Plastic versus Empire:
A Technological Explanation for Decolonization

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This research is part of a book I am writing titled *How to Hide an Empire: Power and Territory in the Greater United States*. It is about the United States' overseas empire, including territories, occupation zones, and military bases.

The question of decolonization

From the perspective of global history, one of the most important things to happen in the twentieth century was the collapse of empire. In 1940, nearly one in three humans on the planet lived in colonies. By 1965, just twenty-five years later, it was about one in fifty.[1] Moreover, this trend has been one-way. Whereas empires had waxed and waned in the past—the nineteenth century saw the Americas liberated but Africa conquered—since the late twentieth century there have been virtually *no* acts of new colonization. The empires of the nineteenth century and early twentieth century collapsed and no new ones have arisen to take their place. There are still colonies today, such as Puerto Rico and Martinique, but they are small and there aren't many of them.

As the political form of empire has disappeared, its animating ideology of imperialism has collapsed. In 1919, the League of Nations Covenant referred openly to "peoples not yet able to stand by themselves under the strenuous conditions of the modern world" and required outside supervision for them. In 1942, the Secretary of State for the Colonies in Britain agreed that "most of the colonies, especially in Africa, will probably not be fit for complete independence for centuries." Yet things changed quickly—and on the order of decades, not centuries. In 1960, the UN General Assembly *unanimously* passed a resolution that "all peoples have the right to self-determination" and that "inadequacy of political, economic, social and economic preparedness should never serve as a pretext for delaying independence." In 1970, the General Assembly declared that "the further continuation of colonialism in all its forms and manifestations is a crime."[2]

1 1940: 31.10%; 1965: 2.18%. Calculated from Maddison Project Database, January 2013 update, Groningen Growth and Development Centre, www/ggdc.net/maddison.

2 Quotations all from Robert H. Jackson, "The Weight of Ideas in Decolonization: Normative Change in International Relations," *Ideas and Foreign Policy: Beliefs, Institutions, and Political Change*, ed. Judith Goldstein and Robert O. Keohane (Ithaca: Cornell University Press, 1993), 111–138.

Why? Why did empires vanish from the map? Why did colonialism go from a being respectable practice to being a "crime"? To my mind, this is one of the most important questions to ask about the twentieth century. And we're still answering it.

Explanation 1: Pax Americana

One prominent explanation has to do with the passage of global hegemony from Britain to the United States after the Second World War. Britain, the explanation goes, was an unabashedly imperialist world power. Not only did its empire contain hundreds of millions of subjects but it celebrated this fact openly, as in the holiday of "Empire Day," started in the schools and officially established in 1916.[3] The world system that it led was, unsurprisingly, a world safe for empire.

But a world led by the United States was a different proposition. As a former colony itself, the United States had a longstanding allergy to empire. Yes, the U.S. held overseas territories, but nothing on the order of India. And it did little to publicly celebrate them. Like Britain, it had its own holiday started in the schools and officially established in 1916. But, tellingly, this holiday wasn't "Empire Day" but "Flag Day," an occasion, as President Woodrow Wilson put it, for citizens to join in "united demonstration of their feeling as a Nation" and to show that "America is indivisible."[4] Whereas British schoolchildren were made to examine the world map, U.S. pupils venerated the national flag, which had one star for every state but no symbol for territories.

More to the point, U.S. leaders found themselves regularly questioning the virtues of empire when debating their European counterparts. For example, in 1941 Franklin Delano Roosevelt and Winston Churchill signed the Atlantic Charter, affirming that the United States and Britain would respect "the right of all peoples to choose the form of government under which they will live."[5] Churchill immediately denied that the charter applied to the colonies, declaring, "I have not become the King's First Minister to preside over the liquidation of the British empire."[6] FDR, however, suggested that the Atlantic Charter *did* apply globally. As a model, he pointed to the Philippines, the United States' largest colony, which his administration had put on a path to scheduled independence.[7]

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3 Jim English, "Empire Day in Britain, 1904–1958," *The Historical Journal* 49 (2006): 247–276. For the daily reminders of empire in the British Isles, see David Cannadine, *Ornamentalism: How the British Saw Their Empire* (Oxford: Oxford University Press, 2001).

4 Wilson, Flag Day Address, 14 June 1916.

5 Atlantic Charter, 14 August 1941, *The American Presidency Project*, ed. Gerhard Peters and John T. Woolley, www.presidency.ucsb.edu (hereafter APP).

6 Quoted in John Darwin, *After Tamerlane: The Rise and Fall of Global Empires, 1400–2000* (New York: Bloomsbury Press, 2008), 435.

7 Franklin Delano Roosevelt, Radio Address on the Seventh Anniversary of the Philippines Commonwealth Government, 15 November 1942, *APP*.

The Philippines *was* set free on schedule, on July 4th, 1946, and it was one of the first major colonies to receive its independence after the Second World War. Over the next five years, the Truman Administration made concerted moves to divest itself from empire: to promote Hawai'i and Alaska to statehood (Southern Democrats filibustered against this on civil rights grounds and it only went through in 1959), to grant Puerto Rico a greater measure of self-government (it gained the right to elect its own governor in 1948, it became a "free associated state" in 1952), and to return many of its bases to sovereign nations.

So, the argument goes, the United States proved to be, if not decidedly anti-imperialist, then at least conspicuously ambivalent when it came to the question of empire.[8] It hesitantly supported its European allies at times but also proved perfectly content to deal with nationalist leaders at other times—such as in Indonesia, where it sided with Sukarno's independence movement against the Dutch or during the Suez crisis of 1956 where Washington supported Egypt against the Anglo-French alliance. The United States fought wars in Asia yet never seriously contemplated annexing Korea or Vietnam. On the international stage it chafed at imperial restrictions on trade and pursued open markets. At the heart of the U.S. postwar policy, the Marxist geographer Neil Smith has argued, was a desire to "shake loose the colonies of the European powers and open them up for U.S. commerce."[9] And so, it was under Pax Americana that the foundations of empire collapsed.

Explanation 2: The rising tide of anti-imperialism

There is another way to explain the phenomenon of decolonization. The thrust of this second explanation is that it was not the United States but the *world* that had grown allergic to empire. This argument appeals to the fact that

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8 In-depth examinations of these issues during the crucial period of World War II include Wm. Roger Louis, *Imperialism at Bay: The United States and the Decolonization of the British Empire* (New York: Oxford University Press, 1978); Christopher Thorne, *Allies of a Kind: The United States, Britain, and the War against Japan, 1941–1945* (London: Hamish Hamilton, 1978); and John J. Sbrega, "The Anticolonial Policies of Franklin D. Roosevelt: A Reappraisal," *Political Science Quarterly* 101 (1986): 65–84.

9 Neil Smith, *American Empire: Roosevelt's Geographer and the Prelude to Globalization* (Berkeley: University of California Press, 2003), 320. There are two strains of the "Pax Americana" argument worth distinguishing. The first is "exceptionalist," arguing that the United States, unlike its European counterparts, has had a distaste for empire. Recent examples are Jeremi Suri, *Liberty's Surest Guardian: American Nation-Building from the Founders to Obama* (New York: Free Press, 2011) and Elizabeth Cobbs Hoffman, *American Umpire* (Cambridge, MA: Harvard University Press, 2013). The second, more common in history departments, holds that the United States has exhibited a distaste for *formal* empire but has pursued *informal* empire vigorously. Recent examples of this are the above-cited *American Empire* by Neil Smith and Richard H. Immerman, *Empire for Liberty: A History of American Imperialism from Benjamin Franklin to Paul Wolfowitz* (Princeton: Princeton University Press, 2010). A fine account of the literature, tending toward the Smith-and-Immerman side of things, is Paul A. Kramer, "Power and Connection: Imperial Histories of the United States in the World," *American Historical Review* 116 (2011): 1348–1391.

organized nationalist resistance to empire isn't a historical constant but rather increased dramatically over the course of the twentieth century.

Part of the reason it took nationalism some time to grow was the initial difficulties nationalists faced overcoming the awkward colonial cartography that made "countries" out of lands that often lacked a common tongue, ethnicity, culture, or history. Generating mass movements in favor of the independence of India or Nigeria meant lining up millions behind the fiction that India or Nigeria were nations rather than shapes sketched somewhat arbitrarily on nineteenth-century imperialists' maps. It meant rewriting histories, developing literary canons, gazing at flags, singing anthems, and learning languages. But by the mid twentieth century, the borders of the map had indeed become, at least for a critical mass, borders of the heart.[10]

Another reason why the capacity of nationalists increased with time was their access to arms. Inability to procure weapons in an age of collaborating empires confounded early independence movements. Filipinos in the early twentieth century were fighting with smuggled or captured rifles, using discarded tin cans as cartridges, melting down church bells for bullets, scraping the heads off of matches for fulminate, and using tree resins for gunpowder.[11] But World War II, by pitting warring empires against each other in Asia, flooded the gun-parched region with weapons. The end of the war saw numerous armies on the march. There was Mao Zedong's Red Army in China, the Burma National Army, the Indian National Army, the Viet Minh, the Lao Issara (Free Laos), the Malayan People's Anti-Japanese Army, and the Hukbalahap of the Philippines.[12] Some had grown up under Japan's protection, others were born of the anti-Japanese resistance, still others were hastily assembled in the heady days after the war, but all were strikingly free of outside control. Not surprisingly, Asia led the global decolonization movement. But then the developing Cold War and the presence on the scene of some powerful postcolonial nations led to complicated alliances that further armed the Third World. This allowed colonized populations in Kenya, Algeria, Indochina, and Burma to fight long and bloody independence wars.

As colonized people fought back, the argument goes, imperialists reconsidered their commitments to empire. An example: in 1957, the prime minister of Britain Harold Macmillan asked the Colonial Office to produce a cost-benefit analysis of colonial possessions. Was Britain better served by

10 This process is famously analyzed in Benedict Anderson, *Imagined Communities: Reflections on the Origin and Spread of Nationalism* (1983; New York: Verso Books, 2006).

11 Glenn Anthony May, *Battle for Batangas: A Philippine Province at War* (New Haven: Yale University Press, 1991), 173–174; Resil B. Mojares, *The War against the Americans: Resistance and Collaboration in Cebu: 1899–1906* (Quezon City: Ateneo de Manila University Press, 1999), 75, 223n22.

12 Ronald H. Spector, *In the Ruins of Empire: The Japanese Surrender and the Battle for Postwar Asia* (New York: Random House, 2007); Christopher Bayly and Tim Harper, *Forgotten Wars: Freedom and Revolution in Southeast Asia* (Cambridge: Cambridge University Press, 2007).

defending its colonial rule against resistance movements or by decolonizing and seeking good relations with its formal possessions? The Colonial Office suggested the latter course.[13] Empire, growing more and more difficult by the day, was a flame no longer worth the candle.[14]

Do explanations 1 and 2 suffice?

A convenient feature of the two aforementioned explanations is that they are complementary rather than competing. The United States' ambivalence about empire wouldn't have mattered as much had there not been concerted nationalist movements, and those movements were no doubt encouraged by the permission and potential support of the global hegemon. Still, there are gaps in each explanation that deserve note.

Explanation 1, the *Pax Americana* explanation, presumes that the United States had a dispositional aversion to formal empire. And perhaps that is true. Yet that does not explain how the United States could nevertheless annex half of Mexico in the nineteenth century and then eagerly conquer Spain's transoceanic empire at the turn of the twentieth (meanwhile claiming another major territory, Hawai‘i, in the middle of the Pacific). The United States did indeed let its largest colony, the Philippines, go after the Second World War but it took a *new* territory, the Trust Territory of the Pacific Islands, part of which (the Northern Marianas) remains part of U.S. territory today. Add up the Philippines, Alaska, Hawai‘i, Puerto Rico, the U.S. Virgin Islands, Guam, American Samoa, the Trust Territory of the Pacific Islands, the Panama Canal Zone, and dozens of smaller islands and you get a sizable empire. By the end of World War II it was the fourth-largest empire by population on the planet, and that's not counting the western lands of the North American continent that were conquered in war and then turned from territories to states as they filled up with white settlers.[15]

Perhaps the *Pax Americana* argument can be salvaged by conceding that the United States *had* an empire but insisting that it didn't invest as heavily in the imperialist ideology as Europe did.[16] That is partly true but is easy to exaggerate. The leaders of the United States were not as far removed from colonialism as one might think. Franklin Delano Roosevelt may have been sympathetic to the plight of the colonized in the 1940s, but in the 1910s he had been Assistant Secretary of the Navy with a great interest in annexing the

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13 Frederick Cooper, *Africa since 1940: The Past of the Present* (Cambridge: Cambridge University Press, 2002), 76.

14 Broad accounts of empire that highlight the role of increased resistance in decolonization include Darwin, *After Tamerlane* and Jane Burbank and Frederick Cooper, *Empires in World History: Power and the Politics of Difference* (Princeton: Princeton University Press, 2010).

15 For an account of the dimensions of U.S. territory, see Daniel Immerwahr, "The Greater United States: Territory and Empire in U.S. History," *Diplomatic History* 40 (2016): 373–391.

16 A fine version of this argument is offered in Ian Tyrrell and Jay Sexton, eds., *Empire's Twin: U.S. Anti-Imperialism from the Founding Era to the Age of Terrorism* (Ithaca: Cornell University Press, 2015).

Caribbean ("We have simply got to control those islands as a whole—the sooner the better," he wrote).[17] In moving from Assistant Secretary of the Navy to the presidency, FDR was following in the footsteps of his cousin, Theodore Roosevelt, who was an unabashed, Kipling-quoting imperialist. Roosevelt's successor in the White House, William Howard Taft, had been the governor of the Philippines (and a strong opponent of Philippine independence). Major military leaders, from John Pershing (the governor of a Philippine province), to George Marshall, to Douglas MacArthur (who left the U.S. army to become field marshal of the Philippine army, taking along his aide Dwight Eisenhower) were veterans of colonial wars.[18]

None of this is to say that the United States was as fully committed to empire as Britain. It is rather to note that any argument for global decolonization that depends on an interpretation of the United States as an anti-imperial force will have some more work to do. Particularly, it will have to account for the naked imperialism that was a part (if not a whole) of U.S. political culture up through at least the first half of the twentieth century. The United States has not, in fact, been steadfastly anti-imperialist but rather appears to have shifted in that direction over the twentieth century, in between Roosevelts, as it were.

What about explanation 2, the *rising tide of anti-imperialism* argument? Here there is less question about the existence of the phenomenon in question. It seems clear enough that nationalist movements grew more powerful over the course of the twentieth century. But if decolonization is to be understood as the result of a new balance of forces, then there are two complications. First, nationalist movements gained weapons and grew more powerful, but *so did imperial metropoles*. If the end of World War II saw guerrilla armies marching in the Philippines, it also saw the Philippines' colonizer, the United States, in possession of atomic bombs (a fact that both the outgoing U.S. high commissioner and the incoming Philippine president felt obliged to mention during the Philippines' independence ceremony). The network of bases and airfields that allowed the Allies to move supplies quickly across the planet during the Second World War could be of obvious use in quashing nationalist insurgencies, as they were in Indochina/Vietnam.

Second, if decolonization was the result of a shifting balance of forces, one might suppose that colonizers would let go where nationalism was strongest and hold on where it was weakest. It is not obvious, however, that that is what happened. In some places, decolonization proceeded in the absence of either much nationalist organizing or military resistance. In others,

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17 Quoted in Lowell T. Young, "Franklin D. Roosevelt and America's Islets: Acquisition of Territory in the Caribbean and the Pacific," *The Historian* 35 (1973): 206. The whole article is a useful counter to the notion that FDR was an anti-imperialist.

18 A comparative account that finds no substantive difference between U.S. and British colonial attitudes is Julian Go, *Patterns of Empire: The British and American Empires, 1688 to the Present* (Cambridge: Cambridge University Press, 2011). Go argues this not by pointing to the vigor of U.S. imperialism but to the oft-overlooked "exceptionalist" tendency to minimize or deny empire within Great Britain.

colonizers held on in the face of bitter fighting. Trinidad and Tobago, a pair of easily dominated islands that put up little by way of armed conflict, gained independence the same year as Algeria, which fought for years in a war that killed hundreds of thousands. What if any correlation there is between the strength of nationalist resistance and the speed of decolonization remains, as far as I am aware, an open question.

A third explanation: technology

In the face of the potential insufficiency of explanations 1 and 2, I would like to offer a third explanation, which complements the other two. It argues that as the cost of colonizing rose (as indicated by explanation 2), the demand for formal empire decreased as new technologies and infrastructure gave major powers other ways to enjoy the benefits of empire without holding colonies. It argues that the passage of hegemony from Britain to the United States was not solely marked by a switch in the character of the hegemon (as explanation 1 holds) but also by technological and infrastructural possibilities newly available post-1945. These were generally debuted or perfected by the United States during World War II and allowed it to project power without claiming colonies.[19]

There are a few "empire-killing" technologies that one might discuss. I want to focus on one set of them, synthetics, and particular on plastic and synthetic rubber. But before I explain why I think these are so important to the end of empire, let me point to a few others, just to give a sense of the scope of the technological explanation for decolonization.

Let's start with communication. It's well known that telegraphs were crucial to nineteenth-century globalization. Those world-spanning telegraph networks were laid, planned, and controlled by empires. And keeping control of them was an object of great strategic importance, for obvious reasons. Major powers eagerly cut or spied on their adversaries' networks when possible. Within hours of the outbreak of the First World War, Britain cut Germany's transatlantic cables, which is exactly what the United States had done to Spain during the 1898 war. To prevent tampering or spying, major powers sought control of their entire network. British strategists obsessed about acquiring an "all-red route," red being the color of British possessions

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19 The dean of technology-and-empire studies is Daniel Headrick. He doesn't outright argue that technology killed territorial empire, but it's not hard to interpret his work that way, as I've done. Telegraphy, aviation, and synthetics all receive lucid treatment in his work. See especially *The Tentacles of Progress: Technology Transfer in the Age of Imperialism, 1850–1940* (Oxford: Oxford University Press, 1998) and *Power over Peoples: Technology, Environments, and Western Imperialism, 1400 to the Present* (Princeton: Princeton University Press, 2008). While I'm acknowledging debts, I owe a big one to Michael Falcone of Northwestern University, who is writing a dissertation on the United States' "imperial" technologies after WWII and who has been an invaluable interlocutor.

on the world map. The Portuguese, meanwhile, dreamed of the "pink map," overland routes that would connect their African territories.[20]

The United States was a laggard in the world of cable communications. Though its GDP dwarfed Britain's, during the First World War it had to rely on British cable networks (and paid the price when the British spied). Also during that war, its sole cable out to its Pacific colonies broke, leaving the United States with no direct link to the Philippines or Asia for months.

The United States overcame this challenge not by laying cables but by leapfrogging them. It reestablished contact with the Philippines via radio. And its radio technology would serve as the backbone for the U.S. campaign in the Second World War, during which it developed a global communications network. Dispensing with the business of continuous routes, it invested in a few widely spaced hubs communicating by skywave, bouncing messages off the ionosphere, with spectacular results. By the end of the war, the United States could send text messages worldwide (on the eve of the Normandy landing, General Marshall brought together General Eisenhower in the European Theater, General MacArthur in the Southwest Pacific, and General John R. Deene in Moscow for a real-time "teletype conference"). In April 1945, a century after Samuel Morse tapped out "What Hath God Wrought" and sent it down a cable from Washington, D.C. to Baltimore, the U.S. Army sent its own message, this one around the world. "This is What God Hath Wrought" it read, and it was signed "Army Communications Service." It circumnavigated the globe, 23,200 miles in five hops, in nine and a half seconds.[21]

Something similar happened in the realm of transportation. The nineteenth-century standbys of long-distance transportation, steamships and railroads, both required territorial control: ports at particular sites (often, there aren't that many places on coasts where ships can easily land), canals, widened rivers, locks, and cleared, flat areas where trains could run. Setting this up and maintaining it meant repeated on-the-ground interactions. For the Japanese to control even a single rail line in Manchuria entailed administering a "railway zone," collecting taxes, running schools and hospitals, and managing public utilities.[22]

Again, the United States found itself boxed out, a latecomer to the game. Again, it found a way to leapfrog over its rivals by developing a technology that did not require controlling large areas, in this case aviation. Just as steamers and trains were the modus operandi of the British empire,

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20 All of this is covered beautifully in Jonathan Reed Winkler, *Nexus: Strategic Communications and American Security in World War I* (Cambridge, Mass.: Harvard University Press, 2008).

21 George Raynor Thompson and Dixie R. Harris, *United States Army in World War II: The Technical Services; The Signal Corps,* vol. 3, *The Outcome (Mid-1943 through 1945)* (Washington, DC: Center of Military History, 1966), chap. 28.

22 Louise Young, *Japan's Total Empire: Manchuria and the Culture of Wartime Imperialism* (Berkeley: University of California Press, 1998), chap. 2.

planes became the key vehicles for the United States.[23] Again, World War II was the breakthrough, during which the United States had a smoothly operating air network that allowed it to move critical materiel from Detroit to Asia while controlling only select points in between. By December 1943, the U.S. Air Transport Command's famed "Fireball Express" shot material from U.S. factories down to Miami, past the Caribbean to Brazil, over the South Atlantic to the west coast of Africa, across the Sahara to Egypt, up to India, and over the "hump" of the Himalayas into China at the stupefying rate of one flight every eleven minutes.[24]

What both radio and aviation did during World War II was to lower the strategic value of land. Radio beacons and airfields allowed the United States to move information, people, and objects around the world securely while being much more open-minded about which spots of land it controlled. Contiguity and particular location mattered much less than they had before—as long as you controlled enough reasonably proximate points on the map, you could get your planes and messages through.

A special case: rubber

Radio and aviation lowered the strategic value of land by partially replacing the surface-hugging technologies of telegraphy, railroad, and ship with airborne ones. But there is another technological development that the United States pioneered during World War II that lowered the strategic value of land in a different way. Synthetics lessened industrial societies' strategic reliance on tropical products, which in turn lessened their need for colonies.

Take rubber, an indispensable tropical product circa 1940. Not only was it used for tires and insulating electrical wires but it served countless small but for-want-of-a-nail important functions in the industrial economy. By the 1940s, the B. F. Goodrich Company sold more than 35,000 articles.[25] A Sherman tank required half a ton of rubber, a heavy bomber needed a full ton, and a battleship required more than 20,000 rubber parts, totaling 80 tons.[26] As the president of the B. F. Goodrich company put it, "without rubber we could offer only 1860 defenses against 1942 attacks."[27]

Yet *without rubber* was a very real prospect. The United States got its rubber from the tropics, nearly exclusively from colonies to which it might lose access during the war. As Japan inched south into Asia, FDR hesitated to

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23 The argument is laid out well in Headrick, *Power over Peoples*, chaps. 8–9.

24 Reginald M. Cleveland, *Air Transport at War* (New York: Harper and Brothers, 1946), 113. On the significance of aviation for the United States more generally, see Jenifer Van Vleck, *Empire of the Air: Aviation and the American Ascendancy* (Cambridge, MA: Harvard University Press, 2013).

25 Harry Barron, *Modern Synthetic Rubbers*, 3d ed. (London: Chapman and Hall, 1949), 6.

26 Mark R. Finlay, *Growing American Rubber: Strategic Plants and the Politics of National Security* (New Brunswick: Rutgers University Press, 2009), 171.

27 Quoted in Charles Morrow Wilson, *Trees and Test Tubes: The Story of Rubber* (New York: Henry Holt and Company, 1943), 232.

check its movement for fear of triggering a war. Southeast Asia was an important region "where we had to get a lot of things—rubber, tin, and so forth and so on"—he explained to an impatient U.S. public.[28] And he was right: once that war started Japan claimed colonies accounting for 97% of the global rubber supply. The Allies were cut off.

It is hard, from the vantage point of today, to appreciate what a potential catastrophe this was. "If a survey were made to determine the most frequently asked question in America today, it would probably turn out to be: 'When are we going to get rubber—and how much?'" wrote Secretary of the Interior Harold Ickes in mid 1942. "We *must* get rubber—lots of it—and get it rather quickly, or our whole manner of living will be sadly awry."[29] A high-profile government report found the situation "so dangerous that unless corrective measures are taken immediately this country will face both a military and civilian collapse."[30] Roosevelt approved that report, adding that, since it was issued, "the situation has become more acute."[31]

The government tried everything in its power. It launched a massive scrap rubber campaign to bring in all of the spare rubber lying about in the form of old tires, raincoats, garden hoses, and bathing caps—this netted about seven pounds of rubber for every man, woman, and child in the country.[32] The State Department negotiated agreements for rubber purchases from a number of allied countries in Latin America, though there was little chance of immediate success as rubber plantations take six to seven years to start. To conserve what rubber there was in the economy, the federal government established a national speed limit of 35 miles an hour and demanded all spare tires to be surrendered to authorities.

Another solution was to synthesize rubber from grain alcohol or petroleum. Yet this was a Hail Mary. In 1940, only 0.5% of U.S. rubber consumed was synthetic—artificial rubber was limited to a few minor functions where its special properties compensated for its high costs, such as in gasoline hoses or certain chemical equipment.[33] The United States had no synthetic rubber industry to speak of and there had never been a book published on the topic by a U.S. publisher.[34] To generate a synthetic rubber industry sufficient to slake the United States' extraordinary rubber thirst would require on-schedule innovations in chemistry, jump-starting a virtually nonexistent industry, and disciplining existing producers. It would be "an

28 Roosevelt, "Remarks to the Volunteer Participation Committee of the Office of Civilian Defense," 24 July 1941, *APP*.

29 "Rubber to Stretch," July 1942, in Papers of Harold L. Ickes, Manuscript Division, Library of Congress, box 113.

30 Bernard Baruch, Report of the Rubber Survey Committee, 10 September 1942.

31 Franklin Delano Roosevelt, Letter to Rubber Director, 26 November 1942, *APP*.

32 Seth Garfield, *In Search of the Amazon: Brazil, the United States, and the Nature of a Region* (Durham: Duke University Press, 2013), 83.

33 Melvin A. Brenner, *The Outlook for Synthetic Rubber* (Washington, DC: National Planning Association, 1944), 5.

34 Barron, *Modern Synthetic Rubbers*, xi.

almost superhuman task," concluded a government survey of the problem.[35] The Director of the Division of Civilian Supply of the War Production Board testified that it would "almost require a miracle."[36]

And yet, it happened. The government required existing chemical firms to share information irrespective of patents and directed the construction of 51 synthetic rubber plants (largely making rubber from oil) across the country. By mid 1944, the U.S. supply of rubber met demand. By 1945, the United States was consuming *more* rubber than it had been at the start of the war, and 87% of that was synthetic.[37] Jeeps drove and planes landed on synthetic tires, tanks rolled on synthetic treads (conspicuously outlasting the more rudimentary German synthetic tank treads, which grew brittle and cracked in the Soviet winter). The from-scratch creation of a synthetic rubber industry was, in the eyes of Harry Truman, "one of the great achievements of our war effort."[38]

Consider the implications. Before the war, the United States, the world's largest industrial economy, had been sourcing its rubber from tropical colonies (not its own colonies, for the most part, but the colonies of its allies, Britain and France). During the war, Japan cut off the United States from virtually *all* of its rubber sources, depriving the United States of colonial markets. And yet, the United States circumvented this problem by creating a synthetic rubber industry capable of meeting the bulk of its rubber needs from its own oil reserves during an extremely expensive war. What had loomed as an existential crisis for the U.S. economy in early 1942 was by 1945 a solved problem. The United States no longer needed tropical rubber. It might *prefer* it, but it no longer *needed* it.

"The security of the United States and the essential needs of its citizens must never again be jeopardized by inadequate or uncertain rubber supplies," Truman promised Congress shortly after the war.[39] But Truman's promise was not followed by a plan to annex colonies in Southeast Asia, something that the United States had every military capability of doing. Rather, his solution was to keep the synthetic rubber plants available. The economy would switch partially back to natural rubber (in part to ease the dollar crisis in the rest of the world) but its reliance on tropical rubber would no longer be a matter of vital strategic importance. Indeed, when the Korean War broke out and natural rubber prices shot up, the United States simply turned on its synthetic rubber tap once again and the country had a rubber surplus.

Today, synthetic and natural rubber are used together, with synthetic rubber making up seventy percent to the global market.[40] Each has different

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35 Baruch Report.

36 Leon Henderson, quoted in Wilson, *Trees and Test Tubes*, 209.

37 Rubber Reserve Company, *Report on the Rubber Program, 1940–45*, Supplement No. 1; Year 1945 (Washington, DC: Government Printing Office, 1946), 15.

38 Truman, "Special Message to the Congress on Synthetic Rubber," 16 January 1950, *APP*.

39 Truman, "Special Message to the Congress on Rubber," 7 February 1947, *APP*.

40 Finlay, *Growing American Rubber*, 3.

strengths and the two are often intermixed together. But the loss of natural rubber markets could not cause an emergency in any country with access to synthetics.

The case next door: plastics

Plastic and synthetic rubber are close chemical cousins, with some ontological blurriness between them. And their history is largely similar, though plastic, unlike synthetic rubber, had some notable successes even before the Second World War. Bakelite, the invention of Leo Baeckeland, was proudly billed during the interwar period as the "material of a thousand uses." And Du Pont caused a sensation with its debut of nylon in 1939 ("Better Things for Better Living . . . through Chemistry"). In November 1940, Henry Ford, getting into the act, unveiled an all-plastic car, made of a soybean-based resin.

Ford's car failed to stir the passions that nylon stockings had, but it illustrates the boundless possibilities that entrepreneurs recognized in plastic. We are now living through a period in which internet entrepreneurs are trying to produce digital substitutes for experiences or processes that used to work through other means. I imagine the early plastics revolution as working in a similar way: an experimental period in which entrepreneurs tried to figure out which objects could be satisfactorily and inexpensively replaced by plastic.

But the plastics revolution was given a strong push by the Second World War. As the war cut the United States off not just from tropical rubber but from a large basket of tropical commodities, the U.S. War Resources Board advocated the substitution of plastic for aluminum, brass, and any other "strategic" material it could replace. As in the case of synthetic rubber, manufacturers were induced to share information, and the result was a boom in plastics innovation. Polyethylene, nylon, acrylic, Styrofoam, Plexiglas, and Teflon were developed or honed during the war.

Plastic filled in for tropical products in all sorts of small ways. By 1945, a U.S. soldier could expect his canteen, his knife, and the eyelets of his cartridge and pistol belt to be be plastic. His brass buttons would be olive drab plastic. If he received a decoration ribbon, it would be of nylon, not silk. As would his parachute, his tent, and, if he had to do any climbing, his rope (formerly made of Manila fiber, but the Japanese had taken the Philippines). Bugles, razors, whistles, combs, helmet liners, boot insoles, rifle covers, shoe laces, mosquito netting, and toothbrushes were all from plastic. A soldier who received a wound might receive surgical sutures of plastic. One who lost an eye would get a new plastic one (rather than the kryolite glass that could not longer be imported from Germany).[41]

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41 See Erna Risch, *United States Army in World War II: The Technical Services; The Quartermaster Corps: Organization, Supply, and Services*, vol. 1 (Washington, DC: Center of Military History, 1953), 58–74 and Williams Haynes, *The Chemical Front* (New York: Alfred A. Knopf, 1943). Also Jeffrey L. Meikle, *American Plastic: A*

In a vividly metaphorical development, toy soldiers that were formerly made of lead or tin started selling after the war as "little green men," made of molded plastic.

As is well known, plastic flooded the postwar U.S. economy. It would be appropriate to speak of plastic as an archaeological event, drastically altering the material composition of everyday objects and of the debris left behind. Tupperware, Velcro, hula hoops, Frisbees, pink flamingos on the lawn, Formica counters, Naugahyde chairs, Saran wrap, vinyl siding, vinyl records, hi-fis, Silly Putty, Barbie Dolls, Lycra bras, and Wiffle balls appeared as harbingers of a new consumer culture. Now, material culture is so suffused with plastic that its absence is more surprising than its presence.

But the point I'm trying to make is not the usual one about plastic and consumerism or plastic and the environment. It is that plastic—that staggeringly malleable product of petroleum—could and did substitute for any number of tropical products. It is not always a perfect substitute, but it works well enough that it is hard to imagine any country going to war to secure access to hemp (for rope) or silk (for parachutes). Why bother when you have nylon?

Zooming out: synthetics writ large

Stepping back, we can observe a more general pattern since the nineteenth century. Industrial economies have relied upon a number of colonial products: oil, tin, copper, guano, phosphates, gutta-percha, rubber, sisal, tungsten, cotton, kapok, copra, silk, quinine, palm oil, teak, and so on. Even when those goods have not made up a large volume of international trade, they have had a strategic importance, in the sense that countries have a great interest in ensuring that they are not cut off from those goods (try running an international telegraph network without gutta-percha, a crucial insulating material for underwater wires!).

Sometimes markets suffice to provide access to such goods. But open markets require favorable trade relations and, in times of potential autarky such as the first half of the twentieth century, markets alone are no guarantee. Countries concerned about access to tropical products and unsatisfied with their ability to purchase those goods face a choice: *colonies or chemistry*. Colonizing is a way to secure market access (and thus is one, though not the only, motive for the global growth of empires). Chemistry allows industrial economies to do without the tropics through the development of synthetic substitutes.

Not surprisingly, powerful economies facing geopolitical barriers to colonization have turned toward chemistry. Germany is the preeminent example of this. The epochal German discovery of ammonia synthesis relieved Germany from its reliance on the hard-to-source nitrates required for both explosives and artificial fertilizers (most readily available from the guano

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Cultural History (New Brunswick: Rutgers University Press, 1995) and Susan Freinkel, *Plastic: A Toxic Love Story* (New York: Houghton Mifflin, 2011).

islands off of Peru and the sodium nitrate deposits of Chile) and allowed it to fight World War I for longer than it would have been otherwise able to do once Germany's enemies cut off its trade to South America.[42] In the interwar period, Germany was unsurprisingly a world leader in synthetic rubber research and eager to absorb any technological breakthroughs made by U.S. scientists.[43] The famous motto "Arbeit Macht Frei" (freedom through work) was emblazoned over the wrought-iron entrance of Camp Monowitz, a plant I. G. Farben established near Auschwitz to use concentration-camp labor to make synthetic rubber and fuel.

World War II, by sorting out the world economy so that the resource-rich colonies of Asia were mostly on the Axis side of the war and the bulk of the economic production was on the Allied side, forced the United States and its allies to overcome their reliance on tropical products. And so the United States developed what one writer in 1943 giddily described as "a regiment of new man-made materials that range from synthetic nitrogen for fertilizers and explosives to synthetic vanillin for cake and candy." Such materials were, he added, "turning old industries topsy-turvey."[44] Toluene (from oil) could make explosives, atabrine could substitute for chloroquine in the all-important task of fighting malaria, petroleum could be used instead of palm oil, aluminum and plastic could substitute for wood, electrolytic plating could be swapped in for tin.

Since technology is cumulative, the discoveries of interwar Germany and the wartime United States all fed into a large-scale replacement of tropical products with synthetic or non-tropical substitutes. The process was not entirely one-way. Some new technologies *increased* demand for colonial products (quartz crystals for radios, uranium for bombs). But the trend has clearly been toward the decreasing strategic value of colonies for the provision of resources. And coupled with other "empire-killing" technologies and anticolonial resistance movements, this has been enough to encourage great powers to give up direct colonial control in favor of open markets for colonial products.

Putting it all together

I have asked why the world decolonized, abruptly and rapidly, after World War II. Though I think the question is underexplored in general, there are two dominant explanations. Explanation 1, *Pax Americana*, has to do with the identity of the new global hegemon, the United States, and it argues that the United States, as a former colony without much of an empire itself, was dispositionally averse to empire. Explanation 2, *the rising tide of anti-imperialism*, has to do with resistance within colonies and argues that the

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42 The story is told in Vaclav Smil, *Enriching the Earth: Fritz Haber, Carl Bosch, and the Transformation of World Food Production* (Cambridge, MA: MIT Press, 2001).

43 Described in Oliver M. Hayden, interview by Raymond C. Ferguson, 18 February 1986, Beckman Center for the History of Chemistry, Chemical Heritage Foundation.

44 Williams Haynes, *The Chemical Front* (New York: Alfred A. Knopf, 1943), 12–13.

gradual coalescence of national consciousness plus the arming of anticolonial movements during World War II and the Cold War made formal empire too expensive of a proposition for imperial metropoles.

Finding those two explanations potentially insufficient, I have offered a third, to do with infrastructural developments and technological innovations available to would-be imperial powers after the Second World War. That war, by cutting the Allies off from their Asian colonies and by placing the United States at the center of industrial production, strongly encouraged the Allies to develop methods of projecting power and running their economies that did not depend on colonies. They replaced tropical products with synthetics and set up an infrastructure to move goods and people that did not rely on contiguous territorial control.

This explanation is entirely compatible with the other two, and in fact it helps explain features of them that are otherwise confusing. Explanation 1, *Pax Americana*, noted the conspicuous lack of commitment that the United States had to empire as a global hegemon and attributed this to the national character of the United States. But that explanation, I have argued, is hard to fully square with the imperial record of the United States in the nineteenth and early twentieth centuries. When we factor in technology and infrastructure, it is easier to make sense of the U.S. reticence to defend global empires. That reticence may be less a matter of *who* the global hegemon was then *when* all of this was taking place—in this case, the United States directed world affairs after a half-decade experience serving as the center of the Allied industrial economy at a time when many resource-rich were offline. The United States became precocious at leapfrogging and circumventing imperial ways of doing things. And having mastered the art of doing without colonies, it was far less committed to empire in 1945 than it had been in 1920.

Explanation 2, *the rising tide of anti-imperialism*, is about the balance of forces. Nationalists gained strength, it contends, and for that reason imperialists retreated. But, as I have argued, that hypothesis ignores the fact that would-be imperial nations also saw *their* powers increase. Indeed, from balance-of-forces perspective, it is hard to understand why the United States didn't simply annex much of the planet after the war. Certainly, that's what its adversaries—Germany and Japan—had tried to do, and it's doubtful that much could have stopped the United States had it wished to emulate them.

Again, incorporating technology and infrastructure into the explanation can help. It wasn't just that nationalist movements grew more militant and determined, raising the costs of formal empire. It was also that the war had lowered the *benefits* of formal empire. With tropical products easily replaced, with the business of moving around the world easily accomplished via a series of noncontiguous points, the lure of empire simply no longer glimmered as seductively.

There are two caveats worth mentioning. First, this technology-and-infrastructure argument applies only to the strategic value of potential colonies. There are other reasons that have been offered as to why powerful countries have annexed weak ones and held them: prestige, religion, psychosexual urges, racism, civilizing missions, investment opportunities, quests for consumer markets, pandering to voters, fits of "absent-mindedness," etc., etc. Nothing in the technology-and-infrastructure argument rules out changes in those factors as also contributing to decolonization. For example, it seems fairly clear that changing metropolitan ideas about race and civilization also helped decolonization along (though here there is a chicken-or-egg question).

Second caveat: to argue that overseas territory had diminished strategic value by the second half of the twentieth century is not to argue that it had *no* value. There are two ways in which territory still quite clearly mattered. First, although technologies like aviation and radio lessened the need among metropolitan powers for large swaths of connected (and likely populated) land, such technologies created a need for many discontinuous points. Here, yet again, the United States was precocious. After World War II, it rebalanced its imperial portfolio, divesting from colonial empire (of its four largest colonies, the Philippines became independent, Hawai'i and Alaska became states, and only Puerto Rico remained a colony) and investing heavily in islands and overseas military bases. After World War II, though it set the Philippines free it retained air bases in the country and also claimed the bulk of Micronesia from Japan, held as a Strategic Trust Territory under the ostensible supervision of the United Nations. Overseas territory under U.S. jurisdiction today amounts to very little in terms of area—it is smaller, all told, than the state of Connecticut.[45] But that territory spreads across the planet in the from of military bases and island colonies like a constellation, with over six hundred points.

The other obvious exception to the dwindling strategic value of colonies concerns oil. Many of the chemistry-for-colonies substitutions that the United States made during World War II (including synthetic rubber and plastic) involved oil. In 1945, 59% of the world's proven oil reserves lay inside of U.S. borders.[46] But today, with the opening of major reserves in other countries, that all-important substance has *become*, for the United States, partly foreign in its provenance.

Unsurprisingly, perhaps, oil is the raw material that most reliably induces postwar U.S. leaders to backslide on their rhetorical anti-imperialism. When confronted with the specter of an oil embargo, Henry Kissinger mused that the United States "may have to take some oil fields." "I'm not saying we have to take over Saudi Arabia," the Secretary of State continued. "How about Abu Dhabi, or Libya?"[47] It is hard to imagine Kissinger embarking on

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45 I am counting territories and military bases. The total area of U.S. overseas bases is reported in Department of Defense, "Base Structure Report—Fiscal Year 2015 Baseline: A Summary of the Real Property Inventory," Washington, DC, 2015, 84. That figure excludes secret bases and some bases smaller than ten acres.

46 Geir Lundestad, "Empire by Invitation?: The United States and Western Europe, 1945–52," *Journal of Peace Research* 23 (1966): 264.

47 Quoted in Daniel J. Sargent, *A Superpower Transformed: The Remaking of American Foreign Relations in the 1970s* (Oxford: Oxford University Press, 2015), 185.

such unbounded flights of imperialist reverie on behalf of rubber, tin, or any other former colonial commodity.

Such thinking continues today. The current president elect, Donald Trump, strenuously opposed foreign military adventures on the campaign trail but simultaneously insisted repeatedly that the United States should claim the oil reserves of the Middle East. "I would go in and take the oil," he said of ISIS-controlled regions in Iraq. "I would absolutely go."[48]

Yet, even when it comes to oil, flare-ups of naked imperialism are relatively rare and do not generally lead to annexations. The trend over the past century is not the persistence of imperialism but its collapse. Today, as Frank Ninkovich has correctly observed, "there are no Kiplings or Churchills, no Rhodeses, no Albert Beveridges or Theodore Roosevelts, no Ferrys to thump their chests while extolling the virtues of empire."[49] Formal empire is now largely a matter of islands, imperialism is virtually an abandoned ideology. And for that we have the technological transformations of the twentieth century to thank.

48 Donald Trump, "New Day," CNN, 11 August 2015.

49 Frank Ninkovich, "Culture and Anti-Imperialism," in Robert David Johnson, ed., *Asia Pacific in the Age of Globalization* (New York: Palgrave Macmillan, 2015), 264.