural product. Collected from the Camphor tree (*cinnamomum camphora*) native to

[19] Mintz, *Sweetness and Power*, xviii, xxiii, and Chapter 3.
[20] Ibid., xviii.
[21] Ibid., xviii.

China, Taiwan, and Japan,[22] it was processed and exported from Asia to Europe and the United States where in the nineteenth century British and American chemists transformed the raw materials into new, modern applications.

The goal of my dissertation is to use the story of this commodity to illuminate the complex ways in which mechanisms of imperialism interacted with resource extraction, scientific and industrial innovation, and technological adoption. Here I will show just how profoundly a commodity from tiny Taiwan helped change the world through its distribution in the imperialist supply chain.

In the nineteenth century (and earlier) Taiwan's camphor trees grew in mountainous areas inhabited by aborigines of Austronesian descent who lived separate from, and often had hostile relations with, the Han Chinese who had colonized the island centuries before the Japanese followed suit. Camphor harvesters had to travel in heavily armed parties. When Chinese fought aborigines to bring camphor to market to sell to agents of European and American companies in treaty ports, the harvesting of camphor became an act of double imperialism. The Euro-American and later Japanese clashes with China over Taiwan's territory, and the Chinese-Aborigine conflicts over access to camphor made the island a battleground of imperialist global commerce. As an essential component for weapons of direct and indirect domination in the form of smokeless gunpowder and photographic film, camphor itself became part of the supply chain of imperialism.

This study aims to explore this supply chain, following it from Taiwan's camphor forests to treaty ports, across oceans to chemical processing in metropoles, and back to Asia as various plastic products and film. In the four chapters following this introduction I

[22] Joseph Needham, *Science and Civilization in China, Vol. 6 Biology and Biological Technology, Part 1: Botany.* (Cambridge: Cambridge University Press, 1986.), 26, 29, 34.

examine: the historical uses of camphor and the nineteenth-century innovations in its use; imperialist entanglements and the camphor trade; celluloid production in China; and popular photography in China. The purpose here is to construct a cultural commodity history that examines not just the plastic and film objects, but the common component that ties them together: camphor.

The most comprehensive study of camphor to-date is R.A. Donkin's above-mentioned *Dragon's Brain Perfume.* This book is largely a medieval world history study of camphor in China, India, West Asia, and Europe and its principal uses for religious and medicinal purposes. Donkin relies heavily on translated Indian, Arabic, and Chinese sources, as well as letters and other documents from early European and American missionaries (he also cites Marco Polo). Donkin explains that what is commonly referred to as "camphor" actually comes from multiple plant species: *dryobalanops aromatic*, *blumea balsamifera*, and *cinnamomum camphora*.[23] My dissertation will only focus on the product of the *cinnamomum camphora* tree native to China, Japan, and Taiwan. Donkin's monograph does not progress beyond the Ming dynasty (~1368-1644), and so it will serve as good background but has no direct bearing upon my study. Additionally, Donkin's work could be improved by using actual Chinese sources rather than relying on translation, as evidenced by the image of a camphor plant that is clearly upside-down as the descriptive Chinese characters attached to the image are inverted.[24]

One work that addresses camphor in Taiwan in the nineteenth century is Leonard Gordon's 2007 *Confrontation over Taiwan: Nineteenth-Century China and the Powers*.[25]

[23] Donkin, *Dragon's Brain Perfume*, 78.
[24] Ibid., 68.
[25] Gordon, *Confrontation Over Taiwan.*

Gordon describes how camphor production was banned in Taiwan before 1725 in an effort by the Qing government to forestall conflict between Taiwan's Aboriginal and Han Chinese populations. He details early nineteenth-century European and American merchant interest in camphor, and their efforts to export camphor and other commodities from Taiwan. However, Gordon's focus is on politics and diplomacy, and camphor is generally discussed together with a list of Taiwan's other major commodities such as sugar and tea.

The study that does deal with Taiwan's indigenous camphor production and the relationship of workers to the colonizing state is Antonio Tavares' 2004 dissertation "Crystals from the Savage Forest: Imperialism and Capitalism in the Taiwan Camphor Industry, 1800-1945."[26] In examining the connection between imperialism and capitalism, Tavares discusses the invention of celluloid and the development of the early plastics industry in the U.S., United Kingdom, France, Germany, and Japan, but his aim is to elucidate the political and economic transformations occurring on Taiwan as it was integrated into the capitalist world economy.[27] What Tavares does not do is discuss the technology that was developed from camphor and its impact in Asia. I build upon Tavares' work and expand the scope of his earlier camphor study to include the development of new technology, and camphor's importance for the modern world.

The chapters that follow are based on largely different sets of sources from libraries and archives in Asia and North America, with little overlap between them. The exception to this is Chapters Four and Five which rely on periodicals published in China from the 1910s to the 1940s. The major primary sources used in Chapter Two come from two archives.

[26] Tavares "Crystals from the Savage Forest"
[27] Ibid., 3-11.

Material relating to the development of rolled film and the Kodak camera comes from the George Eastman legacy collection at the Eastman Museum located in George Eastman's former home in Rochester New York. Material relating to the invention of celluloid comes from the J.W. Hyatt collection at the Syracuse University library special collections research center. The primary material for Chapter Three comes from the collections at Academia Sinica in Taipei, and from British Parliamentary papers.

Chapter 2 traces the use of camphor from earliest times to the revolution in its use in the nineteenth century. Originally prized for its wood and its cooling medicinal value, it was also used in fireworks and culinary delicacies. In the 1860s camphor began to be used in the production of celluloid plastic. Camphor production increased dramatically through the end of the nineteenth century and into the twentieth as the celluloid industry expanded, particularly in connection with film. This trend continued until the twentieth-century discovery of a synthetic substitute for camphor. This chapter makes the argument that for invention to be successful, it is not enough to create the new idea, one must also possess ingenuity in applying it. Alexander Parkes first mixed camphor with nitrocellulose, but it was the Hyatt brothers that made celluloid successful.

Chapter 3 argues that camphor would not have been cheap enough for the Hyatts to profit from celluloid if not for the actions of British imperialists in Qing China's island of Taiwan. When an arrogant acting British consul wearing his honor on his sleeve supported a strong-headed Scottish merchant with a penchant for (mis)interpreting the copy of the Treaty of Tianjin he always carried, and then backing up his views with his personal firearms the "Camphor War" of 1868 led to upwards of twenty Chinese dead and a treaty signed at gunpoint. This agreement was designed by British men eager to break the

Chinese “monopoly” on camphor production and allow British merchants a stronger foothold in the trade. Yet the new camphor regulations resulted in a glut of production, a drop in price of the formerly luxury good, and British merchants cut out of the market by local Chinese-Taiwanese producers with lower overhead costs. The drop in the price of camphor coincided with the first direct shipments from northern Taiwan to New York.

From the Hyatts’ success with celluloid in the early 1870s through to the early twentieth century celluloid production spread across the globe. Chapter 4 turns to Shanghai in the 1920s and 30s when the first Chinese celluloid factories began production. Here I argue that as soon as industrial processing of camphor into celluloid became established in China it was embroiled in nationalistic politics and anti-Japanese sentiment. The National Products movement, supported by the growing power of the Kuomintang’s newly “unified” Republic of China, portrayed every Chinese industrialist as a patriotic hero and every Chinese person buying products “made in China” into a soldier in the war against imperialist exploitation of China. Chinese-made celluloid was a blow against Japan, which had previously supplied the majority of the plastic solid in China. Yet Chinese celluloid factories were a double-edged sword. On the one hand, they brought production and industrial growth, but on the other, they also carried the danger of fire and the loss of life and homes in communities adjacent to the factories.

Chapter 5 examines a happier side of celluloid, or at least a more leisurely one, by focusing on the spread of popular photography in China. Earlier scholarship has focused on the role of photography associations and print media or of shop clerks and camera technicians in the spread of photography in China. In this chapter I delve into the role played by the Eastman Kodak company and argue that it was successful in China by

inserting itself into every step of the process: owning shops and print media, hiring technicians, supporting associations, and even sending representatives into schools of all levels. Kodak's marketing theme was to portray photography as something fun and easy for everyone to do. It appealed to family values, nationalistic feeling, and highlighted photography's uses in education. This business strategy undoubtedly turned a profit for the company, but at the same time created a broad class of Chinese amateur photographers.

Taken together, these chapters trace camphor's journey from the trees of Taiwan to its transformation into the celluloid of false ivory, children's toys, and Kodak film. This transformation was made possible through the connections of global trade and imperialism. Without the intervention of British gunboats in Taiwan, camphor would not have been cheap enough to make the transition from luxury commodity to industrial input. Without an ample source of camphor the Hyatt brothers' celluloid may have gone the way of Alexander Parkes' parkesine, which failed from an inability to both keep costs down and manufacture a quality product. But celluloid did succeed and came to be used in a wide variety of products before it attracted the attention of George Eastman for use in roll film. Industrialized camphor returned to Chinese territory as celluloid: first as imported foreign goods, largely from Japan or Germany, then later as domestic products when Chinese celluloid factories were established.

Concerns about camphor supply and imperial Japan's near-monopoly of the substance led to research into a replacement. Celluloid's flammability also spurred some of that research. Celluloid plastic would by the 1940s and 50s be replaced by bakelite and eventually other plastics more commonly used nowadays. While celluloid is biodegradable,

its more recent plastic replacements are not. While the ubiquitous presence of plastic is becoming a global health concern for all species one may be forgiven for wondering whether the Hyatts' success is something to celebrate. But there have been many advances in science, medicine, and technology that have brought great benefits which could not have happened without plastic.

Chief among these has to be the photographic film with which most people associate the term celluloid. Celluloid roll film allowed for both the point-and-shoot camera that popularized personal photography and for motion pictures. It is difficult to imagine the twentieth century (to say nothing of the twenty-first) without widespread photography and cinematography. They pervade our culture so much that we now expect to see photographic images of historical events, and many people's historical memory can be pared down to one iconic image (staged or not), like the Times Square V-J day kissing photo, or Tank Man.

In conclusion, this dissertation project is an historical commodity study that explores the complex relationship between technology, environment, culture, imperialism, and modernity with an aim to illuminate the ways in which mechanisms of imperialism interacted with resource extraction, scientific and industrial innovation, and technological adoption by showing how disparate, otherwise unconnected people working with one commodity helped to change the world.

CHAPTER TWO: FROM INCENSE TO CELLULOID: THE CHANGING USES OF CAMPHOR

This chapter traces the use of camphor from its earliest recorded mention in Chinese documents through to the major innovations that led to camphor's use as an industrial input in the late nineteenth century. Camphor trees were initially used for timber, which was known for its fragrance. The camphor extracted from the wood came to be used for incense and in medicine before the seventh century. These types of use for camphor continue to the present. In the nineteenth century camphor was used as a stabilizing agent in nitrocellulose, or guncotton, in the production of both celluloid plastic and various formulations of smokeless gunpowder.

Examining in detail the invention of the world's first man-made plastic, initially as Parkesine and later as Celluloid, I argue that for invention to be successful, it is not enough to create the new idea, one must also possess ingenuity in applying it. This thesis is also borne out in the case of George Eastman's development of photographic roll film. In both cases the inventors who have often been given the most credit were not the originators of the idea, but the ones who could best put it into practice.

Furthermore, this chapter shows how camphor transitioned from being a luxury commodity produced and consumed in small quantities, to becoming an industrial commodity of great importance to the late nineteenth- and early-twentieth century world.

Traditional Uses of Camphor in China

Camphor's strong fragrance was "extravagantly admired" in Tang times (618-907 CE),[28] yet it seems that in earlier China camphor was not used for its aromatic qualities.[29] Sima Qian (司馬遷, ca. 140-86 BCE) lists "camphor wood" as one of the products of "the area south of the Yangtze" (江南).[30] In the *Shiji* (史記) Sima Qian lists camphor wood as a product of the area south of the Yangtze. Camphor wood is listed in a section on profitable products from all the various regions of the empire, yet there is no mention of camphor (crystals or oil), incense, or other aromatic substances.[31] Thus it seems likely that in Han and pre-Han times the use of camphor was either not yet discovered or not yet widespread enough to be remarked upon by the Grand Historian.

But, as recorded by Sima Qian, camphor trees were used for timber. And while not as fragrant as processed camphor, camphor wood still held a strong scent. Perhaps the most extravagant use of it in the Han (206 BCE to 220 CE) was the palace built out of camphor wood by Emperor Wu (漢武帝, r. 141-87 BCE).[32] Here I say "extravagant" because I can think of no better way to describe a palace made completely of scented wood imported from over 1,000 kilometers (600 miles) away. The locale where camphor trees grew that was nearest to the Han capital of Chang'an (長安) is also mentioned in what is

[28] Edward H. Schafer, *The Golden Peaches of Samarkand: A Study of T'ang Exotics*, (Berkeley: University of California Press, 1985 [1963]), 167.
[29] Donkin, *Dragon's Brain Perfume*, 225.
[30] Sima Qian, and Burton Watson. *Records of the Grand Historian of China, Vol. II*. (New York: Columbia University Press, 1961), 477.
[31] Ibid.
[32] Donkin, *Dragon's Brain Perfume*, 62. I have not been able to discover which palace this was. Possible sites in Chang'an include the Jianzhang palace (建章宮), the Mingguang Palace (明光宮), and the Gui Palace (桂宮). Personally, I would find it an appealing word-play if the Palace of "establishing order (建章)" was constructed (建) out of camphor wood (樟).

perhaps the earliest record of camphor timber, the *Shu Jing* (書經), wherein camphor wood is recorded as being sent as tribute to Emperor Yu (大禹), founder of the Xia dynasty (夏朝, ca. 2070-1600 BCE), from the province of Yang.[33] Joseph Needham's investigations into botany describe camphor wood (both from *cinnamomum camphora* and *dryobalanops aromatica*) as a product of the "Continental South-East Asiatic" floristic region (which includes Eastern Assam, Upper and Lower Burma, South China and Hainan, Taiwan and the Ryukyu islands, Thailand, Cambodia, Laos, and Vietnam).[34]

On the southwest periphery of the Chinese sphere, historian R.A. Donkin recounts that the Yue peoples of the "colonial South" made use of the leaves, bark, roots, and branches of camphor trees.[35] At this early time the Yue people were divided (in Chinese accounts) into the Min-Yue (閩越), Nan-Yue (南越), and Luo-Yue (雒越). The Yue peoples populated what is today coastal southeast China and northeast Vietnam, with the Min-Yue in approximately contemporary Fujian, the Nan-Yue in today's Guangdong, Guangxi, and neighboring regions, and the Luo-Yue occupied the Red River delta area of today's northern Vietnam known as Tonkin.[36]

The fragrance of camphor was widely admired in the Tang era.[37] By Tang times, camphor wood (*zhangmu*, 樟木) was still being used in China for construction purposes, but distilled camphor oil and camphor crystals had begun to be used in medicine, incense,

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[33] *The Sacred Books of China: The Texts of Confucianism. Part I The Shu King, the Religious Portions of the Shih King, the Hsiao King,* trans. James Legge (Oxford: Clarendon Press, 1879), 68. Legge ascribes this province of Yang to approximately contemporary Anhui and parts of Hubei, perhaps reaching south into Jiangxi as well.
[34] Needham, *Science and Civilization in China, Vol. 6 Biology and Biological Technology, Part 1: Botany,* 26, 29, 34.
[35] Donkin. *Dragon's Brain Perfume*, 227.
[36] Wang Gungwu, *The Nanhai Trade: the early history of Chinese trade in the South China Sea* (Singapore: Times Academic Press, 1998), 8.
[37] Schafer, *The Golden Peaches of Samarkand*, 167.

cuisine, and in death rituals. The process for distilling camphor was not known in China until the eighth century, and until then China's only source for the product was Southeast Asia. The first known source for this tribute is from a Malay peninsula kingdom during the Southern Liang dynasty (502-557 CE).[38] The following sections will examine the origins of the name(s) of camphor, the geographic distribution of camphor wood and supply of camphor to China, and the uses of camphor in the Tang through Song periods (960-1279 CE).

Camphor origin and name

There are three primary species that are classified as camphor and supply the aromatic camphor. These are *dryobalanops aromatica, blumea balsamifera, and cinamomum camphora*. The tree is known in Chinese as *zhang* (樟) or *zhangshu/zhangmu*(樟樹/樟木), thus camphor oil or *zhangnao*(樟腦) is literally 'brain of zhang (tree)'. The Chinese term *zhang* or *zhangnao* certainly applies to the tree, wood, oil, and crystals of the *cinamomum camphora* tree, but it also appears to be a generic term that encompassed the products of the *dryobalanops aromatica* tree as well. But camphor from this tree was deemed of the highest quality and this superior camphor was known as *longnao xiang* (龍腦香, or 'dragon's brain perfume'). And while *blumea balsamifera* is classified as camphor-producing in English, it is not a tree but a weed or shrub and the Chinese term for it is different: *aina xiang* (艾納香). One alternative Chinese name that appears to have applied

[38] Donkin, *Dragon's Brain Perfume*, 218, 209-210.

to all varieties of camphor references its snowflake-like appearance, *bingpian* (冰片, or 'ice flakes').[39]

Our English term for camphor seems to have been the Sanskrit word *karpūra*, which according to Donkin was a loan word from the Dravidian language and meant both *camphor* and *camphor tree*. Donkin believes that the name arose in South or Southeast Asia near the main sources of supply, and in pre-Islamic times was carried from Indonesia to Persia or Mesopotamia where it spread to the Arabic-speaking world, and finally to the Mediterranean. Donkin finds a source recording the medieval Latin term *camphora* in Britain in the early thirteenth century.[40]

Distribution and Supply

According to Needham, camphor trees (both from *cinnamomum camphora* and *dryobalanops aromatica*) grow in the "Continental South-East Asiatic" floristic region, which includes Eastern Assam, Upper and Lower Burma, South China and Hainan, Taiwan and the Ryukyu islands, Thailand, Cambodia, Laos, and Vietnam.[41] *Dryobalanops aromatic* grows in humid tropical regions, and is found in the belt that stretches from West Africa through central and southern India, Southeast Asia, and all the way to New Guinea. They grow to be gigantic trees and are a major source of timber. *Cinnamomum camphora* is a fast growing, broad-leaved evergreen tree and part of the laurel family. The chief constraints to its habitat are prolonged frost and low rainfall. It is distributed across East and Southeast Asia from Tokyo southwest through Honshu, Shikoku, Kyushu, and the Ryukyu islands, the

[39] Donkin, *Dragon's Brain Perfume*, 78, 85, 87.
[40] Ibid., 80, 78.
[41] Needham, *Science and Civilization in China, Vol. 6 Biology and Biological Technology, Part 1: Botany*, 26, 29, 34.

southern coastal provinces of China as well as Sichuan and Yunnan, and Vietnam.[42] The Ming era (1368-1644 CE) Materia Medica known as *Bencao Gangmu* (本草綱目) records camphor oil (*zhangnao*, 樟腦) as being collected from fresh cuts of camphor trees, mainly in Fujian area.[43] Donkin states that the "geo-botanical centre of diversity" for *cinamomum camphora* lies in Fujian and neighboring Zhejiang and Taiwan. Marco Polo also wrote of seeing great forests of camphor trees in Fujian near Quanzhou and Fuzhou.[44]

Camphor came into the broader Chinese market from all of these locales. Chinese made perfume from their own native *cinamomum camphora* camphor, but the best camphor came into southern ports from over the South China seas.[45] From the sixth century the Chinese market for camphor was the "largest and most discriminating in the world."[46] Bringing the "warm odor of the South," camphor was sent as tribute to the Tang court in the seventh and eighth centuries from, among other places, Dagon (in modern Mynmar), Dvāravati (in modern Thailand), Udyāna (in modern India), and even Arab lands. Tribute of *dryobalanops aromatica* camphor (*longnao xiang*) was formed into amulets in the shapes of cicadas and silkworms and then sent from Tokin to Tang emperor Xuanzong (r. 713-756 CE), who gave them to his favorite Lady Yang (Yang Yuhuan [楊玉環], aka Yang Guifei [楊貴妃]).[47] In the Song period (960-1279 CE), Cham monarch, King Jaya Indravarman I, sent his ambassador Abu Hasan to China in 961 with "a letter on palmyra leaves in an envelope of fragrant wood, with an offering of ivory, camphor, peacocks, and

[42] Donkin, *Dragon's Brain Perfume*, 50, 57-61.
[43] *Bencao Gangmu*本草綱目 (Materia Medica): *Di sanshisi juan* 第三十四卷: (*zhangnao*, 樟腦) in Zhou Zhen ed. *Zhounghua Yi shu ji cheng*, v.7 *Bencao lei*, (Beijing: Zhong yi gu ji chu ban she, 1999): 1493-1494
[44] Donkin, *Dragon's Brain Perfume*, 60.
[45] Schafer, *Golden Peaches of Samarkand*, 158.
[46] Donkin, *Dragon's Brain Perfume*, 209.
[47] Schafer, *Golden Peaches of Samarkand*, 167.

twenty 'Tajik [Arab]' vases for the new Sung emperor."[48] The kingdom of Langkasuka in the Malay peninsula was one of the earliest sources for camphor tribute. The first known record is from Southern Liang dynasty in the sixth century, and Langkasuka remained a source up through the Song period. Many other areas of Malay peninsula, even as far as Malacca, continued to trade in and send camphor as tribute during this time as well. The Song court actively sought camphor, and in 987 the Song emperor Taizong sent men to Southeast Asia to encourage tribute, where they also engaged in trade exchanging silks and gold for aromatics, rhinoceros horn, pearls, ivory, and camphor.[49]

Camphor Use

As alluded to above in the discussion of tribute, camphor was prized for its fragrance and often used in incense and perfume products, often worn within layers of clothing like the cicada amulets gifted to Tang Xuanzong. As a fragrance camphor was "known in many cultures as the aroma of death, for it is traditionally used in preserving a corpse," Egyptians, Indians, Chinese, and Sumatrans all used it this way.[50] In addition to making use of its aromatic qualities, during the Tang and Song, camphor was also used in medicine, as a food additive, and in pyrotechnics. Additionally, the camphorwood was a southern hardwood prized for building boats.[51]

Camphor was first distilled in China from *blumea* and *cinnamomum* species in the eighth century, the time when herbalist Ch'en Ts'ang-chi (ca. 740) recommended "native

[48] Schafer, *The Vermillion Bird*, 75.
[49] Donkin, *Dragon's Brain Perfume*, 209-210, 214.
[50] Andrew Dalby, *Dangerous Tastes: The Story of Spices*, (London: British Museum Press, 2004), 59.
[51] Schafer, *The Vermillion Bird*, 172.

camphor" (*cinnamomum camphora*) as a treatment for cholera.[52] According to the Ming era *Bencao Gangmu* (本草綱目), processed camphor was as white as snow. It was considered "cold" or having a cooling effect and used to treat various medical conditions, including diseases of the lung.[53] Because of this cooling effect, camphor was an ingredient in the cold dessert "cooling wind rice" for hot summer days served to boy emperor Tang Jingzong (r. 824-827). [54]

The use of camphor in chemical experiments and explosive formulae is recorded from the ninth through thirteenth centuries in various Arab, Indian, and Chinese sources. While Donkin finds no proof of this in original Arabic and Sanskrit sources, he cites the thirteenth century Arab author Hasan al Rammah as finding camphor in Chinese firework recipes. Camphor was added to the mixture if "white fire" was wanted. According to various other secondary sources consulted by Donkin the earliest Chinese fireworks (from the seventh century) and bombs (from the tenth century) did not include camphor.[55]

Modern Industrial Uses

In 1924 an article in the *Far Eastern Review* remarked "There are extremely few people who realize the vast importance of camphor in everyday life."[56] The uncredited author continued to say that while 15-20 percent of the world's camphor production went

[52] Donkin, *Dragon's Brain Perfume*, 218. Chen Cangji? Unfortunately Donkin gives no Chinese characters and does not use pinyin romanization.
[53] *Bencao Gangmu*本草綱目, 1493-1494.
[54] Dalby, *Dangerous Tastes*, 59. Schafer, *Golden Peaches of Samarkand*, 168. Camphor is actually poisonous to ingest.
[55] Donkin, *Dragon's Brain Perfume*, 161.
[56] "China and Japan's Camphor Monopoly Threatened," The Far-Eastern Review XX.4 (1924): 197. Nineteenth Century Collections Online. Web. 27 Nov. 2014.

to “drugs and medicine” the remaining 80 percent went for use in celluloid.[57] The successful industrial use of camphor in fact began with John Hyatt’s invention of celluloid plastic in the late 1860s, though the term “plastic” was not generally used and acknowledged by the broader public until the 1930s.[58]Camphor use continued, its uses expanding into film and munitions, through the end of the nineteenth and into the first half of the twentieth century. Substitutes for Asian camphor were sought by many in the United States who sought a closer source for camphor.[59] Eventually, during WWII when the Japanese monopoly on camphor production was a major concern for Allied nations, a synthetic solution was found using Canadian turpentine as a base.[60]

All of these major uses of camphor are tied to the use of nitrocellulose, which was discovered by Christian Friedrich Schoenbein in 1846, and is sometimes called pyroxylin or guncotton (or flash cotton), depending on how it is prepared. Nitrocellulose, also called cellulose nitrate, with chemical formula $C_{12}H_{14}O_4(NO_3)_6$, is made by taking a source of cellulose $C_6H_{10}O_5$ (usually cotton or paper, sometimes wood) and combining it with nitric acid HNO_3. Schoenbein discovered that nitrated cotton would cause a flash when exposed

[57] "China and Japan's Camphor Monopoly Threatened," The Far-Eastern Review XX.4 (1924): 197.
[58] Meikle, *American Plastic*, 4. Meikle writes, “Most dictionaries, slow to reflect technological innovation, added nothing to these adjectival meanings until the 1930s. One exception was the first dictionary to note plastic as a noun roughly corresponding to our current usage. In 1910 The Century Dictionary Supplement described plastic as "the commercial name for any one of a class of substances, such as celluloid or viscose, which are worked into shape for use by molding or pressing when in a plastic condition." This meaning did not reappear in a major American dictionary until 1934 but acknowledged an emerging class of materials known mostly to industrial chemists and engineers.”
[59] These substitutes included attempts to commercially grow camphor trees in California and Florida, as well as attempts to find other chemical alternatives.
[60] "China and Japan's Camphor Monopoly Threatened." The Far-Eastern Review XX.4 (1924): 197. Nineteenth Century Collections Online. Web. 27 Nov. 2014.

to flame, and several chemists around Europe began working on ways to use nitrocellulose as an explosive (thus the flash cotton or gun cotton name).[61]

Two preparations of nitrocellulose are important for our purposes here: collodion and pyroxyline. Collodion cotton is a preparation of nitrocellulose that has a lower nitrate level, one of its uses was "blasting gelatin." When made in solution with ether and alcohol this becomes collodion, a hard, filmy substance that was used in photography (collodion plates) and medicine (for sealing wounds).[62] Pyroxyline, or pyroxylin, is another specific preparation of nitrocellulose, most commonly used for making celluloid.[63]

The discovery of nitrocellulose was the first step towards celluloid. The addition of camphor stabilized and plasticized the nitrocellulose, and the uses of celluloid in part followed the footsteps and improved upon collodion. Camphor would also act as a stabilizer in nitrocellulose-based explosives.[64] But the more than half century of camphor's crucial contribution to modern technological change began with the search for prize money.

Celluloid

Celluloid was the first man-made plastic, but there were other natural plastics that saw widespread use in the nineteenth century: shellac, gutta percha, and vulcanized rubber were used to mold small objects, to insulate telegraph wires or other electronics, and even to make buttons. When introduced in 1869-1870 by John Hyatt, celluloid supplemented

[61] P. Gerald Sanford, *Nitro-Explosives: A Practical Treatise Concerning the Properties, Manufacture, and Analysis of Nitrated Substances, including the Fulminates, Smokeless Powders, and Celluloid*, (London: Crosby Lockwood and Son, 1896), 68-70.
[62] Ibid., 94-96, 106.
[63] For more on the process and chemistry behind the making of pyroxyline, see: Sanford, *Nitro-Explosives*, 109-115.
[64] Bockmann, *Celluloid*, 39.

these materials.[65] But this was not what Hyatt had been seeking to do. The Phelan and Collander Company of Albany, New York had offered a prize of $10,000 dollars to anyone who could invent a substance that could replace ivory in a billiard ball.[66] John Wesley Hyatt, a chemist in Albany, New York, eagerly sought a replacement and the prize. Hyatt and his brother Isaiah patented an "improvement in treating and molding pyroxyline."[67] This process produced the substance they would later call *celluloid*. The Hyatts' patent described the use of pyroxyline ground into a pulp, then mixed with camphor and treated under pressure, creating a product: "solid about the consistency of sole-leather, but which subsequently becomes as hard as horn or bone by the evaporation of the camphor. Before the camphor is evaporated the material is easily softened by heat, and may be molded into any desirable form, which neither changes nor appreciably shrinks in hardening."[68]

In their patent the Hyatt brothers also acknowledged their awareness that camphor had been used in a liquid state in a solution with alcohol or other solvents, and disclaimed such use themselves.[69] This other use of camphor with nitrocellulose began in Great Britain in the 1850s.

Camphor of increasing interest in Britain in the mid-nineteenth century. One example of this is an 1862 article in the *Illustrated London News* introduced "Kaempfer's Camphor Tree" in Japan, discussing in part how the camphor laurel is native to Kyushu, Fujian, and Taiwan. The article included a very simplistic and somewhat inaccurate description of how camphor is made and then sold on to Britain. It also discussed "Malay

[65] Meikle, *American Plastic*, 4-5; Friedel, "Parkesine and Celluloid: The Failure and Success of the First Modern Plastic," 46.
[66] Kaufman, *The First Century of Plastics,* 33.
[67] John Wesley Hyatt, Jr. and Isaiah S. Hyatt, "Improvement in the Treatment and Molding of Pyroxyline," US Patent 105,338, issued July 12, 1870.
[68] Ibid.
[69] Ibid.

camphor" that comes from a different tree in Southeast Asia, and was "unknown in Europe as an article of trade."[70]

In the 1850s English inventor Alexander Parkes began experimenting with collodion and observed "that the solid residue left on the evaporation of the solvent of photographic collodion produced a hard, horny elastic and waterproof substance."[71] In 1856 he was granted a patent for waterproofing fabric with this method. At the 1862 International Exhibition in London Parkes presented a number of items made from what he called *Parkesine*, and won a bronze medal "for excellence of quality and ingenuity."[72] This *Parkesine* was made from heat-molden collodion, and was certainly a precursor to celluloid (as well as the likely inspiration for Hyatt), it is also considered by many to be the first instance of what would later become known as celluloid.[73]

Parkes discovered many solvents, including camphor, that were less volatile and better for producing a plastic with nitrocellulose.[74] In 1865 he reported that adding "2 to 20 percent" camphor would improve "texture uniformity and contractile properties."[75] In 1866 Parkes formed a partnership with Daniel Spill and Spill's older brother to produce parkesine. This business failed in 1868. Many factors are thought to have contributed to this failure, including: Parkesine's flammability, rapid production, inferior raw materials, and an overall pressure to keep costs down.[76]

Plastics historian Robert Friedel has argued that Parkes failure was both economic and technical. Economically, or from a business perspective, Friedel's assessment can be

[70] "Kaempfer's Camphor-Tree." *Illustrated London News* [London, England] 4 Jan. 1862: 29. Web. 30 Oct. 2014.
[71] J.A. Brydson, *Plastics Materials*, Fifth Edition (London: Butterworths, 1989), 3.
[72] E.S. Stevens, *Green Plastics*, 108.
[73] Ibid.
[74] Sanford, *Nitro-Explosives*, 117.
[75] Stevens, *Green Plastics*, 108.
[76] Ibid.

boiled down to critiquing Parkes for not having a vision for his product or how it could be used, and instead focusing only on how cheaply it could be made.[77] On a technical level, "Parkes never developed a dependable formula for a nitrocellulose plastic," as evidenced by his multiple and varied descriptions of different solvents in different patent applications across the 1850s and 60s.[78] Friedel also argues that Parkes' insistence on liquid nitrocellulose solutions limited his success.[79] The Hyatt's used camphor with solid nitrocellulose and were successful, but I think that speaks more to their ingenuity rather than Parkes' limitations. Parkes was, after all, the first to use camphor to make plastic.

Parkes early patents mentioning camphor led to legal disputes with the Hyatt brothers. When Parkes' business failed, his partner Daniel Spill inherited the patents. He began his own Xylonite Company and later sued the Hyatts for patent infringement, leading to a number of cases between 1877 and 1884.[80] Parkes testified on behalf of the Hyatts. Chemist E.S. Stevens credits this to Parkes' low regard for Spill and general desire to counter Spill's patent-rights to Parkes invention.[81] The final judgement did just that. The judge declared that the true inventor of the process for making celluloid was Parkes, and that neither Hyatt nor Spill were infringing. Thus there were no restrictions on the use of this process by any company.[82] This likely contributed to the quick spread of celluloid manufacturing.

As to whether Parkes or Hyatt deserve more credit, there are arguments to be made on both sides. Through the many technical details it all boils down to this: Parkes was the

[77] Friedel, "Parkesine and Celluloid," 48.
[78] Ibid., 47-48.
[79] Ibid., 48.
[80] Stevens, *Green Plastics*, 108-110; Brydson, *Plastics Materials*, 3-4.
[81] Stevens, *Green Plastics*, 110.
[82] Brydson, *Plastics Materials*, 4.

first to think of using camphor, Hyatt was the first to be successful at it. As the Chemist E.S. Stevens remarked, "Although court cases ultimately require final decisions, history does not; what is important is that the contributions of each are known."[83]

Friedel argued that the Hyatt's success was both from mastering a formula for celluloid, and for understanding how celluloid could be used to make finished products.[84] The standard practice for making celluloid, as first invented by the Hyatts, was described by Gerald Sanford in 1896: Celluloid is made by mechanically mixing two parts pyroxyline with one part camphor, either by melting camphor and adding the pyroxyline, or by compressing the two substances together at high pressure, or by dissolving the two in alcohol or ether and allowing the solvent to evaporate. The combined mass is worked between first cool, then warm iron rollers. It is shaped into plates approximately one centimeter thick, and these plates are stacked and then again pressed together, and cut to the desired thickness. These final plates are stored in a room to dry for fourteen days at a temperature between 30 and 40 degrees celsius. Once the plates are dry they are ready to be shaped or molded into a final product.[85]

A replacement for ivory in the billiard ball was Hyatt's first objective as a final product for celluloid, and they Hyatts quickly founded the Albany Billiard Ball Company. Robert Friedel argues that despite what other sources may say, celluloid was not physically capable of imitating ivory. Instead, he says, "Hyatt's company manufactured balls with a shellac or shellac-composition core sometimes coated with collodion or thin celluloid."[86] John Hyatt himself did say that celluloid was used, though in the same breath mentioned

[83] Stevens, *Green Plastics*, 110-111. Stevens lays out both sides. Brydson also discusses this, see his *Plastics Materials*, 3-4
[84] Friedel, "Parkesine and Celluloid," 47-48.
[85] Sanford, *Nitro-Explosives*, 107-109.
[86] Friedel, "Parkesine and Celluloid," 52.

how problematic that was, noting that 1) "a lighted cigar applied would at once result in a serious flame," and 2) "occasionally the violent contact of the [billiard] balls would produce a mild explosion like a percussion guncap. We had a letter from a billiard saloon proprietor in Colorado, mentioning this fact and saying he did not care so much about it, but that instantly every man in the room pulled a gun."[87]

The Hyatt's next product was dental plates. Here they failed with problems due to quality being less than initially advertised and celluloid plates being more expensive than the alternative rubber plates which the Hyatt's were trying to replace. Friedel argues that from their failure with dental plates the Hyatts learned that celluloid would have to be price-competitive, and because of this lesson they chose to position it as a middle of the road commodity that would be more expensive than cheap rubber or shellac, but less expensive than the ivory or horn it could be made to imitate. In this, Friedel says, celluloid also set a precedent for modern plastics.[88]

The Hyatts then began a slow expansion of celluloid plastics. After dental plates they granted rights to several licensees to make other products. Friedel finds this slow growth in specialized markets to be an important characteristic of the Hyatts' success.[89] Historian Jeffrey Miekle summarized the various uses of celluloid as follows:

"From its beginnings plastic embodied considerable hubris. Early imitative uses exhibited pride in the ingenuity of illusion. Celluloid, introduced around 1870, imitated the layering of ivory, the mottling of tortoiseshell, the hard translucency of amber and semiprecious gems, the weave and stitching of linen, the veining of marble. ... Promotion of

[87] John Wesley Hyatt, "Acceptance of Perkin Medal," speech given to the Society of Chemical Industry, January 23, 1914, (Printed pamphlet of the speech held in the John Wesley Hyatt collection at the Syracuse University Library), 2.
[88] Friedel, "Parkesine and Celluloid," 60.
[89] Ibid., 52-59, 61.

various types early in the twentieth century emphasized substituting cheap substances for scarce natural materials. Modern science was making former luxury goods available to democratic man and woman. ... By comparison to ivory or shell, even celluloid was a homogeneous material that lent itself to mass production."[90]

Hailed as a "middle-class" luxury item, celluloid was celebrated and used to make many products. Combs, brushes, flatware, jewelry, piano keys, glasses, anything that could be made with ivory, horn, tortoiseshell, and the like.[91] Then one day the Hyatts sent some sheets to Rochester, New York and began what would become the most famous application of celluloid with which its name is still most closely associated: film.

Photography and Celluloid

Search your local library catalog for "celluloid" and the majority of the results will likely be books and articles pertaining to motion pictures. Flexible film made from celluloid was used by moving picture inventor Thomas Edison on the advice of (and provided by) George Eastman. Early motion pictures continued to use celluloid film, even though its flammability was responsible for many theater fires. Eastman's company, Eastman-Kodak, had brought "transparent film" onto the market in August 1889, after the first Kodak camera in came out in June 1888.[92] Yet, like with Hyatt and Parkes and the invention of celluloid itself, Eastman was not the originator of the idea for celluloid-backed film.

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[90] Meikle, *American Plastic*, 2.
[91] "China and Japan's Camphor Monopoly Threatened." The Far-Eastern Review XX.4 (1924): 197..
[92]"George Eastman to E.C. Forbes, New York," December 27, 1915. Letter held by the George Eastman Archives, George Eastman House, Rochester, NY.

On May 2, 1887, a retired pastor and amateur chemist and inventor in Newark, New Jersey named Hannibal Goodwin filed a patent claim for a flexible base for rolled film. Goodwin described a nitrocellulose solution that would be used to make a clear and flexible film. The US patent office deemed some of his claims to be too similar to the Hyatt's celluloid patent and Goodwin was asked to revise his patent.[93]

In 1888 Eastman directed his chemist Henry Reichenback to work on a way to make flexible film with a celluloid backing in place of the paper backing then in use for Eastman's stripping film. Eastman was perhaps aware of Goodwin's activities, or potentially moved in this direction because of an 1887 letter sent to him by a customer suggesting celluloid for use in film.[94] In 1888 John Carbutt, in collaboration with the Celluloid Manufacturing Company, began using a celluloid base to make dry plates.[95] Though in a 1905 letter Eastman claimed to have been aware of an Edgar Ellis also of Rochester using gum-camphor to attempt a pyroxylin-based film.[96] In April 1889 Eastman and Reichenback applied for a patent. Deemed too similar to Goodwin's, Eastman withdrew his name and had Reichenbach file an amended patent. After much more back and forth with competing claims and amendments, Goodwin was granted his patent on September 13, 1898. Goodwin

[93] George E. Helmke, "Hannibal Goodwin and the Invention of a Base for Rollfilm," (The Fleetwood Museum of Art & Photographica of the Borough of New Plainfield, New Jersey & The American Photographic Historical Society, New York, March 25, 1990), 3-4. Pamphlet held by the George Eastman Archives, George Eastman House, Rochester, NY; William G. Theirs, "Eastman Dry Plate & Film Company: Case History 1880-1892," (Eastman Kodak Co., Dec. 1, 1992). Report in Kodak History - Misc. & Subsidiary Co. Folder at the George Eastman Archives, George Eastman House, Rochester, NY.

[94] Helmke, "Hannibal Goodwin and the Invention of a Base for Rollfilm," 1, 3-8 (quotation from page 1); see also Theirs, "Eastman Dry Plate & Film Company," 3; W.N. Jennings to George Eastman, March 19, 1887. Celluloid Company Folder, George Eastman Archives, George Eastman House, Rochester, NY.

[95] Helmut Gernsheim and Alison Gernsheim, *The History of Photography: From the Earliest Uses of the Camera Obscura in the Eleventh Century up to 1914,* (London, New York, and Toronto: Oxford University Press, 1955), 294-295; John Carbutt was first brought to my attention in a September 2014 conversation with Mark Osterman, Photographic Process historian at the George Eastman House International Museum of Photography.

[96] ; George Eastman to J.J. Kennedy, Aug. 23, 1905, Celluloid Company Folder, George Eastman Archives, George Eastman House, Rochester, NY.

and his attorney Charles H. Pell began to pursue Eastman-Kodak for infringement on October 3rd, with Goodman expecting to strike it rich, writing to Pell "I think I am quite right in saying that we have a veritable Klondike!"[97]

Goodwin never saw any compensation. In summer 1900 while returning home he stepped onto a loose flagstone while getting of a trolley car, fell and broke his leg. Already seventy-eight years of age, he died of related complications on December 31st. But Goodwin had already formed the Goodwin Film and Camera Company, and his widow Rebecca and the company directors continued to press their claim against Kodak. Goodwin was absorbed into the new Anthony and Scovil Company (Ansco), as Goodwin already had a business relationship with Scovil. Ansco kept the Goodwin name on their cameras, and also continued the legal battle with Kodak from US District Court into the appellate court, which in 1914 upheld the decision that Kodak had infringed on Goodwin's patent. Kodak paid a settlement of $5 million to Ansco.[98]

So like Hyatt with celluloid, Eastman did not truly invent flexible film. Also like with Hyatt, Alexander Parkes was the first to propose the invention that Eastman became associated with, as in 1856 Parkes had the idea of using several layers of collodion as a backing for film, but never progressed further.[99] In this case it was Eastman who had the business sense and capacity to exploit the invention and successfully bring it to the market. According to Eastman Kodak business analyst William Theirs, "George Eastman's greatest marketing triumph was his insight that a rich opportunity awaited the first entrepreneur

[97] Helmke, "Hannibal Goodwin and the Invention of a Base for Rollfilm," 1, 3-8 (quotation from page 1); see also Theirs, "Eastman Dry Plate & Film Company," 3.
[98] Helmke, "Hannibal Goodwin and the Invention of a Base for Rollfilm," 8-11. Rebecca Goodwin used part of her portion of the settlement to establish a fund for the widows and orphans of deceased clergy in Newark. As of the 1990 printing of this pamphlet, the charity was still active.
[99] Gernsheim and Gernsheim, *The History of Photography*, 293.

who could deliver photography to the masses."[100] Following this belief Eastman adopted the strategy of focusing not on professionals or "serious amateurs" but on members of the public one might call casual photographers.Eastman also believed from early on that glass plates would eventually be replaced by a flexible material that could be rolled and placed inside the cameras themselves. This is what had led to Eastman and his employee George Walker inventing the paper-backed stripping film in 1884.[101]

Eastman himself laid out his ideas about both photographers and cameras quite clearly in a letter to sent in 1892 in response to an attorney's request for a description of Eastman's company. Eastman wrote that, outside of professionals, there were two classes of photographers: first, the "true amateurs" who devote time to learning the skills to master the craft, including developing their own photos in darkrooms, and second, those who do not have the time or resources to become such true amateurs but nonetheless still "desire personal pictures or memoranda of their every-day life, objects, places or people that interest them in travel, &c."[102]

Similarly, Eastman saw that there were two kinds of cameras: cameras for the picture-maker and cameras for the picture-keeper. Picture-makers were professionals or true amateurs. For picture-keepers who "wish to take pictures everywhere" Eastman said the Kodak "with the roll-holder and continuous film" was for them.[103] For, Eastman argued,

[100] Theirs, "Eastman Dry Plate & Film Company," 3.
[101] Ibid., 2-3. Although stripping film had been previously developed by others as well for, e.g.: Leon Warneke (1875), Thiebaut (1883), and George Balagny (also 1883). See Gernsheim and Gernsheim, *The History of Photography*, 292.
[102] George Eastman to Myron G. Peck, Esq., Rochester, NY, Jan. 19, 1892., 1-2 Letters (Pre-1879-1903) Box, George Eastman Archives, George Eastman House, Rochester, NY.
[103] Eastman to Peck, Rochester, NY, Jan. 19, 1892, 2.

the Kodak was not just "a neat and handy instrument" but "the exponent of a radically new system of photography which admits the whole public into the practice of the art."[104]

At the same time Eastman recognized that the Kodak itself was not radical, but the culmination of several other inventions. Here Eastman mentions all the patents his company owns relating to the process, and discusses his roll-holder patent (1885).[105] He presents this as a unique invention, yet photography historians Alison and Helmut Gernsheim point out that roller-slide film dates back to 1854, and Leon Warnerke had already introduced one "as perfect as" Eastman and Walkers in 1875.[106] Here though the Gernsheims also give credit to Eastman for his marketing genius in targeting the "snapshooting amateur" whose numbers alone could bring enough demand to bring down costs and popularize hand-held cameras loaded with film capable of taking multiple pictures without reloading. Putting into practice the Kodak slogan "You press the button, we do the rest," with cameras sent back to the Kodak factory for processing of negatives and reloading new film before being sent back to the customer along with prints of their photos really helped expand the snapshot amateur market. In the words of the Gernsheims: "This was and is all that the average camera user asks of photography, and thus modern photography was launched."[107]

In discussing the precursor inventions to the Kodak, Eastman carefully elides mention of the transparent film patent, and perhaps still hopes to win that case as it would be another six years before Goodwin was awarded his patent. Eastman describes transparent film, made from a supporting flexible sheet of guncotton and camphor

[104] Ibid., 3.
[105] Ibid., 3-4.
[106] Gernsheim and Gernsheim, *The History of Photography*, 300.
[107] Ibid., 301-302. Quotation from p. 302.

2/1000th to 3/1000th of an inch thick, with a silver and gelatin emulsion painted onto the support. He later calls this "celluloid," and mentions the Hyatts' Celluloid Manufacturing Company, but says their celluloid has a defect that causes the edges to shrink when rolled, and that Eastman's company has developed a new patented process that gets around this problem.[108]

Eastman and his company had a long history with the Celluloid Manufacturing Company. According to Kodak company records, a customer had suggested use of celluloid in film making in 1887.[109] Eastman wrote and requested samples of celluloid for use in film experiments in 1888, and he met company representatives in 1889. By 1890 the Celluloid Manufacturing Company was suing Eastman Dry Plate & Film Company for patent infringement. In January 1892 the Celluloid Manufacturing Co. was again supplying "dope" (the mixture of guncotton and camphor used to make celluloid) to Eastman. And after a period of apparent harmony, the Celluloid Co. again sued Eastman-Kodak for patent infringement, filing on June 23, 1915, a case which was settled out of court in 1916.[110]

The Kodak camera, George Eastman's star invention and the foundation of his fortune, was, as Eastman said, a culmination of other inventions. Eastman did not originate any of the individual pieces and processes that went into his famous camera. Eastman did have the vision to bring them all together and market them to the right audience. The Kodak was the first popularized snapshot camera and in essence gave birth to modern photography. The style of taking snapshots of daily life, travel, people or items of personal importance became widespread with the success of the pocket-sized Kodak. The trend

[108] Eastman to Peck, Rochester, NY, Jan. 19, 1892., 3-4.
[109] W.N. Jennings to George Eastman, March 19, 1887. Celluloid Company Folder, George Eastman Archives, George Eastman House, Rochester, NY.
[110] Letters, Celluloid Company Folder, George Eastman Archives, George Eastman House, Rochester, NY.

began by Kodak continues with today's most popular cameras that still fit in our pockets (and also happen to be tiny computers and telephones) and of course allow for instant viewing and publishing of our photos to various virtual and physical locations.

Smokeless Gunpowder

Gunpowder revolutionized warfare. But a serious drawback to the use of "black powder" was the billowing clouds of smoke. After a few volleys of rifle fire a literal "fog of war" was created on the battlefield. Soldiers could no longer see the enemy they were supposed to shoot at. And worse, they could not see their own officers who already had to resort to visual commands because the roar of gunshot and cannon fire impaired spoken commands. This changed with the invention of smokeless gunpowder in the late nineteenth century. Today's firearms exclusively use smokeless powders. But in those early years when smokeless powders were being experimented with by chemists across Europe and the United States, the stakes were high. By being able to both maintain their line of sight and not give away their firing positions, an army in possession of smokeless gunpowder would have a significant advantage over its enemies.

In the late nineteenth century there was an explosion of research into new propellants for firearms. When compared to traditional black powder gunpowder, these powders produced significantly less smoke (sometimes almost none at all), and so they have been termed "smokeless powders." While sometimes written as "smokeless gunpowder" for clarity in terms of their intended use, they are not actually gunpowders. Gerald Sanford, former "resident chemist" at the British guncotton works in Stowmarket,

describes some twenty of these in his book on nitrogen-based explosives. A great many of these are based on nitrocellulose (or gun-cotton), though with a higher concentration of nitrogen than that normally used for celluloid, and four of them also added camphor "to reduce the sensitiveness of the explosive."[111]

The use of camphor with guncotton may have been inspired by its use in the celluloid industry. Or perhaps by intrepid chemists researching explosives and discovering Leonardo da Vinci's recipe for Greek fire which included camphor (along with charcoal, saltpetre, alcohol, sulphur, pitch, and frankincense).[112] Regardless of the inspiration, though, the world price of camphor jumped in the late 1880s and early 1890s as larger and larger quantities were being bought for the use in smokeless gunpowder, or so the author of of an article in *Chemist and Druggist* believed. The author lamented: "what we have to face is a substantial increase in the price of a valuable medicine, because of the perversion of its use to the extermination, rather than the preservation, of the human species and lower animals."[113] Of course this period also corresponds with the increasing use of celluloid for both everyday goods and film production.

One of the powders to use camphor was developed by Alfred Nobel, known as ballistite. It was made with 10 parts camphor for every 100 parts nitroglycerin. Benzol and guncotton were also part of the mix. Nobel later decided that the camphor was not advantageous and changed his formula to half guncotton and half nitroglycerin.[114]

There were three other powders that made use of camphor. In 1882 a Walter F. Reid and his partner patented Reid's invention, dubbed EC Powder, and is described as being

[111] Sanford, *Nitro-Explosives*, 165-191. Quotation on page 165.
[112] J.R. Partington, *A History of Greek Fire and Gunpowder*, (Cambridge: W. Heffer & Sons, Ltd., 1960), 58.
[113] "Smokeless Gunpowder." *The Chemist and Druggist*. London: Benn Brothers. Vol. 36, (Jan.-June 1890), 406.
[114] Sanford, *Nitro-Explosives*, 171-172; Bockmann, *Celluloid*, 38.

carefully made with high quality cotton and nitrogen. The No. 2 EC powder contained camphor, was very stable, withstood heat tests longer than required, and burned "with great regularity."[115] Sanford also described a JB Powder (invented by Judson and Borland) as being very similar to EC powder and also containing camphor.[116] Finally a F.H.A. Snyder from New York invented a powerful powder (the "Snyder explosive") made for artillery shells containing 94 percent nitroglycerin and 6 percent guncotton and camphor.[117]

The most successful researchers working on smokeless powder were perhaps Alfred Nobel, who developed ballistite in Paris in 1887, and in England at the Royal Gunpowder Mills at Waltham Abbey Frederick Abel and James Dewar, who together patented cordite in 1889. Cordite was deemed the best smokeless propellant and replaced other powders used by the British military in 1892.[118]

Cordite did not make use of camphor, as it was approximately half nitrocellulose and half nitroglycerine.[119] So while camphor played a role in the development of smokeless powders, it was not a permanent one like it was with celluloid. But in the mid-twentieth century camphor's place in celluloid would also be challenged.

Replacement for camphor?

The many industrial uses of camphor that began in the nineteenth century continued to demand a greater supply of the substance into the twentieth century, particularly for use in celluloid. The greater demand,the fact that the supply was

[115] Sanford, *Nitro-Explosives*, 174-175.
[116] Ibid., 175.
[117] Ibid., 188.
[118] Glenys and Alan Crocker, *Damnable Inventions: Chilworth Gunpowder and the Paper Mills of Tillingbourne,* (Surrey: Surrey Industrial History Group, 2000), 108.
[119] Ibid., 108.

concentrated in East Asia, and that it was predominantly in Japan and its colony of Taiwan led to a search for a substitute. Japanese government officials attempted to forestall this by increasing camphor production in Taiwan. In 1920 the Government General of the island, which earned revenue from its monopoly on camphor, announced they would increase the supply of camphor by four million pounds.[120] In the early 1930s there was some concern in Japan about increased production, but others argued that at current rates there were enough camphor trees to supply the world's needs for another seventy-five years.[121]

Perhaps ironically it was Japanese Professor S. Sato who announced in 1918 his discovery of "Satolite," a celluloid-substitute that was not flammable and made from soybeans.[122] But by 1924 American chemist R.J. Moore developed a process to make synthetic camphor from turpentine.[123] The author of a *Far Eastern Review* article about this discovery, noting as mentioned above, that extremely few people know the importance of camphor for everyday life, but "There are probably even still fewer who know that for years Japan has absolutely controlled the camphor output of the world,"celebrated the fact that Moore's discovery would allow producers to get around the monopoly on camphor held by Japan.[124] Moore's turpentine solution would later become key when trade with Japan was restricted due to war.

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[120] "Camphor in Formosa." The Far-Eastern Review XVI.1 (1920): 68. Nineteenth Century Collections Online. http://tinyurl.galegroup.com/tinyurl/NdDy2. Last accessed 27 Nov. 2014.
[121] Walter A. Durham, Jr., "The Japanese Camphor Monopoly: Its History and Relation to the Future of Japan," *Pacific Affairs*, Vol. 5, No. 9 (Sep., 1932), (pp. 797-801), 801.
[122] "Japan and the Chinese Customs." The Far-Eastern Review XIV.3 (1918): 110. Nineteenth Century Collections Online. http://tinyurl.galegroup.com/tinyurl/NdES1. 27 Nov. 2014.
[123] "China and Japan's Camphor Monopoly Threatened." The Far-Eastern Review XX.4 (1924): 197.
[124] Ibid.

Conclusion

Camphor has been an important, if little known, commodity in world history. From incense to medicine, extravagant palaces to shipbuilding, camphor and camphor wood had many uses before the nineteenth century. When it was discovered that camphor helped to both stabilize and plasticize nitrocellulose, camphor's importance to modern industry was assured. Alexander Parkes was a tinkerer with many ideas. John and Isaiah Hyatt were able to use one of those ideas--the addition of camphor--to make the successful plastic nitrocellulose that Parkes had attempted with Parkesine. Their celluloid became a household name, as equivalent with early plastics as kleenex is with facial tissue. The Hyatts used business acumen and partnerships to broaden celluloid's usage and reach. Their partnership with John Carbutt was celluloid's first step into the world of photography. But where celluloid really became wedded to film was with the Kodak. Parkes may have first suggested the idea, and Goodwin had the patent, but George Eastman made it work. With roll holders and flexible film, his pocket Kodak camera brought the "whole public" into photography.

While Eastman's Kodak did not truly turn the whole of humanity into photographers, it did allow for a broad expansion of the practice to the point that pictures became part and parcel of our daily lives: in advertisements, in magazines, in newspapers, in postcards, and in family photos. Furthermore Eastman's roll film made possible the cinematography that revolutionized our visual and storytelling experiences in so many ways.

The new explosives of the late nineteenth-century shared with celluloid a nitrocellulose-base. Camphor was included in some of these experimental powders, but eventually removed as an ingredient from most. The British pharmacists' concern that medicinal supplies were being used to cause new levels of death and destruction were mostly unfounded. Instead the majority of the worlds camphor supply was being directed towards producing plastic for film, or for household consumption as buttons, combs, collars, or flatware.

The *Far Eastern Review* was correct in stating that very few people had

any idea of camphor's connection to Japan, or Asia in general. Many historians and chemists have written about the inventions of celluloid, rolled film, and smokeless gunpowder, but not many have mentioned the connection to Asia. While these inventions are important factors that helped shape our modern world, they were dependent upon the camphor forests of Taiwan, China, and Japan, and the people who harvested, processed, packaged, shipped, and traded in camphor. Even then the trade routes linking East Asia with Europe and the United States were also dependent upon a series of political, diplomatic, economic, and imperialistic linkages. An examination of these factors in Taiwan in the years leading up to the invention of celluloid is the subject of the next chapter.

CHAPTER THREE: CRISIS 1868: QING-BRITISH MERCANTILE AND DIPLOMATIC CONFLICTS IN TAIWAN AND CHANGES IN THE CAMPHOR TRADE

In the 1860s British merchants sought to enter the Taiwan camphor market. At the time camphor was a lucrative luxury commodity, and the island of Taiwan supplied the majority of the camphor on the world market.[125] British merchants often were unaware of the normal practices of the Taiwan camphor industry. Many entered into contracts to purchase camphor and then had "their" camphor seized by Qing government agents because the foreign merchant had failed to go through the foreman of military works, generally a local merchant whose contract with the Qing government to supply lumber for the naval shipyard also gave him authority over camphor production. British merchants protested what they believed to be unfair "monopolistic" practices, not understanding that Qing officials did not see themselves enforcing a monopoly, but as Antonio Tavares has shown, they believed themselves to be ensuring the security of the state by protecting lumber resources.[126]

Arguing and fighting to open up the Taiwan camphor trade to "free trade," British merchants and their diplomat compatriots sought to gain advantage in the luxury camphor market. With supply limited, camphor often sold in Hong Kong (and even Xiamen) for 30-50% greater price than in Taiwan.[127] Instead, due to the conflicts directly and indirectly caused by British merchant activity, the camphor trade really did become open to all, and a

[125] W.M. Gregory, "Vice-Consul Gregory to Mr. Wade," Tamsuy, Dec. 29, 1870 in *Commercial Reports from Her Majesty's Consuls in China. 1869-70*. Presented to both Houses of Parliament by Command of Her Majesty, May 1871. (London: Harrison and Sons, 1871), 82.
[126] Tavares, *Crystals from the Savage Forest*.
[127] *Commercial Reports from Her Majesty's Consuls in China, Japan, and Siam for 1865*, 170, 173, 186; *Commercial Reports from Her Majesty's Consuls in China and Japan, 1865*, 231, 235.

great number of small operations distilled an incredible amount of camphor relative to previous production levels. This flooded the market and tanked the price, pushing the camphor trade out of the "luxury" category, and simultaneously making it possible for camphor's new cheapness to drive its use in industrial production.

One of these important new uses of camphor was invented in 1869, and patented in 1870 by John Wesley Hyatt, a substance he came to call "celluloid," which was the world's first commercially successful man-made plastic.[128] While earlier experiments had been made in Europe with using camphor in industry, I find it not coincidental that the successful invention of celluloid plastic, which combined nitrocellulose with camphor, occurred within a year of the "revolution" in the camphor trade and the start of direct shipment of camphor from Taiwan to New York, where celluloid was invented. Thus I argue that the new cheapness of camphor is one reason that allowed the Hyatt's invention to be so successful.

It is also perhaps worth taking a step back to point out that without British gun-boat-driven trade and diplomatic practices, the camphor industry in Taiwan would not have undergone such changes. Without the Arrow War (or Second Opium War) forcing the Treaty of Tianjin, Taiwan would not have been open to trade, and would not have had a British Consul (acting or otherwise) to call in the navy in support of British merchants' interests. Thus plastic, like many other inventions crucial to our modern age, is a product of empire.

This chapter examines the British imperial intervention into Taiwan's camphor market. British diplomatic (and military) endeavors culminated in the December 1868

[128] John W. Hyatt, "Improvement in treating and molding pyroxyline," United States Patent No. 105338 A, July 12, 1870.

"Camphor Treaty (樟腦條約)," negotiated in Takow (modern day Kaohsiung, 高雄) and Anping (in modern day Tainan, 台南) between Xingquanyong (興泉永)[129] Circuit Intendant (*Daotai*, 道台) Zeng Xiande (曾憲德) and Acting British Consul John Gibson. The treaty officially opened up the camphor trade and ended the official camphor procurement system. Many scholars point to this treaty as the cause of the increased camphor production. Relying largely on British and Qing diplomatic, governmental, and customs records, this chapter explores the multiple conflicts between Chinese and foreigners in Taiwan in 1868 and concludes that while the "Camphor Treaty" may have officially changed regulations, the actual practice of camphor trade had already changed earlier in the year, and then wraps up by pointing to some of the broader consequences for the changing camphor industry.

The Camphor industry in Taiwan in the 1860s

The workings of the camphor industry in late-Qing Taiwan is described in detail by Antonio Tavares in his 2004 dissertation *Crystals from the Savage Forest: Imperialism and Capitalism in the Taiwan Camphor Industry, 1800-1945*.[130] From the eighteenth century up until 1868 the camphor industry in Taiwan was controlled through the office of the

[129] 閩浙總督英桂 *Minzhe Zongdu Yinggui* (Fujian-Zhejiang Governor-General Yinggui),《為吉領事收到賠款照覆並漳浦一案事》[As to the matters of Consul Gibson receiving and returning reparations and a case in Zhangpu County], June 5, 1869, in 臺灣史料集成編輯委員會 (Taiwan historical materials compilation editorial committee), eds., 明清臺灣檔案彙編 *MingQing Taiwan dang'an huibian* (Ming-Qing Taiwan Archive Compilation), 第肆輯, 第六十九冊 (4th collection, v. 69),(Tapiei: National Taiwan History Museum, Yanliu Press, and National Taiwan University Library, 2008), 345. Areas of Fujian province which included the treaty port of Xiamen (Amoy), and so British documents from the time refer to Zeng as the "Amoy Taotai." [Hereafter the *MingQing Taiwan dang'an huibian* will be cited as MQTD followed by a volume number.]

[130] Tavares, "Crystals from the Savage Forest."

foreman for military works for each of the districts in Taiwan (Taiwan-fu, Fengshan, Chiayi, Changhua, Tamsui, Gemalan/Yilan). This was not an official office, but the foremen were deputies to the Taiwan Circuit Intendant (道台 *Daotai*), and then held the sole authority over logging and other lumber-related rights throughout the forests of their districts. The original purpose for the foreman position was to secure lumber for the Fujian and Taiwan naval shipyards. Appointment to this office required a large payment made directly to the Intendant. Then the foremen could sub-contract out the rights to cut and harvest camphor and camphor trees.[131] Thus the Qing regulation and taxation of the camphor industry took place up-front, before any harvesting and camphor production, and before any sales of camphor.

The foremen faced many challenges to their control of the camphor industry, notably from illicit (i.e. not authorized by a foreman) production and smuggling. Qing authorities realized that the profits from the camphor trade were necessary to defray costs the foremen incurred in procuring lumber for the shipyards, and so supported the foremen in their efforts to curb smuggling. The Tamsui district was recognized as producing both the most lumber and the most camphor, and so from the 1850s the circuit intendants of Taiwan allowed the Tamsui foreman to have sole authority over the production of camphor in Taiwan.[132]

Camphor was produced in stills in the mountains. The exact technical methods for producing camphor are detailed in chapter 2, but here I will briefly describe how it was done. Camphor trees were cut down, branches stripped, and the branches and trunk were cut into small chips by means of a specialized tool (a small adze). Using specially

[131] Ibid., 49-50, 57.
[132] Ibid., 57-66.

constructed stills, the wood chips were then essentially steamed and the vapour they gave off was collected in a condenser. The condensed vapor dried into a white flakey substance, camphor crystals, which were scraped off and stored in baskets for transport.[133]

Camphor was brought down from the mountains in leaf-lined baskets, with each basket weighing about half a picul (or 67 lbs.).[134] Upon arrival in a port town, the camphor was then transferred for storage either into large vats that could hold fifty to sixty piculs each, or was packed directly into the containers (tubs or lead-lined boxes) that it would be exported in.[135] Under the "camphor procurement system" described by Tavares, the camphor would have been stored in official depots, and then sold on from there.[136] British and other foreign merchants viewing this system from the outside saw it as a system of "monopoly rights" held by the Qing government and sub-contracted out to local merchants. Historian Leonard H.D. Gordon summarizes the prevailing foreign view of the camphor monopoly: in 1863 the then-Taiwan Circuit Intendant Chen Fangbo created the "camphor office" (*naoguan* 腦館), "establishing a system of branches in camphor growing areas to administer the monopoly," the main complaint of the British merchants then was that "foreign merchants were required to purchase camphor only through the camphor office that sold the product at very high prices."[137] Gordon's account (and those of many

[133] Alex Hoise, "Report by Mr. Hoise on the Island of Formosa, with special reference to its Resources and Trade." [dated March 17, 1893.] Presented to both Houses of Parliament by Command of Her Majesty, August 1893. (London: Harrison and Sons, 1893), 22-23.
[134] The picul, the standard Chinese weight used in the camphor and other industries is equivalent to approximately 133 ⅓ pounds.
[135] Taintor, "Tamsui Trade Report for the Year 1868 together with Addendum for the Year 1869," 165. Taintor also warns of the proclivity of camphormen to dilute the camphor with other substances, and suggests some ways to detect such fraud.
[136] Tavares, "Crystals from the Savage Forest," 65. Tavares' sources calls these as "material depots" (*liaoguan* 料館) or "camphor depots" (*naoguan* 腦館), but the Qing official documents I have seen most often refer to them as "official depots" (*guanchang* 官廠).
[137] Gordon, *Confrontation over Taiwan*, 67. While Gordon's book was published in 2007, it reads as if it were written much earlier, and does not reference Tavares's work.

other earlier historians) is contradicted by Tavares' research which situates the beginnings of the camphor procurement system in the eighteenth century. Qing reports also indicate that this system had been going on for quite a long time, so long that it was uncertain when it had begun.[138] In English on this subject one could also read from British Vice-Consul W.M. Gregory, who in 1871 sought to clarify this issue:

> It may be worth while [sic] to correct an error which got into currency three or four years ago, and found its way into official reports, in regard to the origin of the official camphor monopoly which formerly existed here. The origin of the monopoly was assigned to a quite recent period, subsequent, indeed, to the establishment of this office. It might well excite surprise that such a restriction on trade should have been introduced without being noticed by this office. But the fact is that in Mr. Swinhoe's first Commercial Report from Formosa, dated the 1st January, 1862, the camphor monopoly is mentioned as a thing of some standing, and as in vigorous existence.[139]

Thus whether we join with the nineteenth-century foreign merchants in calling this a "camphor monopoly" or with Tavares in calling it the "camphor procurement system," it is clear that the beginnings of the system were much earlier than was generally believed and reported by the English-speaking community in Taiwan, reports which have unfortunately been taken up and repeated by several twentieth-century scholars. Yet the foreign

[138] 閩浙總督英桂 [Fujian-Zhejiang Governor-General Yinggui], 《為臺灣各洋案分起稟生報曾憲德會督辦結緣由事》 *wei Taiwan ge Yang an fenqi linsheng bao Zeng Xiande huidu banjie yuanyou shi* , March 15, 1869, in MQTD v. 69, 182.

[139] "Vice Consul Gregory to Mr. Wade," Tamsuy, July 20, 1871, in Reports on Consular Establishments in China: 1869. (Presented to both Houses of Parliament by Command of Her Majesty. 1870. London: Harrison and Sons, 1870), 84-85.

community of 1860s Taiwan, and British merchants in particular, did view the camphor trade regulations as an illegal practice in contravention of the Treaty of Tianjin (1860), and sought to end the "unlawful monopoly."[140] These actions culminated in the conflicts of 1868.

Sino-Foreign conflicts in Taiwan, 1868

Interactions between foreigners and Taiwan residents, including Qing officials, local Han Taiwanese, and Taiwanese aborigines, were often fraught with tension. These tensions built up during the 1860s and culminated in multiple conflicts in 1868: an attack on British merchants in Banca (in the area of the Wanhua district in modern-day Taipei), a violent altercation between a well-armed Scottish merchant and local militia in Wuqi harbor (in modern-day Taichung City), attacks on Christian missionaries and their property near Takao (modern-day Kaohsiung), and the British navy shelling and occupying of Fort Zeelandia and the neighboring village of Anping (modern-day Tainan).[141]

This is all important to the history of camphor production in Taiwan because the agreement signed by Qing officials and British diplomats in the aftermath of these conflicts, and under threat of continued British gunboat "diplomacy," completely changed the way that the camphor trade was regulated and carried out in Taiwan. British merchants and

[140] Tavares, "Crystals from the Savage Forest," 66.
[141] The conflict in Banca and the attacks on Christians will not be dealt with here, though they are representative of the broader problems in Sino-British relations that also gave rise to the camphor conflicts, namely poor communication, inability or unwillingness to see the other's point of view, and general arrogance. See for example, *Correspondence respecting the attack on British Protestant Missionaries at Yang-chow-foo, 1868*. [Presented to both Houses of Parliament by Command of Her Majesty, 1869. London: Harrison and Sons, 1869], and *Correspondence respecting Missionary Disturbances at Cheefoo and Taiwan (Formosa)* [Presented to Both Houses of Parliament by Command of Her Majesty, 1869. London: Harrison and Sons].

diplomats were quite eager to change the camphor regulations in Taiwan, which they felt unfairly excluded foreigners from the trade. Yet in their rush to end what they saw as an illegal monopoly they did not foresee the unintended consequences.

In the late 1860s, foreign merchants began to take a renewed interest in the camphor trade in Taiwan. In 1868, British merchants and diplomats pushed for changes in the Qing regulation of camphor on Taiwan, and in some cases initiated violent actions. The related events have been called by some the "Camphor War," and led to an agreement between the British and the Qing officials to change the regulations on camphor production on Taiwan in ways that would open the market to anyone. The intentions of the British diplomatic and military officials in effecting this change were to support British merchants entry into the lucrative trade in camphor as a luxury commodity, which had been trading in Hong Kong for twenty to thirty Spanish silver dollars per picul. The actual outcome, however, was different than they had expected: many small-scale local Chinese merchants were able to enter into the camphor trade, the production of camphor increased dramatically, the market price dropped by 50% to below eight dollars per picul within one year, and British merchants were forced to abandon camphor trading because the low prices meant they could not make a profit in the trade. A final consequence that can be extrapolated from this chain of events is that with the production of camphor drastically increased and the price cut by more than half, camphor was more easily accessible as a commodity for industrial use.

The "Camphor War" and the Camphor Treaty

The "Camphor War" of late 1868 was less of a war and more of an exchange of fire, raiding actions, and one short battle between Qing forces defending Taiwan on one side, and British navy and marines on the other. It left at least 14 dead. The British use of force further compelled the local Qing authorities to sign the "Camphor Treaty" (樟腦條約, *zhangnao tiaoyue*) which changed the regulations governing the procurement and sale of camphor on Taiwan.

Tensions over the camphor trade were forced to a head by the actions of William Alexander Pickering. Pickering was an arrogant Scottish sailor, customs official, merchant, eventual colonial administrator, self-described as both a "friend to the Chinese people," and instigator of the "camphor war."[142] In 1868 he was a merchant agent of Elles & Co., living in southern Taiwan. Pickering arranged to purchase 6,000 (Spanish silver) dollars worth of camphor through business partners in Wuqi harbor (梧棲, part of modern Taichung).[143] By the Treaty of Tianjin, foreign merchants were allowed to enter the interior of Taiwan provided they carried a passport signed by their consul and the local Qing official. It is unclear which Qing official's signature was necessary on Pickering's passport (perhaps Taiwan Prefect Ye Zongyuan, 葉宗元, or the Taiwan Circuit Intendant [道台*Daotai*] Liang Yuangui 梁元桂), but Pickering did not get it. He obtained the signature from the British Consul for Taiwan, but according to him, "the wily Tao-tai refused to sign my passport,

[142] Pickering, William Alexander. *Pioneering in Formosa: Recollections of Adventures Among Mandarins, Wreckers, & Head-Hunting Savages*. London: Hurst & Blackett, 1898.
[143] Ibid., 203.

though he was bound by treaty to do so at the consul's request."[144] Pickering's interpretation of the treaty here is clearly mistaken, as the relevant section reads: "British subjects are hereby authorized to travel for their pleasure or for purposes of trade, to all parts of the Interior, under Passports, which will be issued by their Consuls and countersigned by the Local Authorities."[145] Throughout Pickering's account, he blames his troubles and setbacks on the machinations of this "wily Tao-tai," who was determined to protect his monopoly which allowed "that dignitary [to make] great profits from farming the camphor sales to wealthy natives."[146]

Pickering traveled armed and ready: "On arriving at [Wuqi], we found our warehouse besieged by the clan Tan; but, with the help of our seven-shooter rifle and two boat guns, we and our agents, Clan Ch'oa, succeeded in routing the enemy for the moment."[147] After a minor skirmish, the district magistrate of Lukang, Hong Xitian (洪熙恬) arrived with militia. Hong invited Pickering to discuss matters, but Pickering feared for his safety and required a letter of safe passage, before he ventured forth (again armed) to meet Hong: "I was armed with my revolver and a seven-shooter Spencer rifle, ... As a pacific weapon, I took with me a copy of the Tien-tsin [Tianjin] Treaty in Chinese, to back up my arguments."[148]

Their discussion ended with a compromise that Pickering would not buy or transport camphor until he communicated with the British consul, and Hong would write to his superiors for further instruction. A fight broke out while Pickering walked back to his

[144] Pickering, *Pioneering in Formosa*.
[145] Article IX, Treaty of Tianjin (1858), http://www.chinaforeignrelations.net/node/144 (accessed June 19, 2016).
[146] Pickering, *Pioneering in Formosa*, 202. Here by "natives" it is clear Pickering means Chinese, not Aborigines.
[147] Ibid., 204.
[148] Ibid., 206.

temporary residence, and several locals were injured. Pickering waited for several weeks, and then received a report that the "Tao-tai" had concocted a plot to have him arrested and then "accidentally" killed while on transport back to Taiwan-fu for trial. Pickering and his attendants managed to escape on their boat, but left their camphor behind. He then met with the new (acting) British consul, John Gibson, and demanded compensation.[149]

Qing records recount that in March of 1868 Pickering went to Wuqi harbor without a passport to collect seven piculs of camphor for shipment to Taiwan-fu (modern Tainan). Pickering is intercepted and stopped because he did not carry a proper passport.[150] Another report described Pickering as a foreign merchant who "collaborated with scoundrels," illegally and in contravention to Treaty entered the interior of Taiwan, set up a warehouse in Wuqi outside of the established treaty ports, purchased and exported camphor on his own, and obstructed the official camphor procurement system.[151] Consul Gibson, of course, supported Pickering's claims. Pickering had broken the treaty, and Qing officials also charged Pickering with setting up a warehouse in the interior. We could grant him the benefit of the doubt and say he it was his local business partner's warehouse and Pickering had not yet collected the camphor. Pickering traveled well-armed, something that might seem fairly extreme, and yet the areas he was traveling through had been and would continue to be plagued by bandit attacks up until at least

[149] Pickering, *Pioneering in Formosa*, 207-213.

[150] 馬新貽 (Ma Xinyi), "為查阻截英商怡記行採運樟腦案事" (*wei cha zujie Yingshang Yijihang caiyun zhangnao anshi*) March 11, 1869, in MQTD, v. 69, 173-175.

[151] 總理各國事務衙門 (Zongli Yamen),《為照會英國該領事因福建臺灣英商置買樟腦及教民滋事各案起釁事》(*wei zhaohui Yingguo Gailingshi yin Fujian Taiwan Yingshang zhimai zhangnao ji jiaomin cishi gean qimoushi*), Jan. 16, 1869, in MQTD, v. 69, 29-32.

1895.[152] Yet taking his rifle to meet Magistrate Hong was probably unnecessary. And while I believe that Qing officials wanted to arrest him and send him back to Taiwan-fu, I doubt there was a plan to murder him.

Throughout the summer and fall Acting Consul Gibson was preoccupied with attempts to obtain from Taiwan Circuit Intendant Liang redress for the attacks on Christians and on Pickering, as well as compensation for the camphor confiscated from Pickering in Wuqi. Gibson communicated with the British Ambassador in Beijing, Sir Rutherford Alcock, and with several naval officers.[153] When Pickering reported his experiences in Wuqi to Gibson, he must have exaggerated even more than he did in his later memoir, as a letter between naval officers summarizing the camphor trade situation mentions that Pickering escaped "having been fired on by upwards of 100 soldiers."[154] The letter author, Commander Lord Charles T. Scott, had been to Taiwan recently and may have heard the tale directly from Pickering or from Gibson, as Scott had been helping Gibson put pressure on Taiwan Circuit Intendant Liang. Scott believed that what had been done to Pickering by the Qing authorities on Taiwan was "a simple case of robbery and attempt to murder."[155] Relying on Scott's letter, and another complaining of rudeness and treaty violations on the part of Liang, his superior Vice-Admiral Keppel wrote to Ambassador Alcock, who was also concerned about the threat against Gibson in the earlier reported

[152]林為朝 (Lin Weichao), 《勞生略歷》(*Laosheng Lueli* ["A Rough History of a Life of Toil"]), in 嘉義縣志, 卷五, 社會志, *Jiayixian zhi, juan wu, shehui zhi* [Chiayi County Gazetteer, 5th Juan, Soceity], ed. By Yang Hongren (楊弘任), (Chiayi City: Chiayi City Government, 2009), 264.
[153] "Sir R. Alcock to Vice-Admiral Sir H. Keppel," Peking, August 14, 1868 in *Correspondence respecting Missionary Disturbances at Cheefoo and Taiwan (Formosa)* [Presented to Both Houses of Parliament by Command of Her Majesty, 1869. London: Harrison and Sons], 5-6.
[154] "Commander Lord C. Scott to the Senior Naval Officer, Hong Kong," Aboard the "Icarus," Amoy, Sept. 11, 1868, in *Correspondence respecting the Attack on British Protestant Missionaries at Yang-chow-foo, August 1868*, [Presented to both Houses of Parliament by Command of Her Majesty. 1869. London: Harrison and Sons], 50.
[155] "Commander Lord C. Scott to the Senior Naval Officer, Hong Kong," Sept. 11, 1868, 50.

planned ambushes, responded that a show of force might be necessary "to enforce a full measure of justice and redress for the injuries inflicted, both as regards person and property."[156]

Gibson and Scott had been petitioning Liang for redress of grievances. In late August Scott had presented Liang with a list of nine demands, including 6,000 dollars compensation for Pickering, allowing foreigners to freely move about and engage in the camphor trade, and prosecution of the people who had murdered a Christian convert, burned churches, and otherwise attacked foreigners.[157] According to the British, Liang agreed on September 5th, with the exception that he would not compensate Pickering. Based upon further reports from Gibson and Scott, on October 16th Vice-Admiral Keppel reported to the British Admiralty in London that Liang had still not taken any of the agreed upon steps, and that his "seeming compliance as only the beginning of a fresh course of evasion and cunning."[158]

On October 29, 1868, Alcock followed up on his concerns through proper diplomatic channels by writing to Yixin (奕訢), better known as Prince Gong (恭親王), head of the *Zongli Yamen*, which served as the Foreign Office for the Qing dynasty. Prince Gong replied

[156] "Sir R. Alcock to Vice-Admiral Sir H. Keppel," Peking, Oct. 30, 1868, in *Correspondence respecting the Attack on British Protestant Missionaries at Yang-chow-foo, August 1868*, 51-52; "Vice-Admiral Sir H. Keppel to Sir R. Alcock," Onboard the "Salamis," Nagasaki, Oct. 3, 1868, in *Correspondence respecting the Attack on British Protestant Missionaries at Yang-chow-foo, August 1868*, 51; "Commander Lord C. Scott to the Senior Naval Officer, Hong Kong," Aboard the "Icarus," Amoy, Sept. 11, 1868, in *Correspondence respecting the Attack on British Protestant Missionaries at Yang-chow-foo, August 1868*, 51.
[157] "Commander Lord C. Scott to the Taoutae of Taiwan-foo," Taiwan-foo, August 21, 1868, in *Correspondence respecting Missionary Disturbances at Cheefoo and Taiwan (Formosa)*, 6.
[158] "Vice Admiral Keppel to the secretary of the Admiralty," Onboard the *Princess Charlotte*, Hong Kong, October 16, 1868, in *Correspondence respecting Missionary Disturbances at Cheefoo and Taiwan (Formosa)*, 4.

on November 2nd that he had already ordered the Governor-General of Fujian and Zhejiang to dispatch an official commissioner to investigate and settle matters.[159]

Accordingly, Fujian-Zhejiang Governor-General Hešeri Yinggui (英桂) appointed Xing-Quan-Yong Circuit Intendant Zeng Xiande as a special commissioner to go to the prefectural capital of Taiwan (modern Tainan) with his seal, assemble a dossier, and investigate matters and mediate the disputes between Gibson and local Taiwan officials with appropriate speed.[160] As described by the Zongli Yamen, the cases to be investigated were that of Pickering, the case of general Sino-European trade, and cases from Fengshan of tearing down and burning churches, and planning the deaths of Christians. Further complicating these problems was the fact that Acting Consul Gibson had "repeatedly moved around warships," using threat of force to demand compensation.[161]

Gibson wrote that Zeng arrived in Taiwan on November 8, 1868 and spent his first week on the island discussing matters in Taiwan-fu (now Tainan) and then in Fengshan, before finally coming to Takow to talk with Gibson, seeking to meet with him immediately and then "be off to Amoy in a day or two." Gibson, having been eager to meet with a higher Qing official to request for Taiwan Intendant Liang to be removed, was annoyed by both the delay and Zeng's desire to get things done quickly, Gibson thought it would take a least a week for Zeng to understand his side of things, and so Gibson pushed the meeting back by a

[159] "Sir R. Alcock to the Prince of Kung," Oct. 29, 1868, in *Correspondence respecting the Attack on British Protestant Missionaries at Yang-chow-foo, August 1868*, 52; "The Prince of Kung to Sir. R. Alcock," Nov. 2, 1868, *Correspondence respecting the Attack on British Protestant Missionaries at Yang-chow-foo, August 1868*, 52-53.
[160] Zongli Yamen, "*wei zhaohui Yingguo*…", 29-32; 上海通商大臣馬新貽 (Shanghai Commissioner of Trade Ma Xinyi),《為請速辦理臺灣地方英法等國被拆教堂並壯勇匪徒擾害教士殺死教民各案事宜》(*wei qing su banli Taiwan defang YingFa dengguo bei chai jiaotang bing zhuangyong feitu raohai jiaotu shasi jiaomin gean shiyi*), Jan. 6, 1869, in MQTD, v. 69,28-29.
[161] Zongli Yamen, "*wei zhaohui Yingguo*…", 29-32

day, setting an appointment for three o'clock on the afternoon of November 17th.[162] Qing records make clear that Zeng spent that week meeting with local officials and collecting documents for his investigative dossier, as he had been ordered to do by Yinggui. This report also mentions that Gibson used "illness" as his reason for delaying the meeting.[163]

Negotiations & Gunboat Diplomacy

The meeting was attended by Gibson, two naval officers Lt. Gurdon and Lt. Johnson, the missionaries Dr. Maxwell and Dr. Mason, British merchants from both Tait & Co., and Elles & Co. (probably Pickering), as well as Zeng and the Prefect of Taiwan Ye Zongyuan (葉宗元). At the meeting, Zeng told Gibson he thought that the problems were all minor and could be resolved in a few days. Not happy, Gibson informed Zeng that he thought it would be impossible to amend the situation without removing Liang. According to Gibson, Zeng laughed at Gibson and his characterization of the problems and the necessary solution(s). Zeng also informed Gibson that he did not have the power to suspend Liang, and even if he did Gibson had no proof of his charges against Liang.[164]

After the meeting, Gibson concluded that if Zeng left Taiwan, Gibson would have to resort to force, but if he did that he would have no one to negotiate with, so he would need to convince Zeng or resort to force before Zeng left. It did not take him long to decide on military action. Unsatisfied with Zeng's power to actually remove Liang, and with Zeng's repeated desire to settle everything within a few days, Gibson believed that Zeng and the Chinese authorities were not taking matters seriously enough. After consulting with the

[162] "Acting Consul Gibson to Sir R. Alcock," Taiwan, Takow Office, Dec. 14, 1868, 8.
[163]Zongli Yamen, "*wei zhaohui Yingguo*…", 29-32.
[164] "Acting Consul Gibson to Sir R. Alcock," Taiwan, Takow Office, Dec. 14, 1868, 8.

senior British naval officer, Lt. Thornhaugh P. Gurdon, Gibson decided to, in his own words: "take military possession of the Fort of Zelandia, and the ramparts of the village of Amping [sic], not only as a material guarantee in the shape of a reprisal, but as a basis for action, Amping being the key to the capital of Taiwan."[165]

On November 20th, Gibson wrote to Lt. Gurdon, requesting Gurdon hold Ft. Zelandia and Anping "till the local Government of Fukien will settle the just and important conditions with which you are already acquainted, which for nearly five months I have been urging on them to perform."[166] According to Gurdon, however, Gibson's motivation for seizing the fort was not due to the failure of diplomacy, but because he believed Zeng did not have the power to "accede to his demands."[167]

On November 21st, Gibson and Gurdon proceeded to Anping in Gurdon's ship, the *HMS Algerine*. They explored and took possession of Ft. Zeelandia. Gibson ordered Gurdon "not to interfere with the civil government of the village, to allow the native merchants to trade as usual, and to protect the foreign custom-house."[168] Gibson "transmitted another set of Proclamations to Taiwan-foo, announcing to the inhabitants that if they molested Her Majesty's Consulate, or the foreign houses, the city should be bombarded."[169] Lt. Gurdon recommended holding the fort and the village of Anping from his ship, both being in reach of his "pivot gun," because their examination of Fort Zelandia found it "in such an utter state of ruin that it would not have been prudent, with the limited force at my disposal, to

[165] Acting Consul Gibson to Sir R. Alcock, Dec. 14, 1868, 8, 9, quotation from page 9.
[166] "Acting Consul Gibson to Lt. Gurdon," Nov. 20, 1868, in *Correspondence respecting Missionary Disturbances at Cheefoo and Taiwan (Formosa)*, 13.
[167] Lieutenant Gurdon to Commodore Jones," Dec. 2, 1868, in *Correspondence respecting Missionary Disturbances at Cheefoo and Taiwan (Formosa)*, 13.
[168] "Acting Consul Gibson to Sir R. Alcock," Taiwan, Takow Office, Dec. 14, 1868, 9.
[169] Ibid.

occupy it permanently."[170] Gurdon further recommended a proclamation to the effect that they held the fort and village, and "obliging the Military Mandarin in charge of Amping to quit the place, and allowing no naval or military force to enter it."[171] After this had been decided Gibson went back to Takow onboard Lt. Johnson's ship *HMS Bustard* arriving in the evening of November 22nd.[172] Qing reports indicate that when the warships of Lt. Gurdon and Lt. Johnson entered Anping they fired their cannons seven times. This reportedly angered the inhabitants of Anping who desired for war. The Taiwan Garrison Commander Liu Mingdeng (劉明燈), could have returned fire but decided to not "act blindly without thinking," and instead sent an urgent messenger requesting orders to quell the British attack.[173] Liu did not receive orders to attack.

On November 24, 1868, Zeng, again accompanied by Ye, went to meet with Consul Gibson. After "talking around in circles" Gibson was unable to put forth any convincing arguments, and became willing to negotiate.[174] According to Zeng's report of those negotiations, as Zeng and Gibson came to agreement they wrote it down immediately. It was agreed to carry on according to Treaty (the Treaty of Tianjin), and Gibson expressed no disagreement. It seemed there was a written contract.[175] Yet Gibson's later report indicated he believed Zeng and Ye had agreed to Gibson's demands, including a stipulation

[170] Lieutenant Gurdon to Commodore Jones," Dec. 2, 1868, 14.
[171] Ibid.
[172] "Acting Consul Gibson to Sir R. Alcock," Taiwan, Takow Office, Dec. 14, 1868, 9.
[173]Zongli Yamen, "*wei zhaohui Yingguo*…", 29-32.
[174] Ibid.
[175] 閩浙總督英桂 (Fujian-Zhejiang Governor-General Yinggui),《為臺灣各洋案分起稟生報曾憲德會督辦結緣由事》(*wei Taiwan ge Yangan fenqi bingsheng bao Zeng Xiande duban jieyuan youshi*), March 15, 1869, in MQTD, v. 69, 181-184.

that British forces would hold Zelandia/Anping until conditions of agreement were met and Circuit Intendant Liang and his subordinates were removed.[176]

Zeng's own report highlighted a sticking point in the negotiations: Gibson's insistence on compensation for Pickering's lost camphor to the tune of 6,000 dollars. The Qing view was that Pickering had broken the treaty and was not entitled to compensation, but the attacks on churches were something that they should pay compensation for. Gibson tried to sneak an extra 6,000 into the settlement for the churches to give to Pickering, but Zeng would not allow it. Yinggui believed that Gibson used the threat of force as blackmail to obtain compensation for Pickering.[177]

While Gibson was negotiating in Takow, Lt. Gurdon was active in Anping harbor. A Zongli Yamen document reports that Gurdon unexpectedly left the harbor on November 25th, as he was called away to the Pescadores (澎湖) to escort the paymaster's ship. Gurdon does not mention this in his own reports. Upon his return Gurdon seized what he called a "man-of-war lorcha" when it did not move out of the harbor as ordered, held its captain and two men, and moored the boat near his own *Algerine*.[178] The ship was in reality a customs barge, and it's captain was Imperial Maritime Customs Commander Sun Guangcai (孫廣才).[179]

Also on November 25th, Gurdon got reports that 500 Chinese soldiers had occupied the fort and began to mount guns on the walls. Since Gurdon does not mention his ship's absence from the harbor, perhaps Qing forces re-occupied the fort once they saw the ship depart. Gurdon wrote to the officer in charge to tell him to withdraw the troops and stop

[176] "Acting Consul Gibson to Sir R. Alcock," Taiwan, Takow Office, Dec. 14, 1868, 9.
[177] Yinggui, "*wei Taiwan ge Yangan*…," 183.
[178] Lieutenant Gurdon to Commodore Jones," Dec. 2, 1868, 14.
[179] Zongli Yamen, "*wei zhaohui Yingguo*…", 29-32.

mounting guns within one hour or Gurdon would be forced to open fire. He then sent notice to the town's inhabitants that they should evacuate as he intended to open fire at three o'clock. Gurdon began firing at four o'clock, "a slow fire from my pivot gun with shot and shell at 2,000 yards, confining my fire as much as possible to the batteries that were being armed. At 5:20 P.M. I ceased firing and anchored."[180]

Later that evening Gurdon received Gibson's message about the agreement and the fort being held in collateral, and Gurdon realized he would need to be in actual physical possession of the fort. Gurdon "came to the conclusion to storm the town of Amping the same night," and then he led a daring, stealthy, and successful night raid into the fort and Anping, beginning a series of skirmishes that night and the next day that would leave many Chinese soldiers dead and force the suicide of their commander.[181] But the British did not actually realize this. Later Gibson would write that an unhappy Zeng had the commander removed and replaced with another man named Tang.[182] Qing reports indicate that Lt. General Jiang Guozhen (江國珍) could not defeat the British assault with his limited force. Having already sustained injuries, and bearing the shame of defeat, Jiang later took poison and died. Through the course of the fighting 11 soldiers and militia were killed, and a further 18 soldiers and militia were injured. Three armories and powder stores near the joint office were set alight and destroyed by fire.[183]

In the afternoon of the 26th Lt. Gurdon received "a deputation of the chief merchants of Taiwan-foo" who said they had been sent by Circuit Intendant Liang to know

[180] "Lieutenant Gurdon to Commodore Jones," Dec. 2, 1868, 14.
[181] Acting Consul Gibson to Sir R. Alcock, Dec. 14, 1868; Lieutenant Gurdon to Commodore Jones, Dec. 2, 1868, 13-15; Zongli Yamen, "*wei zhaohui Yingguo*…", 29-32
[182] "Acting Consul Gibson to Sir R. Alcock," Taiwan, Takow Office, Dec. 14, 1868, 10.
[183]Zongli Yamen, "*wei zhaohui Yingguo*…", 29-32.

what his terms were. Gurdon requested 40,000 dollars be delivered to him by noon the next day as guarantee that Gibson's agreement would be ratified by the "Viceroy" [Governor] of Fujian, and the amount would be returned when that happened. Gurdon received the money on the afternoon of the 27th, the same day that Gibson arrived back in Anping with Lt. Johnson onboard the *HMS Bustard*.[184]According to Zongli Yamen records, Lt. Gurdon told Anping locals that he had been ordered into battle, but if they provided him with a ransom of 40,000 dollars then he would cease hostilities. When Zeng explained to Gibson that ordering an attack was in breach of treaty, Gibson replied that he had ordered Gurdon to anchor at Anping, but had not ordered him to open fire or attack the town, therefore Gurdon had acted on his own initiative in attacking. Yet Gurdon maintained that he was only following orders.[185]

In his own report of the events, Gibson stressed that no civilians or private homes were injured or damaged in the fighting, no"private house was entered, nobody outraged by the sailors or marines."[186] He commends the bravery of Gurdon and his men, and praises their "manly, honest, English character."[187] Gibson regretted the loss of life, which he entirely blamed on the local Qing authorities, and wrote that without Gurdon's actions instead of twenty dead, "it might have been hundreds, not on one side only, before my position at Taiwan could have been secured."[188]

Yet while Gibson praised Gurdon's gallantry, he questioned the lieutenant's judgement in regards to the 40,000 dollar ransom. Gibson wrote to Gurdon that the money could serve as no guarantee that the conditions of the agreement would be met by the Qing

[184] Lieutenant Gurdon to Commodore Jones," Dec. 2, 1868, 15.
[185]Zongli Yamen, "*wei zhaohui Yingguo*…", 30-31.
[186] "Acting Consul Gibson to Sir R. Alcock," Taiwan, Takow Office, Dec. 14, 1868, 10.
[187] Ibid.
[188] Ibid.

authorities as, "In China the relative ranks of the merchants and the local officials are so diverse that the property of the former can make no impression upon the later."[189] Gibson was also concerned that the demand for money "led the Chinese to believe we came in quest of money, not of justice" because "however our agreement may sound to English ears, to the Chinese it is viewed as a bribe."[190]

On November 29th, Commissioner Zeng and Prefect Ye went to Anping together and invited all the British officials to a meeting. At the meeting they together went line by line through the agreement that was to become the Camphor Treaty. Gibson agreed to implementing the original agreement (from before Gurdon's attacks) completely, and also ordered Gurdon to return the 40,000 ransom. Yet Gibson also suggested that Gurdon should take something for his military expenses. The Qing officials were surprised with how Gurdon decided to keep 10,000 out of the 40,000 ransom. After giving a receipt to Prefect Ye, Gurdon left for Cihou (in modern Kaohsiung), while Lt. Johnson's ship the *HMS Bustard* remained anchored at Anping.[191] According to Gibson there was an agreement that Lt. Johnson would "hold the fort" from a distance of four to five hundred yards, and no Chinese forces would re-occupy the fort until the final agreement was implemented. Zeng was also to immediately suspend Liang and his subordinates.[192]

The Treaty

Thus the Camphor Treaty came into force: that there would be no need for official camphor depots, foreigners would be allowed to obtain passports and enter the interior to

[189] "Acting Consul Gibson to Senior Naval Officer, Taiwan," Dec. 3, 1868, in *Correspondence respecting Missionary Disturbances at Cheefoo and Taiwan (Formosa)*, 17.
[190] "Acting Consul Gibson to Sir R. Alcock," Taiwan, Takow Office, Dec. 14, 1868, 10-11.
[191] Zongli Yamen, "*wei zhaohui Yingguo*…", 30-31.
[192] "Acting Consul Gibson to Sir R. Alcock," Taiwan, Takow Office, Dec. 14, 1868, 11

purchase camphor as they pleased, and would pay appropriate taxes on that camphor. Furthermore, Elles & Co. would receive six thousand dollars in compensation, and the Lukang district magistrate Hong Xitian would be asked to step down.[193] This agreement was affirmed by the Zongli Yamen, using clearer language stating that official camphor depots would stop being used, and also emphasizing the importance of treaty adherence.[194] Note the full reimbursement for Pickering's firm, which Zeng had resisted before the attack on Anping.

In addition to Pickering's compensation, Gibson also received 2,000 dollars for the Catholic Fathers, and 1,167 dollars for the Protestant Mission. Gibson learned from the officials that brought the money that Zeng had suspended Circuit Intendant Liang, as well as Prefect Ye and nine other officials. On December 6th Zeng forwarded to Gibson two proclamations "in accordance with the conditions." The first, on camphor, abolished the "monopoly," gave foreign merchants and their Chinese agents permission to buy camphor in the interior, not just in coastal ports, also allowed locals to freely sell camphor, and in general brought the camphor trade under the standard regulations set out by the Treaty of Tianjin and the Imperial Maritime Customs. A second proclamation brought rights and protections to missionaries, and repudiated previous allegations of Christians poisoning people and other "gross and malevolent" reports about them.[195]

The second proclamation also instituted mixed courts for Formosa. Gibson explained the "inexpressibly great" benefits of this development: "Any dispute between

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[193] Ma Xinyi, "*wei cha zujie Yingshang*…" March 11, 1869, in MQTD, v. 69, 173-175.
[194] 總理各國事務衙門 (Zongli Yamen), 《為辦理英領事吉必勳牽及教堂各案請兵要挾索賠與採辦樟腦事》 (*wei banli Ying Lingshi Ji Bixun qian ji jiaotang gean qing bing yaoxie suopei yu caiban zhangnao shi*) March 12, 1869, in MQTD, v. 69, 175-176.
[195] "Acting Consul Gibson to Sir R. Alcock," Taiwan, Takow Office, Dec. 14, 1868, 12.

British subjects, their agents, and domestic servants, with the natives will be tried by a Mixed Court." He found this to be so wonderful because in Gibson's opinion the previous three years had seen justice "made a laughing-stock" by local officials who reached their judicial opinions based on receipt of bribes.[196]

The End of the Camphor Procurement System

Responses from various Qing officials highlight several issues for Qing governance. While these comments are particularly framed around the Taiwan camphor case, they are indicative of wider problems in corruption, lack of information, communication, and even basic record keeping. Many reports came from the Zongli Yamen and from Fujian-Zhejiang Governor-General Yinggui. The officials at the Zongli Yamen wrote that while the disputes over the camphor trade had been ongoing for several years, they concisely concluded that there were two errors that led to it becoming a major problem: first there was a cover-up from local officials about what was really going on, and secondly Taiwan Circuit Intendant Liang Yuangui was not versed in the Treaty of Tianjin and did not at all know what his obligations really were.[197]

Yinggui highlighted another difficulty in managing problems in Taiwan, namely that with "Taiwan far and separated by seas and oceans," it was difficult to get reports back and forth quickly. He complained that while the Westerners transmit their messages via steamship, Yinggui often hears news from Shanghai faster than he does from Taiwan

[196] "Acting Consul Gibson to Sir R. Alcock," Taiwan, Takow Office, Dec. 14, 1868, 12.
[197] 總理各國事務衙門 (Zongli Yamen),《為臺灣教堂樟腦各案業經曾道逐一辦結事》(*wei Taiwan jiaotang zhangnao ge an yejing Zeng Dao zhuyi ban jieshi*), March 12, 1869, in MQTD, v. 69, 177-178.

(Shanghai being approximately twice as far away). Yinggui then entreated his subordinates to always speed reports on foreign trade relations to him by special messenger.[198]

Yinggui also wrote at length on the camphor procurement system and how to replace it. It was difficult to discover when the system began, as it had only been mentioned in a memorandum on governance in Taiwan once written by former Fujian-Zhejiang Governor-General Zuo Zongtang (左宗棠, 1812-1885). Since a previous Taiwan Circuit Intendant, Wu Dating, camphor revenues had been commandeered by the state and the profits, amounting some 30,000-40,000 silver dollars per year, used to pay for shipyards, military works, soldiers salaries, and other military expenses. According to Yinggui, Liang Yuangui had worried that abolishing the camphor procurement system and the official camphor depots would lead to trouble when Westerners entered aboriginal districts and colluded with the "raw savages." Zeng Xiande on the other hand suggested that there would be no need for the official depots now as foreigners would be allowed to visit the interior and purchase directly from Chinese producers. Yinggui sided with Zeng, writing that because the Westerners paid such close attention to the details of the treaty, there was no other choice but to handle the camphor trade under the treaty regime. Yinggui also believed Zeng's method would be much better at "preventing disaster" (like the one just witnessed at Anping).[199] Here, while it is not explicitly stated, it seems that Yinggui is arguing that it would be easier to handle trouble with the aboriginal population than it would be to handle another round of gunboat diplomacy.

While these higher officials blamed the actions of their subordinates in Taiwan for causing the problem, they did not let the British off the hook. Officials at the Zongli Yamen

[198] Yinggui, "*wei Taiwan ge Yangan*…," 183-184.
[199] Ibid., 183.

noted that Gibson and Gurdon had broken the treaty in many ways and committed criminal acts by attacking Anping, killing soldiers, burning armories, and forcing the suicide of General Jiang. They compared this to the era before treaty revision when consuls and local officials regularly fought and consuls often called in warships to settle disputes. The Zongli Yamen diplomatic communique emphasized the correct process by which consuls should bring intractable problems to the attention of their ambassador resident in Beijing, who would then negotiate with the Zongli Yamen to obtain redress. Furthermore, because of Gibson's criminality, that he be recalled and punished was important to the maintenance of friendly relations between the two nations, and to "pacify the anger of the Taiwanese people."[200]

Zeng negotiated with Gibson in good faith, and when fighting broke out Zeng and Taiwan's local officials displayed remarkable restraint and patience in the face of blatant British aggression. Gibson concluded his report to Alcock very pleased with himself for having achieved "justice" for British interests and seeing all the local culprits punished.[201] It is interesting, given Gibson's repeated statements about seeking justice, and criticizing Chinese officials for inadequacies on many levels, that Gibson himself seems more concerned with "face" or his personal reputation than he does with actual justice and diplomacy. He was quite upset to not be officially recognized as "consul" by Liang and Ye. Two of his early demands in negotiations with them was that he, and his passports, be recognized. He was angered by Zeng laughing "at" him on November 17, and quickly

[200] Zongli Yamen, "*wei Taiwan jiaotang zhangnao…*," 177-178 (quotation from page 178); Zongli Yamen, "*wei zhaohui Yingguo…*," 31-32; and 恭親王亦訢等 (Prince Gong),《為奏陳臺灣及潮汕英艦逞凶案辦理情形事》(*wei zou chen Taiwan ji Chaoshan Yingjian cheng xiong an banli qingxing shi*), May 31, 1869, in MQTD, v. 69, 340-341.
[201] "Acting Consul Gibson to Sir R. Alcock," Taiwan, Takow Office, Dec. 14, 1868, 12.

decided to take military action to force Zeng's hand, rather than negotiating in good faith. And after the fighting in Anping, Gibson was not concerned about the loss of life, he found it unfortunate, but to his mind the Chinese brought it on themselves. Gibson, however, was greatly concerned about the implication that the British are after money, "not justice," as if his view of justice in the matter was anything more than 'might makes right'.

Clearly pleased with himself for having ended the "camphor monopoly," Gibson reveals his ignorance of the larger Taiwan camphor industry and what was going on in the north of the island. While the "Camphor Treaty" agreement between Zeng and Gibson has been rightly cited by modern-day scholars Gordon, Tavares, Lin Man-hoang (林滿紅), Li Zuji (李祖基), and others as the official end of the camphor procurement (or "monopoly") system,[202] these scholars overlook the fact that change in camphor production and pricing levels began before this agreement. Prominent Taiwan scholar Lin Man-hoang notes the great variance in pricing and export totals, but since her focus is on the larger 1860-1895 timeframe she points to increased demand due to new industrial uses for camphor, though she does mention (without elaborating) that some extra-economic factors may have played a role.[203]

The end of the official camphor depots and the authority of the foreman for military works over camphor production meant that essentially anyone could set up a still and begin to produce camphor. Yet remembering that the 1868 production figures doubled the amount of camphor that was produced in 1867, how could an agreement implemented in

[202] Gordon, *Confrontation over Taiwan,* 73; Tavares, *Crystals from the Savage Forest,* 85-86, 99; Lin, *Tea, Sugar, Camphor*, 132-133;李祖基 (Li Zuji),《晚清臺灣對外貿易研究》(Late Qing Taiwan-Foreign Trade Research), (臺北市：海峽學術, 2012) [Taipei City: Straits Academic Press, 2012],34-36.
[203] Lin, "Tea, Sugar, Camphor," 33-50. Lin also inaccurately notes that the production of celluloid did not begin to use camphor in "large amounts" until after 1890.

December have that great of an effect? While I am certain that the Camphor Treaty served to codify the new and more open camphor regulations, the effective end of the official camphor procurement system came earlier, at least in the north of Taiwan, in the districts that produced the greatest amount of camphor.

According to E.C. Taintor, the acting commissioner of the Qing Imperial Maritime Customs for northern Taiwan (the Tamsui and Keelung ports), the "monopoly" on camphor ended in August of 1868. In his words:

> During the spring and early summer several small lots of camphor bought in the producing districts directly from the manufacturers by a merchant resident here, were conducted to Tamsui under armed escort. The monopolists, seeing their exclusive privilege in imminent danger, resorted to a series of aggressive acts, through hired agents, in hope that by making this direct trade hazardous, it would be abandoned. Boats were stolen, boatmen in foreign employ were threatened with violence if they continued in that employ, and the culmination was reached in a conflict which resulted in the loss of four or five native lives. These events took place in August. From this date open opposition ceased. The great fall in price encouraged foreign merchants to buy largely, and manufacturers came forward with their produce in such quantities that the export during the last six months of the year, reached 7,367 [piculs], against 1,313 [piculs] during the corresponding period of 1867. The formal abrogation of the monopoly was effected at

Taiwan-fu, about three months after it had been practically extinguished here.[204]

From Taintor's account we see that the official camphor procurement (or monopoly) system ended *in practice* three months before Gibson's reckless "diplomacy" and the signing of the "Camphor Treaty." And while foreign merchants were behind the purchase of the camphor that prompted the violent clash, it was the killing of Chinese by other Chinese in Taiwan that prompted this end. Consul Gibson's machinations and Lt. Gurdon's attacks brought about the formalization of this change. A change which led to drastic change in the Taiwan camphor market.

Camphor Production and Trading after 1868

Camphor production in Taiwan increased dramatically in 1868. The average amount of camphor exported 1865-1867 was 7,101.6 piculs. The 1868 amount more than doubled that figure to a total of 14,440.88 piculs.[205] The increased production led to a precipitous drop in price: in early 1868, camphor was at 16 Spanish silver dollars per picul, immediately after August the price was 9 dollars per picul, and the lowest figure reached by early 1869 was 7.80 dollars per picul.[206] This decrease by more than half is more astonishing when one learns that in 1864 and 1865, camphor was selling for between

[204] E.C. Taintor, acting commissioner of customs, Tamsui, to Robert Hart, inspector general of customs, Peking, "Tamsui Trade Report for the Year 1868 together with Addendum for the Year 1869," Customs House, Tamsui, Formosa, 31st January, 1869, in Reports on Trade at the Treaty Ports in China for the Year 1869, Imperial Maritime Customs, Shanghai: Customs Press, 1869], 164-165.
[205] Ibid., 164. This amount was also nearly triple the 1867 export total of 5,070.99 piculs.
[206] Ibid., 165.

twenty-three and thirty-one dollars.[207] The "completely revolutionized" camphor trade and subsequent price decrease was, belatedly in 1871, quoted in the *New York Times* as well.[208] By that time a "new feature in the trade," that of direct shipments of camphor from Tamsui to New York, had already begun, having started in 1869 (previously most camphor reached the U.S. via England).[209]

Increased camphor production and export became the new normal. 1869 saw a similar amount of camphor exported as in 1868, and in 1870 a new record was set at 17,239 piculs.[210] Prices remained low as well, with the average price in 1869-1870 being around eight dollars per picul, and by 1873 the price had only modestly increased to nine and a half dollars per picul.[211]

Taintor attributed the increase in exports and drop in price to the end of the camphor monopoly, and wrote that "The enormous profits which have hitherto gone into the hands of the monopolists are now open for free competition."[212] In early 1869 he worried that due to "limited demand" that there would be no market for the glut of camphor that was now being produced and the Tamsui trade would be "unfavorably"

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[207] *Commercial Reports from Her Majesty's Consuls in China, Japan, and Siam for 1865*: Presented to Both Houses of Parliament by Command of Her Majesty, July 1866. (London: Harrison and Sons, 1866), 186; *Commercial Reports from Her Majesty's Consuls in China and Japan, 1865* (in continuation of reports presented in July 1866) Presented to Both Houses of Parliament by Command of Her Majesty, August 1866. (London: Harrison and Sons, 1866), 231.

[208] "The China Trade: Official Reports from the 'Customs Press' at Shanghai--The Trade of 1869 at Various Treaty Ports in China--Curious Details of Importance to American Traders--Reforms in the Customs Service," *The New York Times*, Jan. 3, 1871.

[209] E.C. Taintor, "Addendum for 1869," 10th March, 1870, in *Reports on Trade at the Treaty Ports in China for the Year 1869*, Imperial Maritime Customs, (Shanghai: Customs Press, 1869), 169.

[210] Ibid.; and W.M. Gregory, "Vice Consul Gregory to Mr. Wade," Tamsuy, July 20, 1871, in *Commercial Reports from Her Majesty's Consuls in China. 1870*. Presented to both Houses of Parliament by Command of Her Majesty, June 1872. (London: Harrison and Sons, 1872), 84.

[211] W.M. Gregory, "Vice-Consul Gregory to Mr. Wade," (Tamsuy, Dec. 29, 1870), 87; W.M. Gregory, "Vice Consul Gregory to Mr. Wade," (Tamsuy, July 20, 1871), 88; Herbert J. Allen, acting Vice-Consul, "Report on Foreign Trade at the Port of Tamsuy and Kelung for the Year 1873." Tamsuy, April 30, 1874, in *Commercial Reports from Her Majesty's Consuls in China. 1873*. Presented to both Houses of Parliament by Command of Her Majesty, August 1874. (London: Harrison and Sons, 1874), 112.

[212] Taintor, "Tamsui Trade Report for the Year 1868 together with Addendum for the Year 1869," 165.

affected. He presciently speculated, however, on the possibility that camphor's "greater cheapness may discover for it other uses than the few to which it is at present applied."[213] By spring 1870 when Taintor was writing his follow-up report, he had undoubtedly heard of new applications for camphor. He wrote of increased camphor consumption due to its cheapness and "the discovery of new applications of it in manufactures and the arts," and now worried not about over-production but about sustainability, and lamented how no new trees were being planted to replace the ones destroyed in the making of camphor.[214]

Tavares has argued that the breakup of what he called the camphor procurement system represented a breakdown of political-economic institution that had existed on Taiwan for over 200 years. As such it was "not easily replaced by treaty port practices," and conflict between Qing officials on one side and British merchants and diplomats on the other continued until 1895.[215] Much of the conflict related to how the camphor trade was taxed or regulated and included complaints of a revived monopoly system. Tavares also shows that Han Taiwanese merchants were better placed to take advantage of the new camphor regulations, due in part to their ability to access smaller ports and avoid both *lijin* taxes and treaty port duties, and also to lower operating costs (both Western merchants and Western steamships were expensive to maintain).[216]

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[213] Taintor, "Tamsui Trade Report for the Year 1868 together with Addendum for the Year 1869," 165.
[214] Ibid.,169.
[215] Tavares, "Crystals from the Savage Forest," 99, 86. Quotation from page 86.
[216] Ibid., Another interesting outcome of British imperialistic efforts in Taiwan in the late 1860s is the conclusion reached by Ambassador Alcock that operations on Taiwan were too expensive relative to the returns to justify continuing there. Alcock advised this withdraw "on grounds of both policy and economy," and the Foreign Secretary Lord Clarendon agreed due to the expense and difficulty of maintaining trade and diplomatic posts in Taiwan. This caused great concern among the merchant community, and never actually came to pass, but for a while the Foreign Office considered pulling out of Taiwan and directed Alcock to negotiate with the Chinese to see if he could exchange the Treaty Ports in Taiwan for the opening of Yichang (in Hubei Province along the Yangzi River) [See Hammond, "Mr. Hammond to the Secretary to the Treasury," Foreign Office, Feb. 17, 1870, in *Correspondence respecting Diplomatic and Consular Expenditure in China, Japan, and Siam*. Presented to both Houses of Parliament by Command of Her Majesty. 1870. (London:

Conclusion

Before 1868 very few British subjects in Taiwan seemed to realize that the Qing restrictions on camphor trade had legitimate purpose, and that the "monopoly" in camphor trade exercised by the foreman of military works also functioned as a system of taxing camphor production (since the foreman had to pay the circuit intendant for the privilege of his position). After 1868 at least one British official did recognize that a well-operated monopoly might be a legitimate way to regulate the camphor industry.[217]

This kind of compromise and recognition was lacking in Taiwan in 1868. As Laurie Dickmeyer and others have noted, the quality of trade relations and treaty enforcement depended upon the caliber of the consul.[218] Compared to previous consuls Gibson was more aggressive, and egocentric. Gibson was upset that "his" passports were not being honored. Additionally, when claiming that Lt. Gurdon's actions, while lamentably resulting in a few deaths, had actually prevented many more, Gibson's words were not that many more lives may have been lost in order to secure Treaty rights, or British property, but, as quoted above: "before my position at Taiwan could have been secured."[219]

Harrison and Sons, 1870), 77-78; Archer R. Hewlett, "Report by Acting Consul Hewlett on the Trade of the Port of Taiwan, for the Year 1870," British Consulate, Taiwan, July 10, 1871, in *Commercial Reports from Her Majesty's Consuls in China. 1870,* 80-82].

[217] Gregory, "Vice Consul Gregory to Mr. Wade," Tamsuy, July 20, 1871., 84-85.

[218] Laurie Jean Dickmeyer, "The Ghost of the Hong Monopoly: US-China Trade and Diplomacy in the Nineteenth Century " (University of California, Irvine, 2017), Chapter 3. See also Ferry de Goey, *Consuls and the Institutions of Global Capitalism, 1783-1914* (London: Pickering & Chatto, 2014); Eldon Griffin, *Clippers and Consuls: American Consular and Commercial Relations with Eastern Asia, 1845-1860*(Wilmington, Delaware: Scholarly Resources, Inc., 1972 reprint); P.D. Coates, *The China Consuls: British Consular Officers, 1843-1943* (Hong Kong: Oxford University Press, 1988); and Te-kong Tong, *United States Diplomacy in China, 1844-60* (Seattle: University of Washington Press, 1964).

[219] "Acting Consul Gibson to Sir R. Alcock," Taiwan, Takow Office, Dec. 14, 1868, 10.

It was Gibson's hot-headedness and rash actions that precipitated the violent clashes when he decided military action was required, not because negotiations were failing, but because he believed, before negotiations had begun in earnest, that he could not get what he wanted from Zeng. Furthermore, if we give full credit to Yinggui's account of the negotiations, Gibson's use of force was motivated by a desire to secure compensation for Pickering that Zeng was unwilling to agree to in light of Pickering's criminality. It was only after the bloody seizure of Ft. Zelandia and the town of Anping that Zeng acceded to the demand to compensate Pickering for his lost camphor. It is easy to imagine that the "camphor war" may have never taken place had a milder man been British Consul.

Yet the quality of trade and treaty relations also had to depend upon the local Qing officials. Yinggui, Prince Gong, and others at the Zongli Yamen pointed out errors that had been made by the local officials in Taiwan. It is hard to believe that at a time in Qing history when *jinshi* degree graduates had difficulty finding government employment that someone as obstinate and ill-prepared as Liang Yuangui could become the Circuit Intendant for Taiwan.[220] That Liang was responsible for governing an island home to multiple treaty ports and a not insignificant amount of foreign trade and yet not be well-versed in the Treaty of Tianjin that governed such trade is quite surprising. A counter-example is Zeng Xiande, the commissioner sent to handle the disputes in Taiwan, who himself was Circuit Intendant for an area of Fujian that included the major Treaty Port of Xiamen (Amoy), and also displayed knowledge of treaty obligations.

One possible explanation for this was that, as Yinggui noted, Taiwan was far away, and still considered a backwater in the eyes of many Qing officials. Even after episodes like

[220] "Obstinate" (固執) is a charge that Yinggui himself levels at Liang.

1868, it was not until the 1874 Japanese expedition to Taiwan, with its clear colonial overtones, that the Qing government began to pay more serious attention to the island.[221] And only after the resolute but ultimately failed French attempt to capture Taiwan in the 1884-85 Sino-French War that Taiwan was considered important enough to be made a province of its own.[222] Yet still, the idea of Liang, who had also only begun his post in early 1868,[223] being replaced with Zeng or someone else more competent also might have prevented the conflicts of that year. Taken together, Gibson and Liang became a kind of "perfect storm" of belligerence, obstinance, and ignorance that caused much death and destruction, as well as brought an end to the official camphor depots.

The end of the camphor procurement system practices in the north of the island were formalized by the Camphor Treaty in the south. By 1869 camphor production had doubled and its price was cut in half. Thanks to several deaths indirectly caused by pressure from British merchants to open up the camphor industry camphor was no longer a luxury commodity. And especially with the 1869 opening of direct Tamsui to New York shipping, low-price camphor was ready to be used in industrial production.

This successful industrial use of camphor began with celluloid (and xylonite) plastic in the late 1860s and early 1870s. Through the end of the nineteenth and into the first half of the twentieth century, the uses of this plastic ranged from luxury goods, to children's toys, to film--where it allowed for both the popularization of personal photography and

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[221] Ernest L. Presseisen, "Roots of Japanese Imperialism: A Memorandum of General LeGendre," *The Journal of Modern History* 29, no. 2 (June, 1957): 108-111; Ludwig Reiss, "Geschichte der Insel Formosa," *Deutsche Gesellschaft für Natur und Volkerkunde Ostasiens* 6, no. 59 (April 1897): 444; Robert Eskildsen, "'Leading the Natives to Civilization': The Colonial Dimension of the Taiwan Expedition," *Occasional PApers in Japanese Studies*, Number 2003-01 (March 2003), 1-18.

[222] Samuel Chu, "Liu Ming-ch'uan and the Modernization of Taiwan," *Journal of Asian Studies*, 23, no. 1 (Nov., 1963): 37-53.

[223] Tavares, "Crystals from the Savage Forest," 81.

cinematography. Camphor was also an ingredient in smokeless gunpowder, a compound which revolutionized military technology by allowing for automatic weapons.

The twentieth century can be and has been described as the "plastic century."[224] Yet, like any other single-term chosen to define an entire century, while a case can be made for *plastic*, it cannot be the only defining characteristic of those hundred years. But plastic is an undoubtedly modern invention, and throughout the twentieth century most people around the world witnessed plastic products becoming more and more commonplace in their everyday lives. All the various types of plastics taken together represent perhaps the single-most ubiquitous commodity today.

It is the necessity of Asian camphor that makes this invention more than simply a product of "Anglo-Saxon ingenuity." And as we have seen, like many other raw materials behind modern inventions, it was a colonial commodity with its harvesting, production, export, and transshipment were all intertwined with nineteenth-century imperialism and exploitative capitalism. Thus the invention of celluloid and all its derivative products that in many ways distinguished daily life in the twentieth century from all previous ones is inexorably tied up in the history of imperialism.

[224] Jake Dunagan, "Our Plastic Century," June 10, 2010. http://www.iftf.org/future-now/article-detail/our-plastic-century/ Last Accessed October 15, 2017.

CHAPTER FOUR: CELLULOID IN CHINA

The global shipment of camphor produced in Taiwan (a Japanese colony after 1895), Japan, and China discussed in Chapter 3 only increased in the late nineteenth and early twentieth centuries. This was due to celluloid products and production spreading after celluloid's invention by Parkes and the Hyatts' successful adaptation and business marketing, as was discussed in Chapter two. Chapter three examined the sourcing of the camphor which was crucial to the production of celluloid, as well as the commodity's imperialist entanglements. While American and European producers and consumers were largely unaware of the provenance of the camphor in their celluloid (and consumers were often also unaware of camphor's presence in the celluloid), Chinese producers and consumers did know where camphor came from.

This chapter focuses on Chinese celluloid factories and the goods they produced. These factories were seen as examples of Chinese growth in manufacturing power and scientific prowess. They made daily use household items, spectacle frames, decorative storage containers, children's toys, and even motion-picture film. But due to celluloid's flammable nature, the factories were also a source of danger to the cramped housing districts that surrounded them and those communities' many poorer residents. The many lives lost in frequent celluloid factory fires are a warning of the dangers of unchecked economic development.

Examining Chinese production and consumption of celluloid in Shanghai of the 1920s and 1930s. These decades saw the growth of many industries in China, and also an expansion of protests against imperialist nations. There were many protests and boycotts

against Japan, especially as Japan encroached more and more on Chinese territory. I argue that as soon as industrial processing of camphor into celluloid became established in China it was embroiled in nationalistic politics. The National Products movement urged Chinese to purchase products made in China and touted each instance of such consumption as a victory against imperialists. Though celluloid factories also brought the danger of fire and loss of life to neighboring communities.

Domestic Production and Consumption of Celluloid

Production

China was not the first producer of celluloid in Asia. Celluloid factories were established in Japan in the early 1910s. According to the British Vice-Consul in Osaka in 1911, before the then-recently built two new factories had gone online in Japan, there had only been fourteen celluloid factories worldwide, of which seven were in Germany, three in the United Kingdom, two in the United States, and two in France. The two Japanese factories would be capable of producing over one thousand tons of celluloid annually, with approximately twenty percent of that satisfying Japanese domestic demand and the remaining eighty percent exported. Japan's largest celluloid export destination was China. At that time China on an annual basis imported approximately £8,000 worth of raw celluloid and £12,000 worth of finished celluloid goods, most of which came from Germany.[225]

[225] "The Celluloid Industry in Japan," *North China Daily News*, Friday, October 13, 1911

But in the 1920s China began to establish celluloid factories, as well as a great number of other types of factories. A 1927 article published in the Far Eastern Review describes the Yung Woo Company as "the pioneer of celluloid manufacturers in Shanghai."[226] Under General Manager Yeh Chung-t'ing, in 1926-27 the company built a factory on West Pao Hsing Road in Shanghai that employed forty workers and produced one hundred and fifty pounds of celluloid per day. The factory had three departments: spectacle frames, toys, and ornament, with plans for a fourth to manufacture motion picture film. The frames department had three machines producing imitation tortoise shell spectacle frames. The toy department produced all kinds of celluloid toys with four machines. The ornament department used five machines and produced caskets, boxes, and chests of all shapes and sizes for decorative use.[227]

A 1928 article in the *Zhongyang Ribao* described a factory producing "colorful celluloid," which had not been in business for long, but had already "received the welcome of the community."[228] The *DaZhonghua*, or Great China Celluloid Manufacturing Plant also began in 1928 in Shanghai's French Concession. The director had studied overseas but returned to start the company. The factory mostly produced common household use celluloid products for the domestic market, which had formerly been filled with Japanese products. In 1933 it was estimated that their factory could produce enough celluloid to satisfy the entire domestic demand.[229]

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[226] "Celluloid Manufacture in China," *Far Eastern Review*, 1927.
[227] Ibid.
[228] 「五顏六色之賽璐珞」 (Colorful Celluloid) ,中央日報 (*Zhongyang Ribao*), July 8, 1928.
[229] Li Youlin 黎又霖 , "中國產業界之最前線：大中華賽璐珞製造廠參觀記（國貨工廠介紹之一）" ("The Front Line of Chinese Manufacturing")《国防论坛》(National Defense Review), 1933, iss. 1, no.2, 18.

In the mid to late 1930s the two largest celluloid producers in Shanghai were the *DaZhonghua* Celluloid Manufacturing Company and the *Zhongxing* Celluloid Manufacturing Company. Each produced many commonly used household goods like dishes, soap boxes, and cigarette cases as well as toys ranging from cars and drums to animals and dolls, and also ping-pong balls.[230] These products were intended for the domestic Chinese market.

Consumption

Chinese consumption of celluloid products expanded rapidly. Advertisements for celluloid in China appeared in the 1920s. As discussed above Chinese factories began producing celluloid for the domestic market in the late 1920s. By the 1930s celluloid had permeated the market to the point that smugglers celluloid containers to transport contraband. By the 1940s, plastic products of made of either celluloid or bakelite were ubiquitous.

In the 1930s celluloid companies and their product and price lists were carried alongside other companies and their products in monthly market price lists, like those published in *Huayang Monthly* (華洋月報) by the Huayang Miscellaneous Goods Trade Association Publishing Group (華洋雜貨業同業公會會刊).[231] As celluloid became more widespread and popular, there were requests published in trade magazines for plastic products that consumers would find useful. An example of this is a 1940 request from sales

[230] 華洋月報：分類市價：賽璐珞類：大中華廠出品：象頭牌皂盒、進步牌皂盒…… (Huayang Monthly: Price categories: Celluloid items …), 《华洋月报》(*Huayang Monthly*), 1935, iss. 2, no.1, 143-146; 華洋月報：分類市價欄：賽璐珞類：有聲花檯球二元一角…… (Huayang Monthly: Price categories: Celluloid items …), 《华洋月报》(*Huayang Monthly*), 1938, iss. 4, no. 8, 58.

[231] For example, see: *Huayang Monthly, "*Huayang Monthly: Price categories: Celluloid items …" 1935, iss. 2, no.1, 143-146

clerk Shi Yuanshan suggests that plastic boxes to hold toiletries would be useful for clerks and factory workers that live in company dormitories, particularly in keeping their personal items from getting wet or developing mold.[232]

As a footnote to the discussion of local Chinese consumption of celluloid products, there is the interesting case of using celluloid to create containers that could fool customs inspectors. According to a report from 1934, a smuggler was caught carrying contraband medication inside celluloid containers that had been made to resemble olives and then transported inside barrels of actual olives.[233]

"Nowadays when you walk down the street and look in shop windows everything is made of celluloid or bakelite."[234] Thus reported Chen Runquan in his 1944 essay describing how plastic products made of celluloid and bakelite had replaced similar goods which previously had been ceramic or made of glass. Chen recounts how John Hyatt invented celluloid, then that each country in Europe and America established celluloid factories. He celebrates how China has already established many celluloid factories in recent years, decreasing the amount of foreign imports. Chen also discusses celluloid products, including film, and the basic methods of manufacturing them.[235]

A 1948 article on celluloid and bakelite speaks to continued interest in the materials. Author Shan Xia (山下) gives a brief history of the invention of celluloid by John Hyatt. Mentioning Parkesine and Xylonite, Shan says Celluloid is the most common name and the three are all the same thing. Shan describes how both celluloid and bakelite are

[232] Shi Yuanshan 施元善, 赛璐珞与电木电玉厂注意大可做得的盥洗盒 (Attention Celluloid and Bakelite factories could make toiletry boxes), 《商业实务》(Business Practice Magazine), 1940, iss. 1, no. 5, 99.
[233] "Smugglers are becoming Ingenious," North China Daily News, December 25, 1934
[234] Chen Runquan 陳潤泉 , 幾種常見的工業品：賽璐珞和電木 "Several Commonly seen manufactured goods: Celluloid and Bakelite," 《新道理》, 1944, iss.7, no.2, 19.
[235] Ibid., 20

made and what they are used to make: toys, film, and household products.[236] The Chinese public's interest in celluloid products carried through into the late 1940s not just because they were useful household goods, but in part because of what celluloid represented: progress.

National Pride for Progress in Science and Production

In China in the 1930s and 1940s there was a general sense of pride in the nation for achieving progress in both science and industrial production, many saw China finally catching-up to the rest of the world. Brett Sheehan has discussed this idea in his analysis of Chinese industrialist Song Feiqing's business philosophy. Song and others in the 1920s and 30s saw industrialization as not just a project of modernization, but as a patriotic project that could redeem China.[237] Celluloid fit into this narrative as well. It was an industrial product, but its production also required advanced scientific know-how. Thus domestic Chinese celluloid production was a double source of pride.

Popular Science

Sigrid Schmalzer has argued that "science dissemination" was, both before and after the 1949 revolution, "central to the ideological mission of Chinese socialists."[238] Yet

[236] 山下 (Shan Xia), 賽璐珞與電木 (Celluloid and Bakelite), 《机联》(Jilian Magazine), 1948, no. 232, 21-22
[237] Brett Sheehan, *Industrial Eden: A Chinese Capitalist Vision* (Cambridge, MA: Harvard University Press, 2015), 2.
[238] Sigrid Schmalzer, *The People's Peking Man: Popular Science and Human Identity in Twentieth-Century China* (Chicago: University of Chicago Press, 2008), 6.

whereas the socialists or communists wanted to "smash superstition,"[239] in the 1920s and 1930s though, there was a great popular interest in science and progress, likely tied to ideals of strengthening the nation and national development. The popular press printed many articles on scientific advancement and basic "how-to at home" topics. Chapter 5 discusses this in relation to photography in the pages of *Kodak Magazine*. In the 1930s and 40s a wide range of newspapers and magazines discussed issues relating to science. Some of these had obvious titles like Popular Science (*Dazhong Kexue*) or Science Pictorial Weekly (*Meiyue Kexue huabao*). Yet even magazines with titles that did not seem relevant to science published related articles, such as National Products Weekly (*Guohou zhoubao*) and National Defense Forum (*Guofang luntan*).

Many of the pieces published on celluloid detailed how it was made, and some included instructions for how to make celluloid at home. In 1934 *Guohuo zhoubao* (National Products Weekly) published an article detailing both the chemistry and physics behind the making and molding of celluloid.[240] A 1943 article from *Meiyue kexue huabao* (Scientific Pictorial Monthly) provided instructions on how to make your own celluloid at home in a bottle, while warning readers to keep their creation away from flame and other sources of heat.[241]

A detailed 1938 article in *Dazhong Kexue* (Popular Science) described four different methods of making celluloid, which the author mentioned was also known as false ivory. Two were for general celluloid, one for "flexible" celluloid, and the fourth method was for a

[239] Schmalzer, *The People's Peking Man*, 113.

[240]This article carried across multiple issues: 张鲁平 (Zhang Luping), 赛璐珞制造法(续) (Celluloid production (continued), 《国货周报》(National Defense Weekly), 1934, iss. 1, no. 2, 42-44; Zhang Luping, "Celluloid production (continued)," *National Defense Weekly*, iss. 1, no. 3, 66.]

[241] 王枕松 (Wang Zhensong), 赛璐珞接合液 (Celluloid assembly fluid), 《每月科学画报》(Scientific Pictorial Monthly), 1943, iss. 3, no. 12, 29.

paste that could be applied to mend bent or distorted celluloid.[242] That this was the second issue of *Dazhong Kexue* says something about the popularity of celluloid. The article concludes with a photograph of factory workers making celluloid dolls, showing one of the key uses for the substance in the mind of the public.

Manufacturing for the Nation

In tandem with pride in the progress of Chinese scientific ability came pride in increased national industrial capability. National pride was reflected in the 大中華 (*Da Zhonghua*) or "Great China" appended in front of many company names, like Great China Celluloid Company, and Great China Match Company.[243] Nationalist feeling also went hand in hand with anti-Japanese sentiment that was reaching new heights in the 1930s. This is quickly illustrated by an article from a children's magazine from 1935. 常识画报：中级儿童 (Common Sense Illustrated: [for] Middle-Schoolers) explained the meaning of *sailuluo* (the Chinese transliteration of celluloid) and stated that while most celluloid products in China were "foreign goods" now that China had celluloid factories of its own it was hoped that China could develop quickly and replace the foreign celluloid with domestic products.[244]

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[242] 方一 (Fang Yi), "賽璐珞的制造法" (Celluloid Manufacturing),《大众科学月刊》(Popular Science)， 1938, iss. 1, no. 2, 39-41.

[243] For an in-depth discussion of the Great China Match Co., see Chapter 7 of Sherman Cochran, *Encountering Chinese Networks: Western, Japanese, and Chinese Corporations in China*, 1880-1937, (Berkeley, Calif: University of California Press, 2000).

[244] 賽璐路的玩具：中國的賽璐珞廠 (Celluloid toys: Chinese Celluloid Factories),《常识画报：中级儿童》(Common Sense Illustrated: [for] Middle-Schoolers), 1935, no. 15, 37.

National Products Movement

This pro-domestic goods and anti-import ideology had been given shape and spread throughout Republican China by the National Products Movement, particularly in the 1930s. While boycotts of imports had sporadically occured in China since at least 1905, particularly boycotts of Japanese imports, Karl Gerth has argued that it was the National Products Movement that helped to tie nationalism and consumerism together to create "patriotic producers" and consumers. With the slogan "Chinese people should consume Chinese products, "participants in the National Products Movement, Gerth asserts, sought to "nationalize consumer culture" and to cleanse China of its "national humiliations."[245] So Chinese consumers were mobilized to "destroy imperialism" by purchasing Chinese-made goods.[246] Meanwhile Chinese factory-owners were constructed as heroes who helped China to resist the imperialists, particularly the Japanese.[247] Though, as Brett Sheehan has argued, neither boycotts nor tariffs were truly effective in reducing Japanese imports (or Japanese aggression).[248]

Chinese Celluloid

Yet the mood of economic nationalism remained strong. This sentiment was recounted in greater depth when author Li Youlin (黎又霖), invited by the company Chairman Zhu Rutang (朱如堂) and General Manager Sun Hongcheng (孫洪成), visited the

[245] Karl Gerth, *China Made: Consumer Culture and the Creation of the Nation* (Cambridge, MA.: Harvard University Press, 2003), 3, 13, 19.
[246] Ibid., 246.
[247] Ibid., 354.
[248] Brett Sheehan, "Boycotts and bombs: The failure of economic sanctions in the Sino-Japanese conflict, Tianjin China, 1928–1932," Management & Organizational History, 2010, Vol 5(2): 197–220.

Great China Manufacturing Plant in Shanghai. Li's account was published in *National Defense Forum* in September 1933. Li calls the celluloid factory "The Front Line of the Chinese Manufacturing World."[249] Li complains that China has often invented things but then not maintained them, and so it becomes as if China never had them at all. Then Li Introduces the idea that domestic production is a form of national defense, and that China should not be dependent on imperialist countries. Thus to Li the Great China Celluloid Manufacturing Plant was then on the front line of national defense of natural resources, writing that "Every year [China is] leaking out hundreds of thousands of *yuan*," but since the celluloid factory has been established China has begun getting that back.[250]

Li almost glosses over the 1929 fire that destroyed the company's entire factory, forcing them to build a new factory in 1930, investing over 60,000 *yuan*. The newly built factory site is over 660 meters long, houses four factory buildings, and four or five other buildings, including a recreation room and a dormitory for the workers. The Great China Manufacturing Plant employs two hundred workers (evenly split between genders). Li describes how celluloid is made and states that the factory mostly produces common household use products of celluloid for the domestic market, which was formerly filled with Japanese products. Finally, the new factory is described as having "complete fire protection equipment" because celluloid was easily combustible.[251] Unfortunately this new factory would also burn.

[249] Li Youlin, "The Front Line of Chinese Manufacturing," 18.
[250] Ibid.
[251] Ibid.

Fire and Danger

Fire was a great danger in industrializing economies of the late nineteenth and early twentieth centuries. The most famous such accident in US history is perhaps the Triangle Shirtwaist factory fire that killed 141 in Manhattan in 1911. The factory occupied the eighth, ninth, and tenth floors of the building. Oil-soaked cloth caught fire in the 8th-floor just before the end of a Saturday afternoon shift. Most workers were prevented from escaping due to locked doors. There were no external fire escapes. Many got out through elevators, and some escaped to the roof where they were helped by students with ladders from the adjacent university building. Many people chose to risk jumping rather than being burned to death. Most of those who jumped did so from the ninth floor: none survived.[252] There was strong public outrage, especially as over 120 of those killed were young women. The factory owners were tried for manslaughter. Although they were acquitted, they still had to escape an angry mob outside the courthouse.[253]

Celluloid factories were at greater risk of fire due to the combustible nature of celluloid, which was always its greatest drawback. In 1914 John Hyatt expressed his subsequent realization of how lucky he and his brother Isaiah had been with their early experiments.[254] The Hyatts' Celluloid Co. suffered factory damage from fire multiple times. In fact in the mid-1870s a fire nearly destroyed the Hyatts' entire operation.[255] Another major fire broke out on September 4, 1898 their factory in Newark, New Jersey burned

[252] "141 Men And Girls Die In Waist Factory Fire; Trapped High Up In …" *New York Times* (1857-1922); Mar 26, 1911; ProQuest Historical Newspapers: The New York Times
[253] Paul Hashagen, "Learning from Tragedy: The 1911 Triangle Shirtwaist Factory Fire," *Firehouse Magazine*, March, 2011, 82-86.
[254] Hyatt, Perkins medal acceptance speech, 3-4.
[255] Ibid., 5.

causing great loss and spreading to almost 100 buildings, many of which were homes.[256] The destructive fire killed one, injured sixteen, and left forty families homeless.[257] Another in New York in the early years of the twentieth century would claim 150 lives.[258]

Shanghai factories were not immune to this danger, though warnings about celluloid fires appeared in Shanghai at least fifteen years before there were celluloid factories in the city. In 1910 the *North China Daily News* reprinted an article warning of "The Menace of Celluloid," in relation to the Clapham fire in London that year. The fire began when a shop assistant started a domino effect by accidentally knocking over umbrellas, which knocked over a lamp that short-circuited, sparked a flame near celluloid ornaments and set the whole store on fire within minutes. Thousands of customers and workers panicked and rushed out. The whole building was destroyed and many people died.[259]

The article's (uncredited) author made some prophetic observations that would have benefited many if they had been heeded: "Celluloid has found a place for itself in our civilization from which it will be difficult to dislodge it."[260] This could be equally applied to all plastic. Describing celluloid as a substance "used indiscriminately in hundreds of ways," which had with the Clapham fire now proved itself "direct and instantaneous cause of great disaster," the author demanded that either celluloid production and use must be closely restricted or "a means must be found of reducing its inflammability in such a manner as to render it comparatively safe."[261]

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[256] Committee of Twenty of National Board of Fire Underwriters, "Report on the City of Newark, N.J., March, 1905," in *Report on Cities*, Volumes 11-15, (New York: National Board of Fire Underwriters, 1905), 22.
[257] "Forty Families Homeless," *The Mail*, Hagerstown, MD, September 9, 1905.
[258] "Dangers of Celluloid," *North China Daily News*, 1911
[259] "The Menace of Celluloid," *North China Daily News*, Wednesday, January 26, 1910
[260] Ibid.
[261] Ibid.

It is unfortunate that flammable celluloid remained the dominant plastic for another few decades, only to be replaced by a series of less-flammable but more environmentally damaging plastics that now circle the globe today.

In 1911 more specific warnings came when a reporter questioned what precautions were being taken in Shanghai after a London theater fire claimed two lives and led to a call to adopt fireproof metal boxes for film. The reporter feared Shanghai theaters would not adopt such measures, and expressed further concern over the fire at the Celluloid Company in New York which killed 150.[262]

Shanghai Celluloid Fires

It has already been mentioned that the *DaZhonghua*, or Great China, Celluloid Manufacturing Company experienced a factory fire in 1929. The 1930s and early 1940s saw several more major fires in Shanghai due to celluloid, and several of these fires also burned *DaZhonghua* factories. The first of these came in 1934 when the factory at 100 Ferry Road was gutted by a "spectacular night fire" in the early morning on Wednesday August 1st.[263] Thankfully there were no injuries.

June 1935, however, brought a disastrous fire that destroyed part of the factory, many homes, and killed dozens. On the evening of June 28 a storeroom caught fire, again at the Great China Manufacturing Company's factory on Ferry Road. A later report concluded that this storeroom had been illegally constructed and was storing some 40,000 pounds of

[262] "Dangers of Celluloid," *North China Daily News*, 1911
[263] "Celluloid Factory Gutted by Fire," *North China Daily News*, August 2, 1934

scrap celluloid, which was a separate breach of regulations governing the storage of celluloid.[264]

The fire was called "one of Shanghai's greatest tragedies."[265] Hanchao Lu has detailed how in the Republican period the majority of Shanghainese lived in two or three-storey row houses in narrow alleyways, usually in mixed-use spaces with factories or businesses in front and houses behind.[266] Many of these homes burned in the fire. Forty-nine buildings burned in part or in whole, and the death count ranged from thirteen to twenty-seven, with between forty and sixty injured. An article from *Gongye anquan* (《工业安全》, Industrial Safety) carried the names and ages of the deceased, at least half of them were children under eight years of age. Judging from surnames the dead included the entire family of Mr. Wu Shiliu and his wife, both 30, his mother age 76, their thirteen-year-old daughter and their seven year old son.[267] Cramped conditions and poor construction materials may also factor into the blame, but the explosion from the factory and the rapid spread of the celluloid fire was the ultimate cause of death.

When put on trial the company managers all maintained their innocence, with their defense counsel even asking for acquittal due to lack of evidence, even going so far as to claim the fire started outside the factories.[268] When management promised to pay $30,000 in compensation to the victims' families, the victims sought to withdraw their case, but the

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[264] "Report Made on Factory Fire: Cause held to be storage of large amount of scrap celluloid soiled by oil," *The North China Herald*, September 18, 1935.
[265] "Death Toll Now 19 in Explosion: About 60 Injured: Celluloid Factory Wrecked: 22 Houses Razed: Inquest Held over Thirteen Bodies," *North China Daily News*, 1935
[266] Hanchao Lu, *Beyond the Neon Lights: Everyday Shanghai in the Early Twentieth Century,* (Berkeley, CA: University of California Press, 1999), 13, 138, 173.
[267] "大中华赛璐珞厂爆炸惨剧之经过及本会之感想" (Reflections on the Experience of the Great China Celluloid Factory Explosion Tragedy), 《工业安全》(Industrial Safety), 1935, iss. 3, no 4., 447-455.
[268] "Celluloid Case," *North China Daily News,* Sept. 11, 1935

court ordered the case to continue. During the trial an inspector for the Shanghai Municipal Council, a Ms. Hinder, reported that after the 1934 fire the factory had been told to replace the exterior bamboo fence with a brick wall. She also mentioned that 10,000 pounds was the maximum to be stored in a single well-ventilated room (not the 40,000 stored in an unventilated room by the Great China Celluloid Manufacturing Company).[269] Eventually, on September 10th, 1935 the First Special District Court ruled four out of five of the managers guilty of negligence and fined them each $300.[270]

While the trial was ongoing the factory had re-opened at the end of August. But the factory closed down again on or before September 4th, when it was reported that the one hundred and seventy workers were negotiating for severance pay.[271] This closure did not stop a third fire from breaking out at the same factory on September 15th. "Heralded by a sheet of flame that was visible all over Shanghai, an explosion in the China Celluloid Factory in Ferry Road last night took the lives of ten Chinese and injured more than double that number," ran the news.[272] The number of injured overwhelmed local hospitals and nearly gutted the factory.[273]

That was the end for the *DaZhonghua* celluloid factory, but not the end of celluloid fires in Shanghai. In 1936 a woman died when a small factory "at the end of a row of rather old two-storey houses," the same time of lilong or alley-houses described by Hanchao Lu, caught fire, gutting the building and burning neighboring homes. The woman was one of

[269]"Factory Structure Unauthorized: Evidence from S.M.C. in Celluloid Factory Case: Only Poor Ventilation: Windows Closed," *North China Daily News*, August 30, 1935.
[270] "Fine Imposed Upon Factory Heads: Verdict Given by Court in Celluloid Case," *North China Daily News*, Sept. 11, 1935.
[271] "Celluloid Factory Closes Doors," *North China Herald*, Sept 4 1935
[272] "Ten Killed by Explosion in Factory," *North China Daily News*, Sept. 16, 1935.
[273] "Third Fire Sweeps Celluloid Plant: Flames Shoot Fifty Feet into Air: Unit Gutted," *The North China Herald*, September 18, 1935

these neighbors.[274] In 1937 six people, including a baby girl, died when a row of shops caught fire. The cause was attributed to "the stocks of varnish, paint, celluloid, and other highly flammable materials" stored in the row of furniture shops and a single spectacle-maker's shop, which contained the celluloid.[275]

In 1939 another few houses were damaged by fire in a celluloid factory, though no one was injured.[276] In 1940 a toy shop owned by a Japanese man burned, with the suspected cause being "a carelessly discarded cigarette-end."[277] And in May 1941 a fire started on a bus when a cigarette was tossed into a basket of goods carried by a man purchasing celluloid for button manufacturers. In this instance several people died and over twenty were injured.[278]

In light of all the injury, death, and damage caused by celluloid fires, the January 1937 *Kodak Magazine* article giving readers advice for capturing photographs of fire can be considered insensitive. The advice included the best f-stop settings and film speed, as well as how to frame your photos, and suggested that including some firefighters in the frame would add drama. Photographs of shadowed buildings illuminated by flame can produce a "different kind of astonishing" feeling.[279] It is astonishing that the author could discuss using celluloid film to capture the beauty of fire without mentioning how much fire and death was caused by celluloid.

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[274] "Celluloid Factory On Fire," *North China Daily News*," Sept. 6, 1936. See Hanchao Lu's chapter 4.
[275] "Six Dead in Fire in Nanking Road: Blaze Fed by Varnish, Paint, and Celluloid," *North China Herald*, Nov. 12, 1937.
[276] "Celluloid Factory Badly Damaged by Fire," *North China Herald*, July 15, 1939
[277] "Celluloid Toys Burn in Downtown Shop: Japanese Establishment Off Henan Road Damaged," *North China Daily News*, Jan. 13, 1940.
[278] "Basket of Celluloid Caused Bus Fire," *North China Daily News*, May 20, 1941.
[279] "火！(Fire!)" 柯達雜誌 (The Chinese Kodakery), Jan. 1937, iss. 8, no. 1.

Ultimately it took an end to the chaos of both war and revolution with a new government to better-control the danger of celluloid fires. After the war against Japan and the civil war between the Nationalist and Communist parties, in 1950 the Chinese Communist Party government issued new regulations pertaining to celluloid factories which were specifically targeted at fire prevention. These required that celluloid producers register with the fire department and the Public Security Bureau. There had been multiple celluloid fires in the year after "liberation," including two ping-pong ball factories. The celluloid fires "accounted for 24 out of 44 fire victims" 1949-1950, thus prompting the new regulations.[280]

Conclusion

Ultimately as camphor came full circle and began to be used to make celluloid in China it was with mixed results. This chapter has focused on Chinese celluloid factories and the goods (and dangers) they produced. Domestic celluloid production was seen as a positive example of Chinese scientific and industrial progress, with China taking another step towards modernization. Simultaneously domestic celluloid products were pitted against imported foreign celluloid, not only in the economic realm of the marketplace, but also in the political realm of growing Chinese nationalism. Both the production and consumption of Chinese-produced celluloid was joined to that of other domestic Chinese goods in the "Chinese people should consume Chinese products" narrative of the National Products Movement.

Yet at the same time nationalist reformers and "patriotic" producers sought to save the nation, at least in part, with Chinese-made celluloid, that same celluloid was bringing

[280] Plants Making, Using Celluloid Must Register, North China Daily News, July 20, 1950.

danger into Chinese communities. The poorly-regulated and poorly-managed early celluloid factories often erupted in flames due to careless sparks (often from cigarettes) or negligent storage procedures. The flames not only gutted factories but jumped fences and charred both the houses and the bodies of lower-class Chinese living in cramped conditions in the neighborhoods adjacent to the factories. This kind of danger was common to the unchecked development worldwide in the rapid industrialization period of the late 19th and early 20th centuries. Yet these dangers were known before the first Chinese celluloid factories were built, and so a chance to avoid them was missed and many lives were lost. While this chapter has explored the production of celluloid in China and the hazards it brought, the next focuses on a more positive aspect of the new technology. In Chapter 5 I examine the introduction of celluloid-backed rolled film into China and the expansion of popular photography there.

CHAPTER FIVE: KODAK AND THE GROWTH OF AMATEUR PHOTOGRAPHY IN CHINA, 1920-1937

By the end of the nineteenth century photography had been embraced by many throughout China, and new technologies were making it easier and easier for amateurs to take up the practice as a hobby. By 1915 photography had taken off in China. An author in *Fanhua Magazine* (繁華雜誌) remarked that the art of photography was flourishing in modern times.[281] This trend accelerated from the 1920s into the 1930s.[282] This chapter addresses the question of how photography spread in China and how new practitioners were brought into the hobby. It also asks what role the Eastman Kodak company had in that expansion.

There has been a lot of discussion of when hobby photography became common in China. One would be forgiven for thinking that the simple fact of having the relatively cheaply available technology of point-and-shoot cameras, with film that could be developed for the amateur by a professional, would be enough to spread photography as a hobby. But that was not the case. There were many challenges to overcome to change public perception into believing that photography was something for everyone, something easy to do, and something fun. I argue that the Eastman Kodak company played a direct and important role in the expansion of amateur photography by repeatedly making the case to Chinese would-be photographers, through a broad range of advertisements in different

[281] 楚雲 Chu Yun, "照相機之秘密安設法" (Camera's secret setup method), 《繁华杂志》(Fanhua Magazine), 1915, no. 6, 78. My rough translation of the phrase "照相之術至近代已極盛"

[282] Claire Roberts, *Photography and China* (London: Reaktion Books, 2013), 27-39, 77; Roberta Wue, *Picturing Hong Kong: Photography 1855-1910*. (New York: Asia Society Galleries, 1997), 44; Wen-hsin Yeh, "Beyond the Frame: The Camera in Republican Shanghai and Wartime Chongqing," in Jeffrey W. Cody and Frances Terpak, eds., *Brush & Shutter: Early Photography in China* [(Los Angeles: Getty Research Institute, 2011), 111-119], 114.

media and through public outreach campaigns which appealed to Chinese values, that photography was indeed easy, fun, and perhaps more importantly, relevant to their lives and interests.

Brief Historiography of Photography in China

Historians and art historians have highlighted several important facets of the growth of photography in China. Technological innovation contributed to the spread of photography. Camera clubs and photographic societies, along with the journals and magazines they published and the contests they held, helped to popularize amateur photography and teach techniques. It was put to various political and social uses, from government IDs and crime prevention, to commemorating modernization projects, to wedding photos. And studio photography remained important even as amateur photography was on the rise.[283] Shanghai has been recognized as an important site for photography and the development of Chinese photography, and the city was also the place where famous early pictorial magazines like the *Dianshizhai Pictorial* and its later successor *Liangyou* (Young Companion) were published.[284] Certainly by the 1930s photography was everywhere: newspapers, magazines, weddings, IDs, school yearbooks, attached to diplomas, and attached to death certificates.[285]

Claire Roberts has pointed out how photography was used in a documentary and commemorative capacity in support of many Chinese "self-strengthening" projects. She also emphasized the importance of photographic societies in the spread of amateur

[283] Roberts, *Photography and China*, 41, 44-45, 51-55, 65, 77, 80-83; Yeh, "Beyond the Frame," 112, 114; Roberta Wue, *Picturing Hong Kong: Photography 1855-1910*. (New York: Asia Society Galleries, 1997), 44, 46.
[284] William Schaefer, *Shadow Modernism: Photography, Writing, and Space in Shanghai, 1925-1937* (Durham, N.C.: Duke University Press, 2017). Roberts, *Photography and China* , 53, 55, 65-66; Yeh, "Beyond the Frame," 114.
[285] Yeh, "Beyond the Frame," 112, 114.

photography, in particular the Light Society, the Chinese Photography Association, and the China Camera Club.[286]

Wen-hsin Yeh has written that in Republican Shanghai the camera became a "democratizing tool," creating many images of "a city in motion and a society in flux."[287] Yeh's work notes the importance of race and gender in the use of photography. European photographers took ethnographic photographs and the Western gaze "produced visual records of perceived racial and ethnic stereotypes," while Chinese photographers composed images in a "Chinese style."[288] Yeh argues that women played a prominent role in helping to transform Shanghai: women were more visible in public spaces than they had been before, they were trend-setters, and at home they often controlled family finances.[289] In discussing the spread of amateur photography, Yeh highlighted the importance of Shanghai's department store photography clerks--they sold the cameras and the film, developed the pictures, and explained the techniques. When bombs rained on Shanghai the clerks fled to Suzhou, Zhenjiang, and other places, taking their photography practices with them. Yeh used these details to suggest that "Shanghai was at the apex of a hierarchy of sophistication in the use of the camera in terms of both access to photographic technology and the extensiveness of its practice."[290]

Roberts and Yeh give overlapping accounts of the spread of amateur photography in China, and particularly Shanghai, in the 1920s and 30s. But Roberta Wue has shown the spread of photography among the Chinese in late nineteenth-century Hong Kong.[291] This

[286] Roberts, *Photography and China*, 42, 80-83.
[287] Wen-hsin Yeh, "Beyond the Frame," 114.
[288] Ibid., 112.
[289] Ibid., 113.
[290] Ibid., 114.
[291] Wue, *Picturing Hong Kong*, 44.

suggests another vector for the dissemination of the hobby: namely spread from person to person, or word of mouth, either among local networks or from Chinese travelling back and forth from Hong Kong.

Reading Roberts, Yeh, and Wue, we see that photography did not just spread because of available technology. New photographers were exposed and brought into the hobby by word of mouth, by photographic associations, and by department store clerks who served roles as both salespeople and teachers.

Japan

In Japan, the spread of popular photography has been captured by Kerry Ross in her 2015 book *Photography for Everyone: The Cultural Lives of Cameras and Consumers in Early Twentieth-Century Japan.* Like Roberts and Yeh, Ross highlights the importance of camera clubs, pictorial media, camera shop clerks, and gender. Ross, however, adds the dimension of camera companies, specifically the Japanese companies Asanuma Shokai and Konishi Roku (now Konica Minolta), which produced dependable and inexpensive domestic photographic products and cameras.[292] She argues that these companies "deployed state-of-the-art marketing, management, and retailing strategies, that, alongside leading department stores like Mitsukoshi and Shirokiya, revolutionized the twentieth-century shopping experience for Japanese consumers."[293]

Within these business strategies, companies employed "overtly gendered" ideas of women as mere "casual photographers" who would take snapshots and then ask a

[292] Kerry Ross, *Photography for Everyone: The Cultural Lives of Cameras and Consumers in Early Twentieth-Century Japan.* (Stanford University Press, 2015), 8.
[293] Ibid., 6.

professional camera shop to develop their film, whereas men would become "dedicated amateurs" with a serious hobby who would obtain "technical mastery" and take and develop their own pictures in home darkrooms.[294] This was a strategy "intended to match middle-class masculine aspirations of technical mastery and productive use of free time away from work."[295] Coupled with a rising new middle class of urban white-collar workers with both higher incomes and more leisure time, this narrative allowed Konishi Roku (who opened their flagship photographic department store in the middle of a Tokyo government and business district) to help define photography as part of middle-class masculine identity in Japan.[296]

To the idea above that photography grows through the efforts of photographers, camera clubs, and salespeople, with Ross' study we add the active role of camera companies. These companies pursue more than an advertising strategy; instead they have an overall marketing narrative, which defines photography as a practice that should be ideally part of the everyday lives of a (certain type) of consumer.

American Commodities in an Age of Empire

The spread of cameras and photography in East Asia was part of a broader story. In Mona Domosh's *American Commodities in an Age of Empire*, she explores how American informal empire was expanded by the opening of markets and selling of American products. Domosh focuses on five major companies, including Singer Manufacturing Company (makers of Singer sewing machines), International Harvester, and, in brief,

[294] Ibid., 7.
[295] Ibid., 7.
[296] Ibid., 8, 21-28.

Eastman Kodak.[297] She examines the way these companies described their profitable international businesses as "part of the civilizing process," that they were "sharing the benefits of industrial development."[298] Domosh argues that an essential part of American economic dominance was "corporate attention to the importance of advertising and promotion."[299] And by 1910 Singer, Harvester, Kodak, and the others had extensive overseas networks that constituted commercial "empires."[300]

Domosh notes three important Kodak strategies: international expansion, which began in London in 1885 and eventually extended throughout Europe and into Australia, China, Egypt, India, Japan, New Zealand, and South Africa;[301] associating Kodak with good experiences and happy memories, as with the ad campaign "Bring your Vacation Home in a Kodak";[302] and associating the company with both simplicity and progress, both through the use of the "Kodak girl," who was a modern girl, but also through ads that showed that their cameras were so simple even a woman could use one.[303]

Kodak in China

This brings us to Eastman Kodak and the role of the company in China. In an 1895 newspaper article about a photography contest, it was observed that, "The man with the kodak is ubiquitous though not always welcome, but still none can withhold admiration for

[297] Mona Domosh, *American Commodities in an Age of Empire* (New York: Routledge, 2006), 2-5.
[298]Ibid., 3. Domosh's book is particularly concerned with the knowledge of other cultures and places that was produced by these companies in the course of their global business practices, and how that knowledge was disseminated back in the United States.
[299]Ibid., 12.
[300]Ibid., 50.
[301]Ibid., 26, 29-30.
[302]Ibid., 79. Picture of Kodak advertisement: "Bring your Vacation Home in a Kodak." Ad in Harper's Magazine, 1904.
[303] Domosh, *American Commodities in an Age of Empire*, 168.

the immense advance in photographic art which amateurs have accomplished."[304] Kodak was connected even more with progress and scientific development when the American Commander Peary took a Kodak camera with him on his expedition to the North Pole. The Eastman Kodak Company could not let such a good marketing opportunity pass by and in 1910 published a booklet distributed worldwide of Peary's photos to commemorate the expedition (and promote camera sales).[305]

Kodak established its own offices in China in the 1920s. The first record for a Kodak branch in China was from July 1921, for an office located in Shanghai at 64 Jiangxi Rd.[306] From 1923 this office was described as the "Headquarters for China and Hong Kong."[307] There are records of at least four other Kodak locations in Shanghai in the 1920s and 30s.[308] And in the city of Tianjin from 1922 to at least 1941 a Mr. R. Gartner managed "The Kodak Shop" located on Victoria Road.[309]

Marketing Kodak

Kodak's marketing machine began quickly. One of the four guidelines George Eastman had laid down for the successful expansion of his business in the 1880s was "extensive advertising and sale by demonstration."[310] Eastman Kodak Company

[304] Advertisement for "the Graphic" magazine, *North China Daily News*, Feb. 22, 1895. Comment made in the context of discussing a photo contest.
[305] "Kodak at the North Pole," *North China Daily News*, May 28, 1910.
[306] "Kodak, Ld.," North China Desk Hong List, July, 1921.
[307] "Kodak, Ld.," North China Desk Hong List, Jan., 1923, continuing biannually (January and July) until July 1927 issue.
[308] "Don't Forget your Kodak," *North China Daily News*, July, 22, 1922; "柯達公司贈書" (Kodak Co. presents a book) 《社友》(Friends of Society), no. 28: 4, Feb. 15, 1933; Untitled article, *North China Daily News*, Feb. 10, 1935; 審定商標第二二二九七號 (Examining Business Logos no. 22297), 商標公報 (Logo Report) , no. 108, Feb. 15, 1936.
[309] "Kodak Shop, the.," North China Desk Hong List, Jan., 1922 issue through Jan. 1941 issue.
[310] Douglas Collins, *The Story of Kodak*, (New York: Harry Abrams, Inc., 1990), 48.

advertisements appeared in English- and Chinese-language publications. A few years ago there was a flurry of discussion in American news and popular media about "advertisements disguised as news," often referred to as "advertorials," "native advertising" or "sponsored content." John Oliver even did a segment about it on his HBO show.[311] Of course this phenomenon is not new, and Kodak advertisers were early masters. "Don't forget your Kodak," was the title of an "article" that ran in 1922. This piece reminded readers to bring a Kodak to take pictures when they went on holiday, promoted the availability of self-timers to take pictures of yourself, and gave an address in Shanghai where Kodaks could be purchased.[312]

From Kodak Girl to Kodak Family

Kodak also ran ads in many newspapers, such as the pictorial newspaper published by the China Camera Club, using the then-standard trope of a modern girl using the newest camera.[313] For Kodak, this trope was, of course, known as the "Kodak girl," and had been in use in their advertisements since 1893.[314] An iconic version of the Kodak girl is shown in figure 1, showing a young woman in a striped dress on vacation to the Dover cliffs. As discussed earlier, Domosh related how Kodak's use of the modern-girl image was strangely progressive and misogynistic. The new modern woman, out on her own, was traveling,

[311] Made available by HBO on YouTube, posted Aug. 3, 2014: https://www.youtube.com/watch?v=E_F5GxCwizc
[312] "Don't Forget your Kodak," *North China Daily News*, July, 22, 1922.
[313] "圖中女子所用鏡箱" (The Camera used by the girl in the picture),《中国摄影学会画报》(China Camera Club Pictorial), 1926, no. 63, 2.
[314] "Women in Focus: Kodak Girl--in Pictures," *The Guardian*, Jan. 19, 2012: https://www.theguardian.com/artanddesign/gallery/2012/jan/19/women-in-focus-kodak-girl-in-pictures (last accessed March 2, 2018).

vacationing, and using her own camera. As mentioned above, the undercurrent to that progressive view was that the cameras were so simple even a woman could use them.

Figure 1: The Kodak Girl: Take a Kodak with You

Kodak Girl. *Australasian Photographic Review*, 23 January 1911. A 770.5 AU7P v.18

This is a faithful photographic reproduction of a two-dimensional, public domain work of art. The work of art itself is in the public domain for the following reason: This work is in the public domain in the United States because it was published (or registered with the U.S. Copyright Office) before January 1, 1923. The official position taken by the Wikimedia Foundation is that "faithful reproductions of two-dimensional public domain works of art are public domain". This photographic reproduction is therefore also considered to be in the public domain in the United States.

Kodak's earliest advertisements in China re-used images of Western women that had been used in marketing campaigns elsewhere. After establishing company offices in Shanghai, Kodak quickly adapted the Kodak girl to the Chinese woman. Four different advertisements with Chinese Kodak girls appeared in the Shen Bao (申報) newspaper in the 1920s. In each instance the girl wears a striped dress. In two of the advertisements, she

is using the camera on her own, taking pictures of scenery, reminiscent of the image of the Dover cliffs.[315] In the other two advertisements she takes pictures of others. In one she photographs a family. In the other she captures a picture of young men graduating, perhaps from college.[316] There were other similar advertisements as well: A Kodak girl taking a picture of family greetings at the New Year,[317] a young woman on a garden tour in 1925,[318] another of a Kodak girl taking a picture of a set of Chinese arches appeared in 1926.[319]

Early advertisements highlighting family and education are emblematic of the directions that Kodak advertising would take in the second half of the 1920s and through the 1930s: family and modernization. The representation of family is obvious. Here the photographer's subject is the family, but eventually the photographer would not be shown and the woman would become part of the depicted family. Photographing students on graduation day signals toward China's modernization with the establishment of European-style universities, and perhaps also towards the reforming zeal of the May 4th protesters. Kodak's initial strategy had been to make cosmetic changes to their advertisements to make them look Chinese. With the shift to portraying images of modernization and families, Kodak sought to situate their advertisements within the culture of the Nanjing decade.

Depictions of family evolve in the late 1920s. A 1926 advertisement shows a seated woman (wife and mother?) photographing father and child.[320] Later on that year no photographer is pictured, instead a young boy holds the camera while his father stands

315 《"Kodak"青春樂事》(Kodak: Enjoying Spring)，申報 (Shen Bao)，March 22, 1925.
316 《柯達KODAK請認明柯達商標贈他一只柯達鏡箱》(If you want the real thing give him a Kodak)，申報 (Shen Bao)，Jan. 19, 1924.
317 《"Kodak"新年樂事青春樂事》(Kodak: Enjoying New Year, Enjoying Spring)，申報 (Shen Bao)，Feb. 5, 1925.
318 《"Kodak"游園紀念》(Kodak: Remembering the Garden Tour)，申報 (Shen Bao)，Nov. 12, 1925.
319 《"Kodak"春假與柯達》(Kodak: Spring break and Kodak)，申報 (Shen Bao)，Mar. 30, 1926.
320 《"Kodak"XXXX》(Kodak: XXXX)，申報 (Shen Bao)，Sept., 12, 1926.

behind him, presumably teaching him how to use it.[321] In 1927, images of young couples are used. In the first, from March, they dance together, while photographic equipment sits on a side table underneath the text of Kodak's advertisement.[322] In the second, from September, they are seated on a couch, facing a camera set up once again on a side table, likely making use of the relatively recent auto-timer invention, allowing them to take their own portrait together.[323]

Representing modernization and perhaps national strength, in June 1925 an advertisement shows Chinese Kodak girl photographing athletes competing in a foot race.[324] In 1930 an advertisement for a Cine-Kodak (movie camera) seems to combine both family and modernization with explicit reference to the National Government. Here the audience sees a group of families with children watching a film that appears to depict Chiang Kai-shek giving a speech.[325]

Kodak's advertisements in China began with copies of what was run elsewhere. Then they became Chinese, the Kodak girl's hair and features became Asian. Her clothing changed as well, but retained the stripes. The advertisements sought to embody scenes that would appeal to Chinese readers. The images evoked important or moving events: graduation, vacation, a date, winning a race, and watching the leader of the country. Through these advertisements Kodak sought to show what their cameras could do. *Kodak Magazine* was a venue where words and photos could be used to convert more photographers.

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321 《"Kodak"XXXX》(Kodak: XXXX), 申報 (Shen Bao), Oct. 17, 1926.
322 《"Kodak"XXXX》(Kodak: XXXX), 申報 (Shen Bao), Mar. 11, 1927.
323 《"Kodak"XXXX》(Kodak: XXXX), 申報 (Shen Bao), Sept. 28, 1927.
324 《"Kodak"XXXX》(Kodak: XXXX), 申報 (Shen Bao), Jun. 7, 1925.
325 《"Cine-Kodak"XXXX》(Kodak: XXXX), 申報 (Shen Bao), Sept. 20, 1930.

Kodak Magazine

Kodak published its own magazine, called *The Kodakery* in the United States, and *Kodak Magazine* in the U.K. The Chinese edition was called 柯達雜誌(*keda zazhi*, literally "Kodak Magazine") or *The Chinese Kodakery*. The Chinese edition, published in Shanghai and edited by Shen Changpei (沈昌培) , was issued monthly and ran from July, 1930 until August, 1937. The first edition began with a bold declaration on the title page: Photographers learning on their own must read (自學攝影者必讀)![326] Like Kodak's advertising, the magazine began with mostly western content, but eventually became more Chinese (see discussion below around figure 5). A typical issue of *The Chinese Kodakery* contained around 20 pages, encompassing travelogues with accompanying pictures, photography advice, price lists, sale advertisements, and an advice column for people to ask questions of experts. All photographs included details of the method by which the photo was taken (including f stop values, shutter speed, etc.).[327] One type of article was an encouragement to get out and take photographs. An example is the 1934 article celebrating summer, *Xiaoxia mantan* 消夏漫談 (Musings on Summer Vacation), which emphasized how the longer days allowed for longer periods of time with good lighting conditions to be outside and photograph nature.[328]

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[326] 柯達雜誌 (The Chinese Kodakery), iss. 1, no. 1, July, 1930.

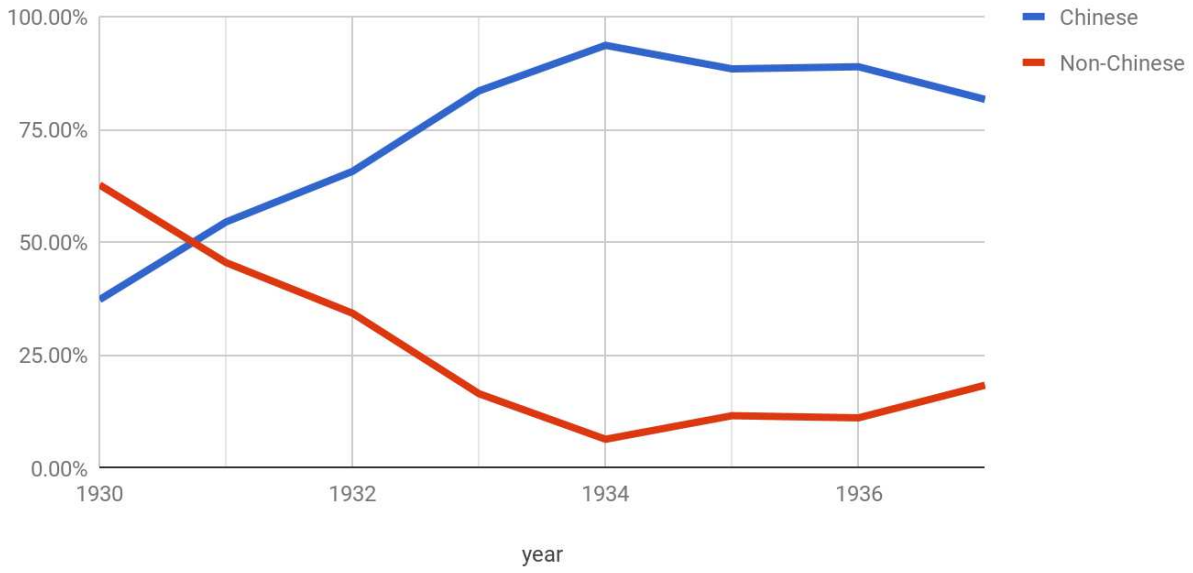
[327]"我們之間：讀者與編者" (Between us: Reader and Editor); and "問答 " (Q&A), 《柯達雜誌》(The Chinese Kodakery), 1934, iss. 5, no. 11, 20.; "柯達無線電播音:好消息" (Kodak Wireless Radio Broadcast: Good News) 《柯達雜誌》(The Chinese Kodakery), 1931, iss. 2, no. 5, 15.

[328] "消夏漫談" (Musings on Summer Vacation),《柯達雜誌》(The Chinese Kodakery), April 7, 1934, iss. 5, no. 7, 3-5. The article concludes with some tips about challenges when photographing under the strong summer sun.

Over the course of its print-run from 1930 to 1937 *The Chinese Kodakery* published 85 issues, 1,238 article pages, and 3,156 photographs. I analyzed the content of the magazine to determine the authorship origin of each article and photograph. As part of this analysis I categorized each article page or photograph as either "Chinese" or "non-Chinese." In many cases this was simple: a Chinese name attached to a photograph or article put that photograph or article page into the "Chinese" category. A non-Chinese name, for example a German or a Japanese name, would put that photo or article into the "non-Chinese" category. But categorization was at times difficult, as several photographs and articles were not credited. In these cases, unless the subject was clearly China or Chinese (and in many cases the subjects of un-credited photographs were clearly caucasian), I counted these in the "non-Chinese" category. I did not count advertisements (or the photos printed with them), or articles relating to magazine administration, or the cover photo. It is my belief that I likely under-counted Chinese contribution to the magazine, as one explanation for un-credited articles and photos is that they could be contributions from the editor or editorial staff.

Nonetheless my findings show a trend of increasing Chinese-ness over time. In 1930 the magazine content was just over 37% Chinese. In 1934 that number peaked at just under 94%. Chinese content remained steady at 88% in 1935 and 1936, but dipped slightly to 81% in 1937. Table 1 shows the overall content from 1930 to 1937.

Table 1: The Chinese Kodakery (Kodak Magazine) Content Source, 1930-1937



This graph combines article page count and photograph count to produce an overall visual trend-line. Tables 2 and 3 respectively show individual graphs for photographs and article pages. While table 1 shows the overall percentage of Chinese vs. non-Chinese content, tables 2 and 3 show raw numbers, making it clear, for example, how from 1933 on Chinese photographs outnumbered non-Chinese ones by the hundreds.

Table 2: Photographer Origin for Kodak Magazine Photos

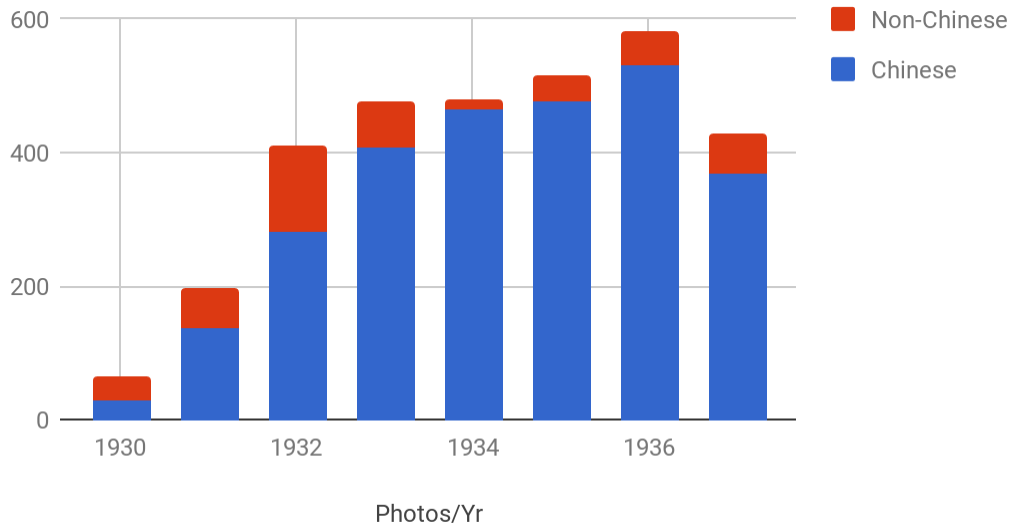
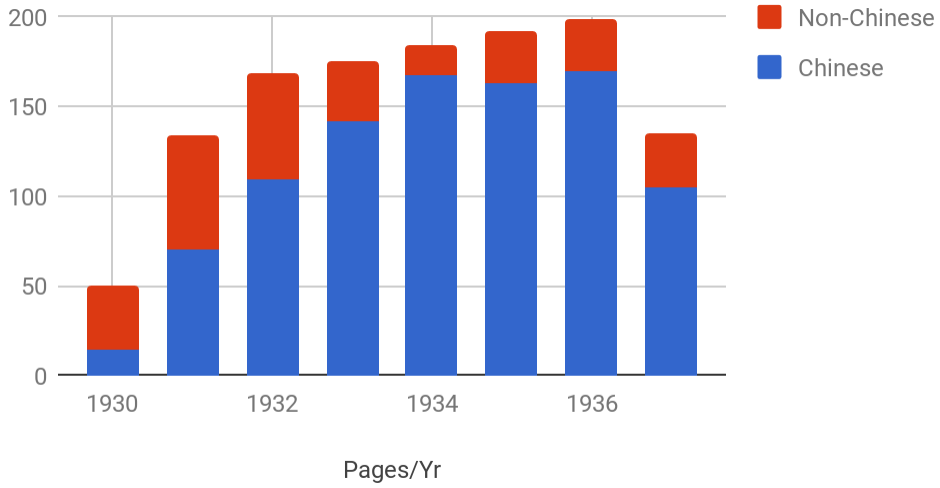


Table 3: Article Authors, Kodak Magazine



Many explanations may first come to mind as to why 1937 saw an uptick in non-Chinese content. Was it pressures of Japanese aggression? Was it an effort to internationalize after the magazine had established itself as duly Chinese? Perhaps some of each. But much of the increase can be attributed to the July 1937 issue that devoted half of its content to an

article and photos by mountaineer and photographer Frank Smythe describing and depicting his recent expedition to Mt. Everest.[329]

User-friendly Kodak

But perhaps the one thing that Kodak did above all others to expand both photography as a hobby and its own profitable business in China was to make a very good, easy to use, all-in-one product. All this was in line with Eastman's desire to simplify the photographic process for the user.[330]

The Chinese Kodakery carried a series of articles, reader-submitted content, discussing how amateur photographers had begun their practice and how much they appreciated Kodak. Many have titles like "Discussing My Photography," "My Process of Learning Photography," or "My Kodak Connection" or "My Brownie" (the Brownie was of course a particular Kodak camera).

Writing for the June 1935 issue, Cao Shuofu concludes with a statement that surely pleased the magazine editors, and would have pleased George Eastman were he still alive: "My photography is completely learned from *The Chinese Kodakery*, it really is our best friend for studying photography."[331] Yet Cao writes that when he first saw photographers he always thought photography "was a matter of art, and [I] was afraid it would be difficult for me to do well."[332]

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[329] 《柯達雜誌》(The Chinese Kodakery), July, 1937, iss. 8, no 7.
[330] Douglas Collins, *The Story of Kodak*, (New York: Harry Abrams, Inc., 1990), 48.
[331] Cao Shuyao 曹曙遙, "我學攝影的經過" (My Photography Learning Process), 《柯達雜誌》(The Chinese Kodakery), June 1935, iss. 6, no. 6, 17.
[332] Ibid.

This fear evidently kept Cao from photography for some time. Only in the second semester of 1934 did Cao finally go out and buy a Kodak. He was impressed with the results of his first two rolls and drove away all his earlier thoughts about the difficulty of photography. Yet after a while he realized there were some limits to his photographic abilities, but then Kodak came out with their Brownie 620 camera, and he bought one of those. The better camera with more aperture and shutter speed settings allowed him to do things he had desired for but could not attain. Cao wrote that the new camera "at once satisfied my desire and more."[333]

Cao's story embodies the narrative that Kodak was crafting to expand the base of Chinese amateur photographers and Kodak's brand in the country. Many people like Cao saw photography as something for trained experts and artists, something that would be difficult. Cao had longed for photography but thought it out of his reach. Cao overcame that fear and bought a camera. He quickly discovered that photography was not hard, because Kodak made it easy. Not being able to achieve his desired results, he bought a second (and more expensive) Kodak, and immediately felt he had satisfied his desire. Finally, he credits *The Chinese Kodakery* with teaching him everything he needed.

There are other stories of reader experiences that echo Cao's tale. In the July 1934 issue, Luo Zhize (羅志澤) discusses how he became a photographer. He purchased a Kodak Brownie No. 2 on the day before he left his hometown of Guangzhou to travel to Tianjin for university, and on the boat to Tianjin he got hooked on photography. Luo concludes his short piece with his belief that photography is a noble hobby and the Kodak Brownie is a

[333] Cao, "My Photography Learning Process."

great camera for beginners.[334] Luo's observations sat very nicely with the narrative that Kodak had tried to push for its products: photography was fun and easy, and Kodak cameras were the best to start with.

Liu Shuofu (劉碩甫), whose story was published in July 1935, writes of his arduous early times trying his hand at photography in Shenzhou, beginning in 1914 when he was a teenager. Then most people still used glass plates, and the chemicals he needed to develop his rolled film were hard to come by. He had bought and used nearly all the supplies from his local pharmacy, when he finally found a Kodak distributor in the photography department of a local hospital(!). His skill also improved after purchasing and reading Kodak's *How to Make Good Pictures* (advertisements for which ran in many issues of *The Chinese Kodakery*) --o much so that on a photography trip to Suzhou with friends (and his new Kodak) his friends started calling him "master," as in "master photographer." Liu explained this was in part due to his name *Shuofu* sounding somewhat similar to *shifu* (master).[335]

A cynical reader might classify all of these as "advertorials," designed to bolster Kodak sales. But in 1941, writing for a separate magazine, educator Yu Ziyi tells a similar tale. Yu, writing for a monthly education periodical, reflected on his own experience of learning photography twice. He first tried to take up the hobby in the later Qing period during the Guangxu reign (光緒, 1875-1908). He failed. But then when Kodaks became available he took it up again. Yu found things to be much easier and he quickly gained confidence. He learned from articles in *The Chinese Kodakery* and photo competitions they

[334] 羅志澤 (Luo Zhize), "我的攝影談" (My Camera Talk),《柯達雜誌》(The Chinese Kodakery), July, 1934, iss. 5, no. 7, 16.
[335] Liu Shuofu 劉碩甫我和《柯達克》的關係 (My Connection/Relationship with Kodak), 《柯達雜誌》(The Chinese Kodakery), July, 1935, iss. 6, no. 7, 14-15..

hosted. He lamented that Kodak had a monopoly and constantly buying equipment and accessories from them gave the company vampiric qualities to suck your wallet dry, but when Yu compared his early experiences to his experience with Kodak he said it was all worth it.[336]

One could say that Kodak of the 1920s and 30s was like Apple/Mac products today. They are more expensive but they provide such a consistent user-friendly experience (and pervasive marketing) that customers are put at ease and often become very loyal to the company.

Kodak in Schools

In tune with Eastman's principle of selling through demonstration, in 1932 Kodak worked with the China Committee of the International Educational Cinematographic Institute (League of Nations) to arrange demonstrations in how films could be used in classrooms.[337] This type of work led to later experiments in using educational films in classrooms, one of which was reported in 1943 wherein over 2,700 students and 600 teachers from 5 major cities participated.[338] In 1937, in what was doubtlessly an attempt to market to students and faculty, Kodak gave a free screening of a film at FuZhe University (福湘大學) in Changsha.[339] In a similar move, in 1936 students from the Tongji University (

[336] 俞子夷 (Yu Ziyi), "柯达公司" (Kodak Company), 《国民教育指导月刊(丽水)》(*Republican Education Guidance Monthly*), 1941, iss. 1, no. 1, 24-25. Yu Ziyi is a famous educator.
[337] Untitled article, *North China Daily News*, June 16, 1932. Displayed over previous two weeks in Municipal primary and secondary schools. Films on topics of geographical subjects, commercial processes, and personal hygiene.
[338] 良 Liang, "電影提高教學效率之測驗：柯達公司測驗" (A test of films improving educational efficiency: a Kodak Co. trial) 《电影与播音》(Film and Radio), 1943, iss. 2, no. 3, 19.
[339] "柯達公司的廣告", (Kodak Company's Advertisement" 《福湘旬刊》(FuZhe University 10-daily [newspaper]),1937, no. 104, 4-5. It was about the greatness of modern machines. Students wondered why

同濟大學) School of Engineering toured the Kodak Company's Shanghai offices, including the photography and lighting departments, the developing room, and the enlargement room.[340]

In February 1937 *The Chinese Kodakery* published an article about Kodak in schools and the many uses of photography in education. Like the tours and film screenings described in the preceding paragraph, the purpose of this article seems to be to entice students to purchase cameras. Photographs included in the article showed students ranging from elementary to college age: students in lecture, art class, engineering class, laboratories, on playgrounds, and at commencement--even military cadets marching in uniform. The article begins by stating that "everyone knows" that photography is a "valuable hobby" but then makes the case that photography, by bringing together art, optics, and chemistry, combines the two great fields of learning: art and science.[341] The article continued saying that as useful as photography is outside the school, it would be even more useful inside the school gates.[342]

Kodak also began its own school, the Kodak Professional school. At the school students learned to process negatives, develop and mount prints, and everything else necessary for a career as a photographer or in a photography shop.[343] Figure 8 shows the

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Kodak would show them a film for free, but the author says s/he discovered it was because Kodak had sent someone to Changsha to market & sell Kodak's new motion picture camera, and they thought they could drum up business by showing a film.

[340] "工学院测量系同学参观柯达摄影公司" (Students from the Surveying department of the School of Engineering toured the Kodak Company), 同济旬刊 (Tongji 10-daily), 1936, no. 115, 3.

[341] 學校中的柯達克 (Kodak in Schools), 《柯達雜誌》(The Chinese Kodakery), v8n2, Feb. 1937, p 1, 3-4.

[342] Ibid.

[343] Jamie Carstairs, "You press the button, we do the rest," Visualizing China blog, March 6, 2012: http://visualisingchina.net/blog/2012/03/06/you-press-the-button-we-do-the-rest/ (last accessed April 17, 2018)

then-Shanghai-based photographer Thomas Crellin supervising students at Kodak's school in 1923.

Figure 2: Crellin and students at the Kodak Professional School, 1923

University of Bristol - Historical Photographs of China reference number: DC-s01. Thomas Frank Crellin (1883-1949) was a photographer and cinematographer. He was based in Shanghai from c.1923 to 1927, working for Eastman Kodak. This photograph was published in 'The Kodak Magazine' (Vol IV, No 2, July 1923). https://www.hpcbristol.net/visual/dc-s01 Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International Public License

Kodak Technology

Kodak also continued to develop new photographic technologies and uses for their technology, and to promote knowledge about these. Newspaper announcements (advertisements) were made about new or improved inventions.[344] A Kodak researcher wrote a piece about advances in photography that appeared in the *North China Daily News* in 1934 (and presumably elsewhere as well). He highlighted x-ray and UV photography,

[344]See, for example: "The Autographic Kodak," *North China Daily News*, Sept. 21, 1914; "Eastman Kodak Company," *North China Daily News*, Mar. 17, 1932.

spectrograph, and other uses, finally declaring: "Photography is truly the servant of mankind. Science, technology, and human welfare owe it a debt of incalculable magnitude. Its services to mankind are enormous."[345] In Shanghai Kodak followed up on this "service" by donating five books on the use of x-rays in various fields of medicine and industry.[346] Above the use of images of people in advertising was discussed. Here it should be noted that images of technology also played a large role in Kodak advertising. Many advertisements contained only drawings or photos of Kodak cameras, film, or other photographic technology.

Conclusion

A linear view of the business of photography might be constructed as follows: Camera makers produce the cameras and other photographic technology, which is then delivered to and sold in stores to customers who are either professional photographers or amateurs. The professionals work in or for studios and print media. The amateurs form camera clubs or photographic associations. Professionals' work gets published in print media that the public consumes, as do the select amateur photographs that win photography competitions.

In trying to explain the expansion of popular photography in China, the entry of more amateurs into the hobby, the question is why they take up the hobby, what part of the chain motivates them. Claire Roberts' work highlighted the role played by photographic associations and print media in creating new photographers. The groundwork for some of

[345] Dr Walter Clark, of Kodak Research Laboratories, "Modern Miracles by Photography," *North China Daily News*, June 27, 1934.
[346] "柯達公司贈書", (Kodak Co. presents a book) 《社友》(Friends of Society), Feb. 15, 1933.

these associations may have been laid by word-of-mouth via the earlier expansion of popular photography among Chinese in Hong Kong, as noted by Roberta Wue. Wen-hsin Yeh introduced us to the role of the department store shop clerks and photographic technicians. For Japan, Kerry Ross emphasized the importance of camera companies' business practices, in particular their crafting of the serious hobby of photography as part of masculine middle-class identity. Mona Domosh showed how American global companies saw advertising as key to increasing sales.

My research places Kodak into the picture. From early on the Eastman Kodak Company knew the importance of advertising and sale by demonstration, and George Eastman also encouraged global expansion.[347] From its entry into China in 1921 and into the 1940s Kodak aggressively marketed their cameras and other products through print advertisements, radio broadcasts, their own photography magazine, and on-site demonstrations with school visits (and their own school), film screening, and company tours. In pushing their product, Kodak focused on the message that photography was for everyone, and that it was fun and easy to do. Their content and message morphed from western-centric content to Chinese content. With both Kodak Girls and *The Chinese Kodakery* content became more Chinese over time.

Returning to our linear view of the photography business, this time with Kodak in particular in mind: Kodak made cameras, which were sold to shops or delivered to company stores, stores attracted customers, and Kodak itself directly marketed to customers in a variety of ways. Professionals and amateurs bought the cameras, but Eastman was most concerned with increasing the numbers of amateurs, who formed and

[347] Douglas Collins, *The Story of Kodak*, (New York: Harry Abrams, Inc., 1990), 48.

joined camera clubs, to which Kodak also directly appealed. Print media and association journals published photographs and advertisements by Kodak, and Kodak printed its own magazine as well.

In 1941 Yu Ziyi observed in *Republican Education Guidance Monthly* (国民教育指导月刊) that if one looked closely at the Western camera business, it was "completely under the control of the Kodak Company."[348] Kodak certainly had their hand in every stage of the process in China. And Kodak has a history of monopolistic behavior. In 1924 the US Federal Trade Commission ordered a break-up of a Kodak monopoly of cinematographic film production and processing.[349] I do not mean to say that Kodak was the only camera company making waves in China. Among others, Zeiss lenses, Contessa Nettel cameras, and later Zeiss Ikon cameras were sold as well.[350] But, according to educationalist Zhuang Zexuan, Kodak and Zeiss were the two major competitors, and by the 1940s Zeiss cameras had disappeared from the China market.[351] Zeiss' disappearance may be due to Kodak out-competing Zeiss in the Chinese market, or perhaps due to manufacturing in the company's home country of Germany being diverted towards the war effort. But regardless of the reason, this left Kodak as the major force in the photography business in China.

Kodak's stature as a towering force in Chinese photography allowed it to play an oversized role. Kodak's managers and editors inserted the company into every stage of people's interactions with photography: from cameras to associations to shops to magazines and even schools. Kodak sought to expand its business in China by crafting the

[348] Yu Ziyi, "Kodak Company," *Republican Education Guidance Monthly*, 1941.
[349] "Finds Kodak Concern has a Film Monopoly," *North China Daily News*, June 2, 1924.
[350] Zeiss Lenses, etc. (Advertisement), 《中国摄影学会画报》(China Camera Club Pictorial), April 1926, no. 33, 2.
[351] 莊澤宣 Zhuang Zexuan, "生活指導：柯達公司的創辦人伊思門先生" (Mr. Eastman, the Founder of Kodak Co.), 《讀書通訊》(At School Dispatch), 1943, no. 73, 9-10.

narrative that photography was fun, easy, and for everyone. It made Kodak and photography relevant to conditions in Republican China: appealing to family values, appealing to self-strengthening and nationalistic feelings, and focusing on education. And by expanding its business Kodak helped to establish a new generation of Chinese amateur photographers.

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Commercial Reports from Her Majesty's Consuls in China. 1873
Correspondence respecting Diplomatic and Consular Expenditure in China, Japan, and Siam.
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Correspondence respecting the Attack on British Protestant Missionaries at Yang-chow-foo, August 1868
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