ON INVISIBILITY: CHEMIFICATION AND MATERIAL MOVEMENTS

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Jasper Ludewig is a 2023 recipient of the H. Allen Brooks Travelling Fellowship. All photographs are by the author, except where otherwise specified.

After 2000 kilometers of circuitous driving, I have finally arrived in central *narrm*/Melbourne, amused as always by the contrast of its orderly, gridded streets and the tortured bombast of so much of its architecture. Today alone I have driven for close to 10 hours, from the far north-western corner of the state, descending after dark onto the plain across which the city unravels. The two-laned road doubles, triples, and then quadruples in quick succession before I eventually pull into a parking facility and scurry through the drizzle to my accommodation. It's here that I begin this first report of my H. Allen Brooks Travelling Fellowship: in a room in a city I now see as an important threshold in the historical geography my travel attempts to retrace.

Fig. 1. Panoramic view of the Paterson Valley from Mount George. Property boundaries, nature reserves and the curving river are clearly visible.

Fig. 2. One of the many agricultural relics on display along the roadsides of the Paterson Valley.

Over the past month, I have visited different regions along the eastern seaboard of what is now known as Australia looking for evidence of its systematic transformation as Country—the term used by Indigenous Australians to describe the lands, waterways, seas and skies with which they are intimately connected—into the landscapes of colonial agriculture. This transformation commenced in the late eighteenth century, radiating inland from a string of settlements established at river mouths and natural harbours in the colony of New South Wales before accelerating over the course of the nineteenth century, propelled by a growing population, global commodity markets, and the advent of political self-governance. Throughout this process, agricultural expansion *was* colonial expansion—both in the geographical sense of the actual material dispossession and occupation of Indigenous land (clearing, fencing, planting, building), and in the political economic and juridical sense of state formation and the reification of systems of colonial governance (land regulation, taxation, policing, establishing institutions, etc.). Of course, the supposed absence of agricultural systems—a cynical interpretation of well-documented Aboriginal land management practices—was also used by the British state and its representatives as moral and legal justification for the invasion and violent dispossession of Indigenous land in keeping with the doctrine of *terra nullius*. One assumption I have therefore made over the past month of traveling is that to interrogate the material history of Australia's agricultural development is also to consider something essential to the manner in which colonial sovereignty was purported and enacted.

More specifically, my travels are based on my emerging understanding that the viability of the colonial project in Australia—given this imbrication with agriculture—depended to a large extent on the biological work performed by fertilizer. Sovereignty and fertilizer may seem an incongruent pairing, but their relation encompasses an approach to the organization of people, land, and materials (and eventually also buildings) that both recasts prevailing understandings of the environmental effects of colonization, as well the forms of governance that were elaborated in their service. The sociologist Marion W. Dixon terms this relation—referring to its twentieth-century incarnation—"chemification," or "the processes by which imperial states gained territories (and land, labour, etc.) through industrial power built on assemblages of production, energy, and materials connected via a handful of chemicals."[1] This fellowship project is something of a meditation on chemification understood as a discrete historical process; from its pre-industrial, colonial origins to its fuller expression in the early twentieth century. What is the historical geography of

chemification? What were its spatial—agricultural, infrastructural, technological, architectural, rural, urban—modes of articulation? What kinds of political order did it give rise to? Whose futures did it secure? Whose did it foreclose? And how does chemification, as a methodological lens, enable us to better collocate colonialism and capitalism as interlinked systems that have facilitated humans' intervention in the processes that govern life within the biosphere?

Fig. 3. An abandoned turn-of-the-century homestead in the Paterson Valley.

Evidence in service of my questions is admittedly difficult to recover through travel. Fertilizers leave no visible trace in the places they are applied; and, unlike other agricultural technologies, they are meant, by design, to dissolve and disappear into other things—soil, water, roots, stems, flowers and fruits—which are themselves routinely removed or replenished. The result, I have learned, is that one struggles to find much (any) information about the use and effects of chemical fertilizers in the (many) local history museums dotted throughout the agricultural districts between *meanjin*/Brisbane and *narrm*/Melbourne. Instead, it seems that chemification is best approached indirectly, by seeking out its epiphenomena: the statistics of increased crop yields recorded at nineteenth-century experimental farms; importation rates of the raw materials purchased by fertiliser manufactures; the almost total devastation of the landscapes at which these raw materials were extracted; and the land-use patterns and forms of living that fertilizers have sustained in a radically different ecology to those in which European farming systems were originally devised.

Fig. 4. The main buildings of Tocal Estate at sunset.

Fig. 5. Tocal’s stone barn, constructed in 1830 using convict labour to dry tobacco.

Fig. 6. The barracks built to house Tocal's 35 convict laborers during its development in the 1830s.

Fig. 7. Tocal Homestead was built to the 1841 design of the Scottish architect William Moir. It was constructed from sandstone with a slate roof, most of which was quarried directly from the Tocal site.

Fig. 8. Tocal Homestead is sited at the top of a slight rise on the property, elevating its legibility within the landscape.

Three weeks prior to my arrival in *narrm*/Melbourne, I arrived in the Paterson Valley, on Wonnarua and Worimi Country, in the Hunter Region of New South Wales. The Paterson Valley is one of the oldest European agricultural districts in Australia, occupied from the early nineteenth century by small-scale farmers supplying Sydney and Newcastle. James Webber was one such colonist, arriving from Britain to take up a land grant in 1822, which he subsequently developed into one of the most successful farms in the colony: Tocal. The main buildings and grounds of Tocal have been carefully preserved, embodying the changing regimes of political order and colonial land use in the district, from the erstwhile tobacco shed (1830) and convict barracks (1835), to the late-Colonial Georgian homestead (1841) and the famous Blacket Barn (1867). Today, Tocal strikes an uneasy balance between its dual role as part open-air colonial heritage display and part bucolic wedding venue—its overabundance of pithy interpretive plaques, affixed to its photogenic buildings, counterposed by the glaring omission of any meaningful engagement with the Indigenous history of the valley. Even the word *"tocal,"* which the plaques purport to mean "plenty" in the Wonnarua language (the Wonnarua Nation Aboriginal Corporation's official dictionary suggests otherwise), operates at the level of simulacrum: naturalizing the colonial history of the estate by establishing a false continuity with its Indigenous "past." Axe-grinding grooves formed by members of the Gringai clan, located on a sandstone outcrop in the middle of a pasture separating Tocal's main buildings, seem like the only authentic historical remnant on the entire estate.

Fig. 9. The Blacket Barn owes its name to the celebrated nineteenth-century colonial architect Edmund Thomas Blacket, known for his churches and public buildings throughout the colony of New South Wales.

Fig. 10. The symmetrical floorplan and timber roof trusses have earned Blacket Barn the mantle of the “Cathedral of Barns” from the contemporary architect Philip Cox, commissioned to design nearby Tocal Agricultural College in 1963.

Fig. 11. The fine detailing of the Blacket Barn plays a central role in Tocal's state heritage listing.

Fig. 12. Today, Tocal Estate caters as much to wedding guests as history enthusiasts. Its buildings and grounds are presented to emulate nineteenth-century rural life in the colony.

The history of Tocal, like so much of Australia's European history, is largely reducible to its geology. Australian soils are among the most nutrient poor in the world and are especially lacking in phosphorous, which promotes plant growth and improves fruiting. Where government officials such as James Grant, writing from the Paterson Valley in 1801, saw "long luxuriant grass" and "plenty of land for agriculture," they therefore projected a cultural and ecological imaginary onto the landscape—and into its soils—that anticipated, erroneously, an equivalence with the soils of Britain.[2] Invisible to Grant and his contemporaries was the work of the Wonnarua and the Worimi, undertaken over millennia, to manage the non-alluvial areas of this landscape through fire. The famous open forest of the New South Wales hinterland, described by Peter Cunningham in 1827 as in "every way suitable for pasture without cutting down a single tree," was

in fact the intentional result of routine cool burning, which supressed the growth of saplings and thickets, encouraging the germination of native perennial grasses instead.[3] Fleet-footed kangaroos, wallabies, emus, and other animals flocked into the forest clearings the fire left behind, providing a reliable food supply alongside native tubers, lilies, flaxes, and sorghums. Mistaking grasses for signs of fecundity, colonists such as Webber poured into the Paterson Valley, stocking the once soft and spongy land with hard-hooved sheep and cattle, and planting cash crops—tobacco, grapes, hops, and maize—along the alluvial corridors. Within only a few years, the colonists had ringbarked the eucalypts for timber while their livestock compacted the earth and razed the grasses, causing widespread erosion and degradation of the already poor soil.

In search of more fertile tracts of land, colonists quickly moved throughout the Paterson Valley, practicing a land-extensive agricultural system known as "soil mining." "The consequence of this miserable system," observed James Atkinson in 1826:

> is that the land in a few years gets exhausted, and having very little tillage, is entirely covered with weeds. [...] The plan then adopted is to let this lie fallow, as it is termed, that is, to suffer it to lie untouched for several years, to be overgrown with mimosas, and to become a nursery for rank and noxious weeds of every description; in the mean time, the Settler clears another piece of fresh land, and with this proceeds as before.[4]

For the soil miner, managing soil fertility was of secondary importance to the availability of an inexhaustible supply of more land nearby. Attempting to constrain colonial settlement, which was rapidly expanding due to the activities of soil miners and others, the government imposed what became known as the Limits of Location in 1829—a semi-circular perimeter radiating 400 km outwards from Sydney that delineated the area in which settlement was legally permitted. The territory within the Limits was broken into 19 counties, which were surveyed and valued in turn; the available land was organized into different classes, each attracting a different rate per acre based on its agricultural potential; and crops were used as collateral against mortgages to enable capital-poor farmers to take up land within farming districts such as Paterson. In effect, the Limits of Location transformed the interior of the colony into a patchworked, "improved" landscape, still clearly legible in the view over the Paterson Valley from Mount George (Figure 1).[5] The Limits are particularly fascinating when understood in relation to contemporary political economic theories of land price, rent, and soil fertility. As David Ricardo notes in his 1817 treatise, *On the Principles of Political Economy and Taxation*:

> Rent increases most rapidly, as the disposable land decreases in its productive powers. Wealth increases most rapidly in those countries where the disposable land is most fertile, where importation is least restricted, and where through agricultural improvements, productions can be multiplied without any increase in the proportional quantity of labour, and where consequently the progress of rent is slow.[6]

Fig. 13. One of Tocal's many pastures, heavily transformed through land clearing, grazing, and chemical fertilizers. The main building of Tocal Agricultural College can be seen in the distant background.

Fig. 14. Widespread grazing has suppressed native grasses, compacted the soil, and made large swathes of land highly susceptible to flash flooding and erosion.

Fig. 15. A field in the vicinity of the former Rutherglen Experimental Farm in northern Victoria.

Fig. 16. “Field E” at the former Rutherglen Experimental Farm in northern Victoria, later the Rutherglen Viticulture College and then Rutherglen Research Institute.

Augmenting the productive powers of a more limited supply of land through the use of fertilizer was therefore not only a question of agricultural production, but also formed part of an incipient colonial property regime in which the value of land was—at least initially—determined by the “indestructible powers of the soil” and the amount of capital/labor required to exploit it. In the Paterson Valley, and throughout the territory delineated by the Limits of Location more broadly, a land-extensive frontier model of soil mining thus gave over to an incipient yeoman ideal focused on regimes of improvement. Tocal occupies a unique position within this history. Its buildings—or, more accurately, what lies beneath them—testify to how the more tightly controlled system of land allocation established by the Limits ultimately reconfigured the biological profiles of Australian soils. Although “hardly a single pre-[European]-contact soil profile survives intact anywhere across the nation,” observes the geographer Stephen Gale, “a rare

exception to this generalisation comes from Tocal."[7] Rather than the "well structured, strongly stable" soils found throughout the Paterson Valley today, the soils beneath the original Tocal homestead are "very friable, poorly structured and have a weak aggregate stability."[8] The comparison reveals the cumulative effects of more than a century of colonial attempts to transform Australia's Indigenous landscape—the sum total of myriad entanglements between the law, capital, agricultural development, and ecological violence descending upon the value latent in the soil. Leaving the valley along the old Paterson Road, which traces a double of *Yimmang* (Paterson River) along the intensively farmed floodplain, I recall the words of the Gurindji man Daly Pulkara who, when asked by the anthropologist Deborah Bird-Rose what he thought of the denuded—but heavily "improved"—landscape of a cattle station in the Northern Territory, simply remarked: "It's the wild. Just the wild."[9]

Fig. 17. Dookie College administration building and museum, formerly the college laboratory.

Fig. 18. The Dookie College buildings were designed by the Victorian Public Works Department, which provided similar facilities at the Rutherglen and Longerenong colleges.

Fertilizers quickly followed the intensification of agriculture in nineteenth-century Australia. They were used to more reliably extract larger harvests from smaller properties on aberrant soils year after year, but also—as Tocal demonstrates—to drastically transform the chemical composition of those soils over time. On my way to the Wimmera district in western Victoria—one of the country's most diverse grain growing regions—I was fortunate to visit an important site in the uptake of chemical fertilizers in Australia. Dookie Agricultural College and Experimental Farm is the oldest agricultural college in Victoria and today forms part of the University of Melbourne, specializing in land management and restoration, viticulture, and food security research. Dookie seemingly appears out of nowhere, nestled into rolling hills on Yorta Yorta Country in the lee of Mount Major; a distinctly proto-urban setting amidst a sea of serried fields and empty gravel roads. Its history dates to 1877 when the Victorian Board of Agriculture established the Cashel Experimental Farm, tasked with training colonists in the latest scientific methods of rational agriculture. Ten years later, 50 people were on the waiting list to enroll in Dookie, where students tended to the almost 5,000 acres as part of a rigorous program housed in state-of-the-art buildings—laboratories, cellars, and greenhouses—designed by the Public Works Department.[10] As reported by a journalist following an inspection tour of Dookie in 1888, "the curriculum includes chemistry, botany, geology, entomology, English, mathematics, surveying, bookkeeping, besides practical farm work in all its branches."[11] Formal training in agriculture was viewed as a matter of economic security in a globalizing world, as well as a domain for state intervention given the value of export duties to annual revenue. "In these days of competition and rapid progress," proclaimed one local newspaper, "the advantage is with those who know how to make the best of their opportunities, and are acquainted with the latest discoveries in science as applied to the cultivation of the soil."[12] Dookie moved the colony of Victoria in this direction, following the examples set by experimental farms throughout the anglosphere in the United States, Canada, and New Zealand, and demonstrating a more modern approach to agricultural science later emulated throughout the colony at Rutherglen in the northeast (viticulture) and Longerenong in the northwest (wheat growing).

Fig. 19. “Agricultural Education in Victoria.” Poster promoting Dookie and Longerenong colleges, c.1895.

Source: Victorian Places.

Fig. 20. Experimentation continues at Dookie College today as part of the University of Melbourne.

The archive at Dookie remains beautifully chaotic, its records distributed between a small campus museum —the college's former laboratory building—and a windowless storage room in which I was permitted to spend multiple hours sifting through boxes. Amidst changing curricula, new pupils, upgraded facilities, and annual reports, the records evince two things in particular: the overwhelming predominance of failed experiments over successful ones, and an obsessional commitment to understanding the natural capacities of the soil:

> Plot 42 – Buck Wheat – Sown August 3rd, came up very well but progressed slowly… Consider this a most useless crop in this dry district. …Plot 43 – Brown Corn – Sown in drills 24 inches apart, August 4th, 1879. Came up very indifferently… Consider this district unsuitable for this crop, as it requires a deep black soil. …Plot 44 – Flax – Sown broad cast in finely prepared soil, 5th August. …The fibre is not of sufficient length to be of any value as a marketable product. This crop certainly cannot be recommended as a sure and profitable one in this district.[13]

As the experiments tick over into the 1880s, more and more appear in which traditional fertilizers—bonedust, saltpetre (potassium nitrate), and cow and chicken manure—were being replaced by imported guanos. Although guano can refer to the dried excrement of a wide variety of animals, only seabird guano was used at Dookie. It had been extracted and shipped there from three vastly different island groups spread across two different oceans: the Chincha Islands in the Pacific Ocean near Peru; Malden Island in the Central Pacific Ocean; and the Lacepede Islands off the coast of Western Australia in the Indian Ocean. This geography becomes almost unfathomable when encountered in the abstract on a 150-year-old spreadsheet in an anonymous storage room on an isolated experimental farm in central Victoria. The collapse of physical distance presented in the spreadsheet, however, more clearly frames the historical movement of the guano itself: from the sites of its extraction to those of its application, which, in this case, are the fields that stretch out in every direction from the building in which I am sitting. Guanos quickly appear in almost every experiment I now come across: wheat, potato oats, Norway oats, white Tartarian oats, English barley, Cape barley—all are pickled and mixed with different blends of imported bird excrement, the results recorded as reliable increases in the yield of each crop per acre.

Fig. 21. An original timber barn sited opposite Dookie's historic olive grove from the late 1890s.

THE DOOKIE AGRICULTURAL COLLEGE, VICTORIA—Drilling and Rolling.

Fig. 22. "The Dookie Agricultural College – Drilling and Rolling." Drilling typically involved so-called "combines," which deposited both seeds and superphosphate in furrows at regular intervals and set depths. Source: Victorian Places.

Guano is much more potent than other manures and immediately delivers more highly concentrated nutrients to plants, as well as protecting them against drought by promoting root development.[14] As research stations such as Dookie confirmed these characteristics, nineteenth-century guano traders pushed further into the Central Pacific, as well as onto the Great Barrier Reef Islands off the coast of Queensland, deploying mobile mining infrastructure and contracting indentured laborers into a frontier industry established to serve the growing demand of farmers throughout the Tasman world and beyond.[15] By the turn of the twentieth century, the surface guano deposits on most islands had been exhausted. In the interim, however, fertilizer manufacturers had shifted their focus from the importation of guano to the production of a synthetic compound known as superphosphate—or, in typical Australian fashion, simply as "super." Dookie seems to have been an early adopter of this new agricultural technology, stating that of the manure experiments conducted in 1888, "the greatest results… were obtained from superphosphate for 30 [shillings] worth of which a yield of 35 bushels per acre was obtained," far outperforming bonedust, Malden Island guano and saltpetre.[16] By the late 1800s, super was made by mixing sulphuric acid with roughly equal parts pulverised rock phosphate ore—a kind of geological fusion of weathered surface guano, dead marine life and coral substrate—which delivers a much higher concentration of phosphorous into the soil than guano while remaining soluble enough to nourish plants. Returning to the Pacific and Indian Oceans in search of rock phosphate, a new cast of European companies advanced a second wave of phosphate imperialism on a handful of remote islands boasting the world's purest deposits: Christmas Island, south of Java; Nauru and Banaba (Ocean Island) in the Central Pacific; Angaur in Palau; and Makatea in French Polynesia.

Fig. 23. Winter fields in the Wimmera. Minimal trees are left to provide shade during pasturing.

Fig. 24. A rare sign of the heavily engineered environment beneath the topsoil.

Fig. 25. Winter fields, shade trees, and a hill covered in prickly pear cactus.

Fig. 26. Fences, roads, lots, and furrows all point the same way in the Wimmera.

Fig. 27. The only curves found in the Wimmera, other than the creeks and rivers, are at the corners of its fields, where tractors and machinery complete a ninety-degree sweeping turn.

By 1910, adoption of superphosphate for the fertilization of wheat—Australia's largest export crop—had risen to around 80 percent from only 25 percent two decades prior.[17] By the outbreak of World War One, Australia was the highest user of superphosphate of all land-abundant economies, including the US, Russia, and Canada.[18] The effects of superphosphate over this period radically altered entire ecologies such as the Wimmera Mallee—an almost completely flat, once forested sandy plain that was comprehensively cleared to make room for wheat fields. Driving across the Wimmera today, the violence to which the Mallee was subjected is largely invisible. Instead, the fences, gates, irrigation systems, and occasional sheds read as inert props in the performance of an entrenched ruralism, their banality somehow all the more confronting when encountered with the broader material and political history of chemification in mind. The serpentine rivers and creeks appear almost alien in the otherwise orthogonal landscape, redoubled in the dense stands of eucalypts that follow the banks and edges before petering out into stubbly winter fields. Concrete grain silos reappear whenever the road intersects with a deteriorating rail line, infrastructural remnants of a centralized distribution system that once connected the Wimmera's wheat fields to international markets via the Port of Melbourne. At Murtoa, I stop to walk through the Stick Shed: a vast 265 x 60 meter emergency bulk wheat store, referred to as the Cathedral of the Wimmera, that was constructed during World War Two to preserve up to 3.4 million bushels of grain. More than 500 unmilled Mountain Ash (*Eucalyptus regnans*) poles reach up to around 18 meters high, fixed to timber roof trusses using galvanized hoop iron and lending the interior a sense of impossible lightness. Integrated into the same rail line as the concrete silos it was designed to replace, the Stick Shed attests to the cumulative development of agricultural systems in the Wimmera, where infrastructural interventions built on and expanded the productive capacities of those that preceded them. Today, growers store their harvests wrapped in plastic and left on the ground in so-called "sausages," ready for when the market price turns in favour of selling a particular grain.

Fig. 28. Concrete wheat silos in Warracknabeal built in the 1930s, now redundant as grain growing has diversified.

Fig. 29. The abandoned train station in central Warracknabeal, built in 1886 to connect the booming Wimmera to the Port of Melbourne.

Fig. 30. The exterior of the Murtoa Stick Shed. Light passes into the interior through thousands of old screw holes in the metal roof sheeting.

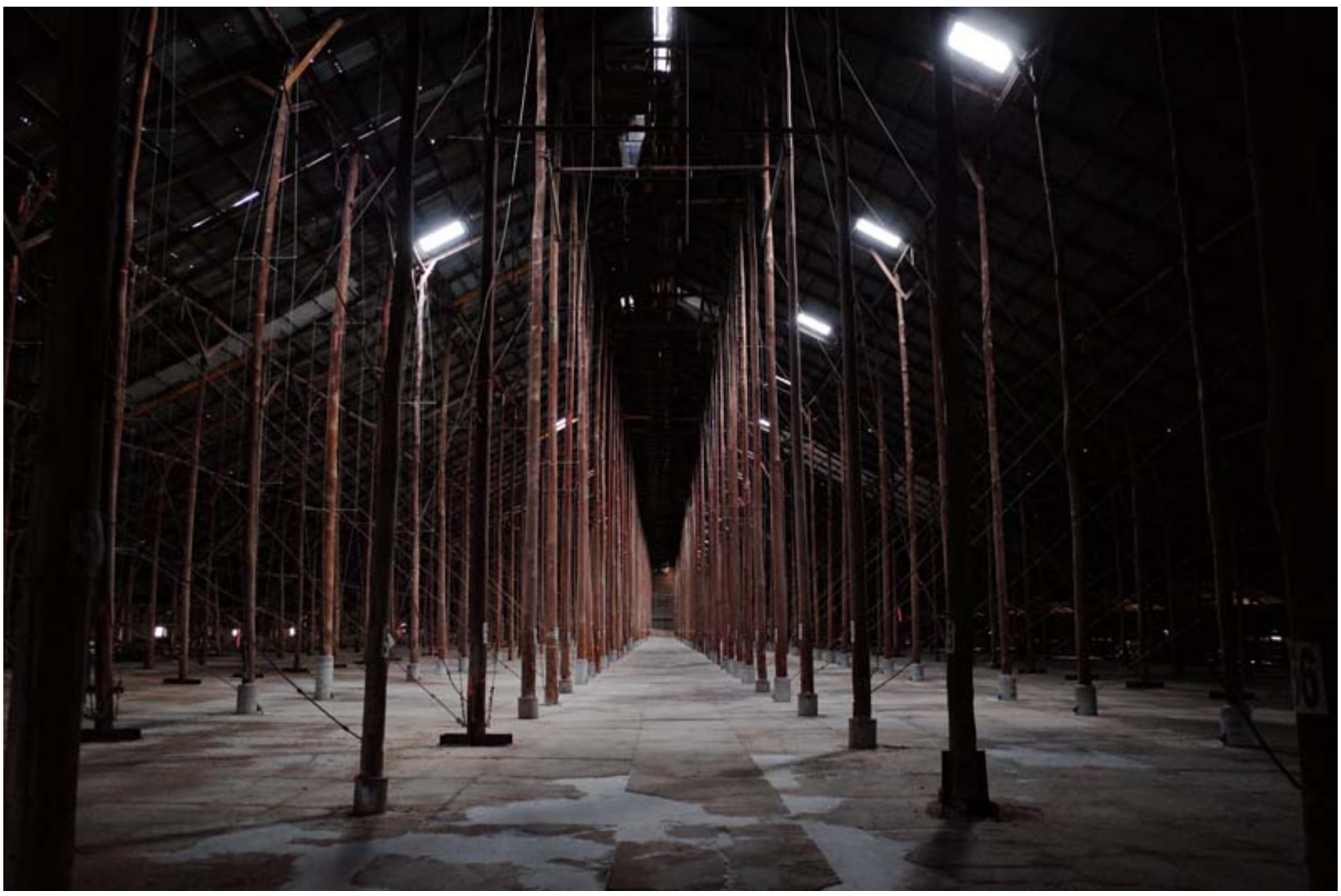

Fig. 31. The unmilled Mountain Ash poles form a central aisle running the length of the Stick Shed. Grains of wheat still fill the cracks in the concrete slab. The smell is a mix of mechanical equipment—oil, diesel, grease—and the sweetness of the wheat.

Fig. 32. A longer exposure photo of the Stick Shed's interior. The ties that cross-brace the tall poles wobble with each gust of wind that hits the exterior of the building.

The straight road eventually deposits me on Wotjobaluk, Jaadwa, Jadawadjali, Wergaia, and Jupagik Country, in the town of Warracknabeal: the capital of the Victorian wheat district and, surprisingly, the birthplace of the musician Nick Cave. Much like Tocal, the history of "Warrack" is one of spectacular landscape transformation in pursuit of profit. As explained in *Prosperous and Progressive Warracknabeal*, a 1910 pamphlet promoting the development of the town:

> Up till a few years ago it was no uncommon thing for a Land Board to say persuasively to an applicant for Mallee land: "There is a fine block adjoining your land. You can have it, too, if you will only keep the rabbits down." And in all probability the applicant would say that he had quite enough Mallee already. To-day, if he wanted the same land, he would have to pay anywhere from £5 to £10 per acre for it. It is only a few years ago when it seemed that Warracknabeal would be buried beneath the drifting Mallee sands, but in the same town house rent is higher than in Melbourne. Building is being rushed ahead almost feverishly to keep pace with the demand for houses, and on every side are the evidences of prosperity and expansion.[19]

The accumulation of capital in the Mallee was directly linked to the accumulation of phosphorous in its soils and the development of the technologies required to deliver it there. "The Mallee was always fertile," continues the pamphlet's author, "but the fact was not known, or, if it was known, the knowledge necessary to take advantage of it was lacking. But the chemist, the implement maker, and the experienced farmer appeared on the scene, and, lo! a transformation." While the chemists demonstrated "how the use of fertilizers added manifold to the productiveness of the soil," the implement makers "armed [the settler] for the fight." Meanwhile, the state extended irrigation channels throughout the northern plains, "with the result that the Wimmera and the Mallee are even now rendered practically drought proof."[20] Once again, the historical record denaturalizes the contemporary landscape, revealing it to be a heavily engineered terrain.

Fig. 33. “15 Ton Truck Mallee Roots, c.1930.” Roots of the *Eucalyptus dumosa*, known as the Mallee tree: a small Eucalypt with a dense lignotuber, allowing it to survive fire and making it notoriously difficult to clear. Source: State Library of Victoria, Victorian Railways Collection, H92.301/243.

Fig. 34. A Type AL harvester manufactured by the Sunshine Harvester Works on display at the Wheatlands Agricultural Machinery Museum in Warracknabeal.

Fig. 35. The Sunprong Pasture Renovator, manufactured at the Sunshine Harvester Works in c.1935. Doses of superphosphate are dropped onto the ground before the rotating prongs turn over the topsoil, mixing in the fertilizer.

Equipment from the early period of the Mallee's transformation is exhibited at the Wheatlands Agricultural Machinery Museum on the outskirts of town. Among grain cleaners, seed picklers, harvesters, harrowers, and winnowers from Britain, Canada, and Germany, by far the most impressive machinery on display stems from the Victorian Sunshine Harvester Works. To provide farming machinery to the burgeoning Wimmera district, as well as South Africa and Argentina, a large industrial facility emerged on the outskirts of *narrm*/Melbourne in the late nineteenth century, forming an entire suburb still today known as Sunshine.[21] The recognizable red and yellow paint schemes applied at the Sunshine factory formed part of the company's marketing strategy, which extended to the model names assigned to each implement. The Mallee Rake, for example, boasted spring-loaded steel teeth that could withstand "the severest strain… If the land is covered thickly with Mallee, it will rake it up quite as easily as if sparsely laid. Nothing left behind."[22] Horse-powered Sun Grain Drills deposited pickled seed in furrows at the correct depth along with a small dose of superphosphate. The Sunprong Pasture Renovator aerated the field with rotating steel prongs while mixing in an adjustable quantity of super prior to planting. Understood as technologies of improvement deployed at the coalface of colonial dispossession and ecological destruction, the bright colors and optimistic marketing produce a jarring effect.

It should be stressed that the chemical transformation of Australia's soils through the routine application of increasingly potent fertilizers did not, in fact, erase Country. As explained by the late Big Bill Neidjie, a Bunitj man and Gagudju speaker from the Kakadu area of the Northern Territory, Country is omnipresent, inextinguishable and abiding:

> Our story is in the land […] it is written in those sacred places. My children will look after those places, that's the law. Dreaming place […] you can't change it no matter who you are. No matter you rich man, no matter you King. You can't change it […] Rock stays, earth stays. I die and put my bones in cave or earth. Soon my bones become earth […] all the same. My spirit has gone back to my Country.[24]

While they did not displace Country, fertilizers nevertheless enabled the physical transformation of the Australian landscape—into "wilderness," to paraphrase Daly Pulkara—in pursuit of imported agricultural systems and attendant ideas of political order and sovereignty. Aileen Moreton-Robinson, a scholar and Goenpul woman of the Quandamooka people in Queensland, argues that the legal regimes of the colonizing state place "Indigenous people in a state of homelessness because our ontological relationship to the land, which is the way we hold title, is incommensurable with [the state's] own exclusive claims of sovereignty."[24] These claims emerged from the imbrication of the law, the atomization of the land as property, and the material practices of improvement to which it was subjected over time. In other words, colonial sovereignty is processual and material as much as it is a historical product of the legal imagination—material in the sense that it takes place and is enacted in discrete ways, and perhaps especially through the extraction of value from and transformation of the soil.

Fig. 36. Cuming Smith & Co.'s Yarraville works in c.1906. Source: "Catalogue of Manures," 1906–7, Cuming Smith and Company Limited Collection, University of Melbourne Archives, 30.15.1.5.

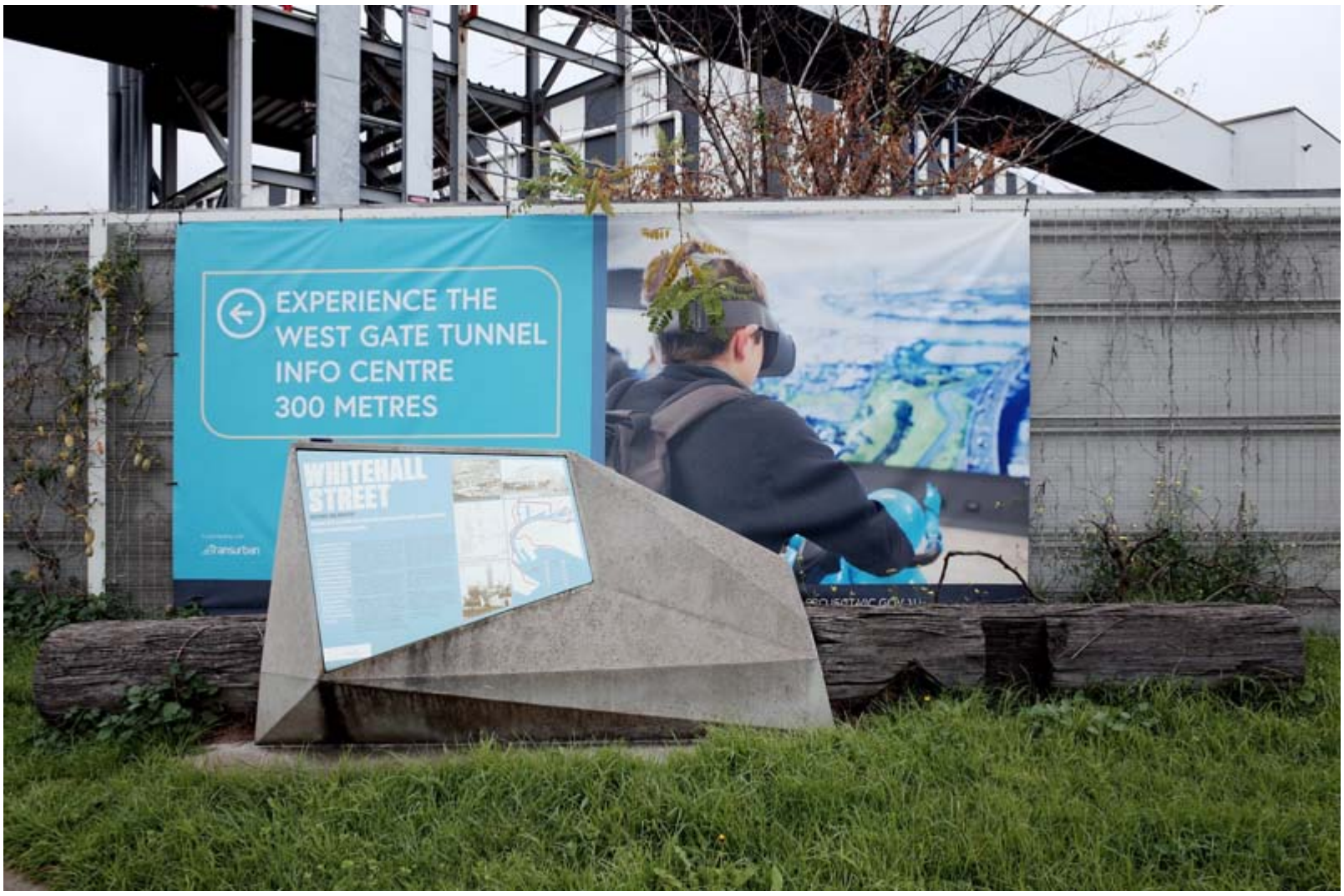

Fig. 37. Plaque in Yarraville outlining the history of Cuming Smith & Co., from its establishment in 1870 until operations ceased in 2000. The timber attached to the concrete plinth was reclaimed from one of the former factory buildings. The site is now part of a major new infrastructure project.

Fig. 38. Dee Cottage (c.1880), the former residence of James Cuming, founder of Cuming Smith & Co.

In *narrm*/Melbourne, I spend time organizing my thoughts after many days of driving on my own. I visit Sunshine but find no real trace of the former factory. I drive to Yarraville, which adjoins the Port of Melbourne, seeking an industrial heritage trail I had read about online. I was eager to see one site on the trail in particular: the former factory of Victoria's most influential superphosphate manufacturer, Cuming Smith & Co. From the 1870s on, the company imported hundreds of thousands of tons of guano and rock phosphate into the colony, blending them with acids, sulphates, and nitrate of ammonia to offer a diverse range of chemical fertilizers. Its awkward—albeit direct—slogan reappears on the catalogues for its Sickle Brand of manures, which I access the following day at the University of Melbourne archives: "BEFORE

USING ‘SICKLE’ MANURES: HARD WORK, NO CROPS. BUT AFTER USING, SPLENDID CROPS, NO WORK, AND THE BANKING ACCOUNT GREW LARGER AND LARGER.”[26] In addition to manufacturing superphosphate, Cuming Smith & Co. also conducted its own experiments into topdressing ratios, sponsored a state school propaganda program, organised pasture and crop yield competitions, and was instrumental in the formation of an industrial cartel, the Victorian Fertiliser Association, in 1907. Perhaps attuned to the veneration I had encountered in the heritage interpretation at Tocal, or maybe because I had already read the 200-page report commissioned to inform its contents, I was surprised by the meagre plaque I eventually located at the former factory site. Affixed to a bland polygonal concrete plinth, the plaque disappeared into the overgrown road siding; almost invisible unless—even if—you knew what you were looking for. Further along the road I came across Dee Cottage: the boarded-up former residence of Cuming Smith & Co.’s manager—a building, much like the plaque, seemingly resigned to its untimely demise as foreshadowed by the sprawling construction site that already surrounds it.

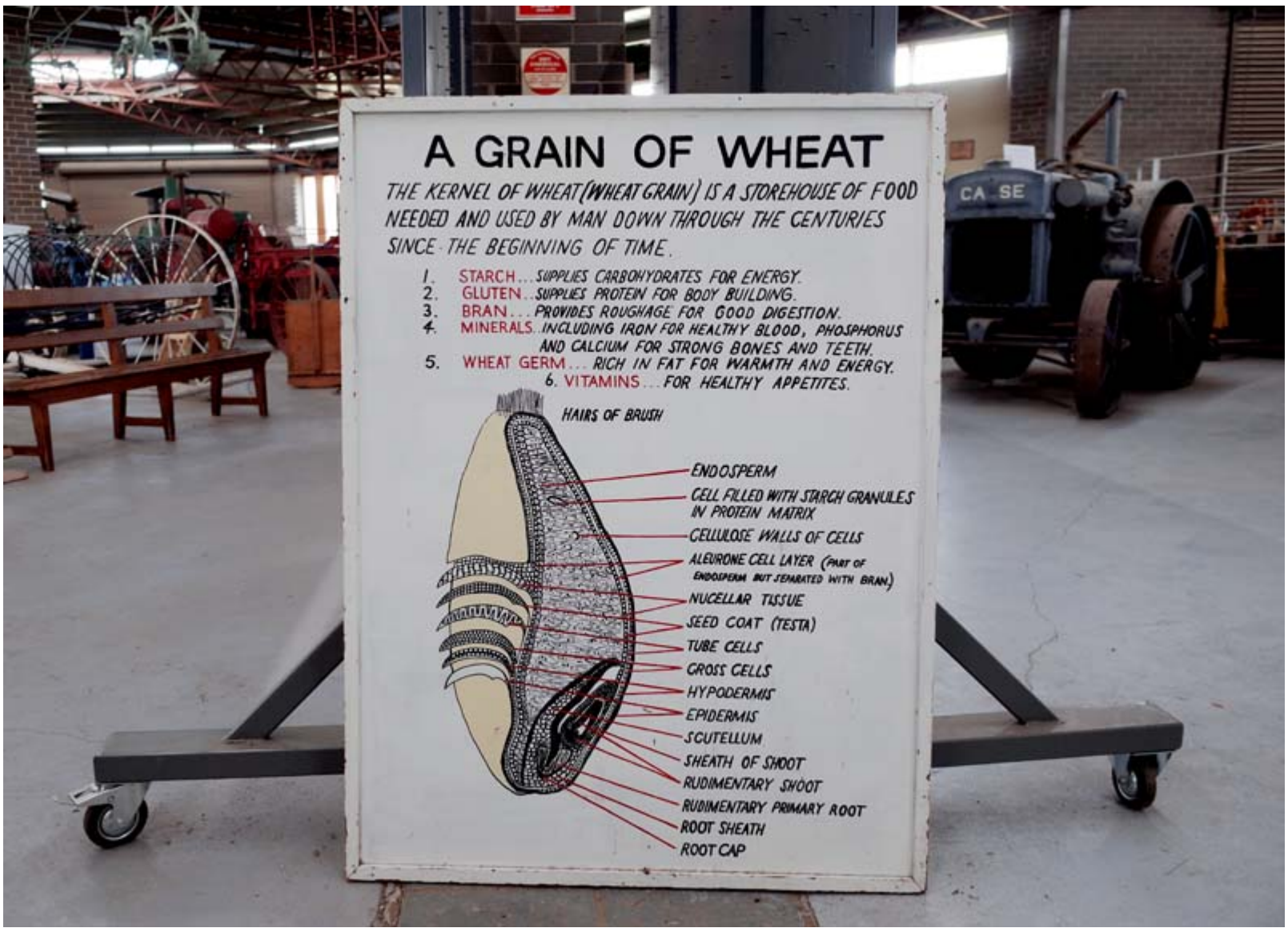

Fig. 39. “A Grain of Wheat.” Microscopic view of the main source of wealth in the Wimmera—wheat—painted on a display board at the Wheatlands Agricultural Machinery Museum in Warracknabeal.

Chemification—its historical geography, effects, residues—is shot through with invisibilities at different registers, a point reiterated here at Yarraville in the diminishing presence of some of its most legible sites and buildings. The type of thinking to which architectural historiography is accustomed (object-oriented, preoccupied with intention and authorship) struggles to accommodate the material movements and displacements inherent in this history. But as the past month of travel has made plain, chemification is also fundamentally a spatial process; a kind of triple displacement in which the transformation of land through the routine application of synthetic fertilizer drew on material and labor elsewhere, which in turn displaced both people and nature in service of the colonial project. This is what the sociologists Brett Clark and John Bellamy Foster refer to as the “environmental overdraft,” imperialistically drawing on natural resources to fuel “the social metabolic order of capitalism.”[26] Intervening in the biogeochemical cycle in this sense involved a telescoping of space across scales, connecting geological material excavated from the Pacific and Indian Oceans to chemical processes controlled in urban factories in the metropole, to yet more chemical processes in the soils of the Tasman world, producing diverse profits along the way. Buildings, equipment,

and infrastructure appear at every turn and with varying degrees of causality—the disaggregated relics of an otherwise largely subterranean and invisible history. It is to its European dimensions that I turn in my upcoming travels.

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ON ACCUMULATION: PHOSPHOROUS AND THE GLOBAL METABOLIC RIFT

Oct 3, 2023 by Jasper Ludewig Leave a comment

Jasper Ludewig is a 2023 recipient of the H. Allen Brooks Travelling Fellowship. All photographs are by the author, except where otherwise specified.

Fig. 1. Tyntesfield House as seen from one of the many ornamental gardens flanking the building.

Tyntesfield is an extravagant Gothic Revival house and estate located just outside Bristol in Somerset. I visited during summer, its large carpark heaving with day tourists eager to inspect the ornamental gardens in full bloom. Well-kept gravel paths weave their way through the 540 acres of land passing by woods, kitchen gardens, orchards, and pasture. In the gift shop café, set in a former model farm (figure 4), visitors can purchase decorative tea towels and fake plants in rustic pots alongside David Matless's *Landscape and Englishness* (2016) and Oliver Rackham's *The History of the Countryside* (1986). The sour smell of scones and a gregarious murmur fill the air. I'm dressed in all black—an occupational hazard on such an irregularly warm day—and I stand out like a sore thumb. Volunteers are stationed across the site in large numbers

and treat me with something between curiosity and suspicion, a situation not helped, it would seem, by my Australian accent. Gazes wander and conversation stalls completely, however, when I mention the reason behind my visit: guano.

Fig. 2. The large estate stretches across 540 rolling acres, often concealing Tyntesfield House from view.

Fig. 3. The walled kitchen garden under cultivation.

Fig. 4. A former model farm building now serves as a café and gift shop.

The Georgian farmhouse that once stood on the site now occupied by Tyntesfield House was purchased by William Gibbs in 1844—three years before his company, Antony Gibbs & Sons, acquired a monopoly for the supply of Peruvian guano to Great Britain. From initial shipments of less than 200 tons in 1842, rates of guano importation increased to 435,000 tons by 1862, the final year of the Gibbs guano monopoly.[1] Mining targeted the rich deposits of the Chincha Islands, which, as I discussed in my previous report, eventually also supplied the Australian colonies with the highly effective fertilizer. According to Jane Hutton, the Chinchas "appear like three giant barnacles latched onto the horizon [...] immersed in an underwater tumult of debris" drawn up from the ocean floor by the Humboldt Current.[2] This debris nourishes the microorganisms upon which anchovies feed, who themselves routinely fall prey to the three main bird species responsible for the Chincha guano deposits: the guanay cormorant, Peruvian booby and the Peruvian brown pelican, their nests dotting the islands together with sea lions, penguins and terns.[3] Centuries of low rainfall and the baking tropical sun converted the bird excrement into the richest deposits of nitrogen and phosphorous known to the mid-nineteenth-century world. Following positive chemical testing of samples in the early 1800s, European trading companies, including Antony Gibbs & Sons, weren't far away.

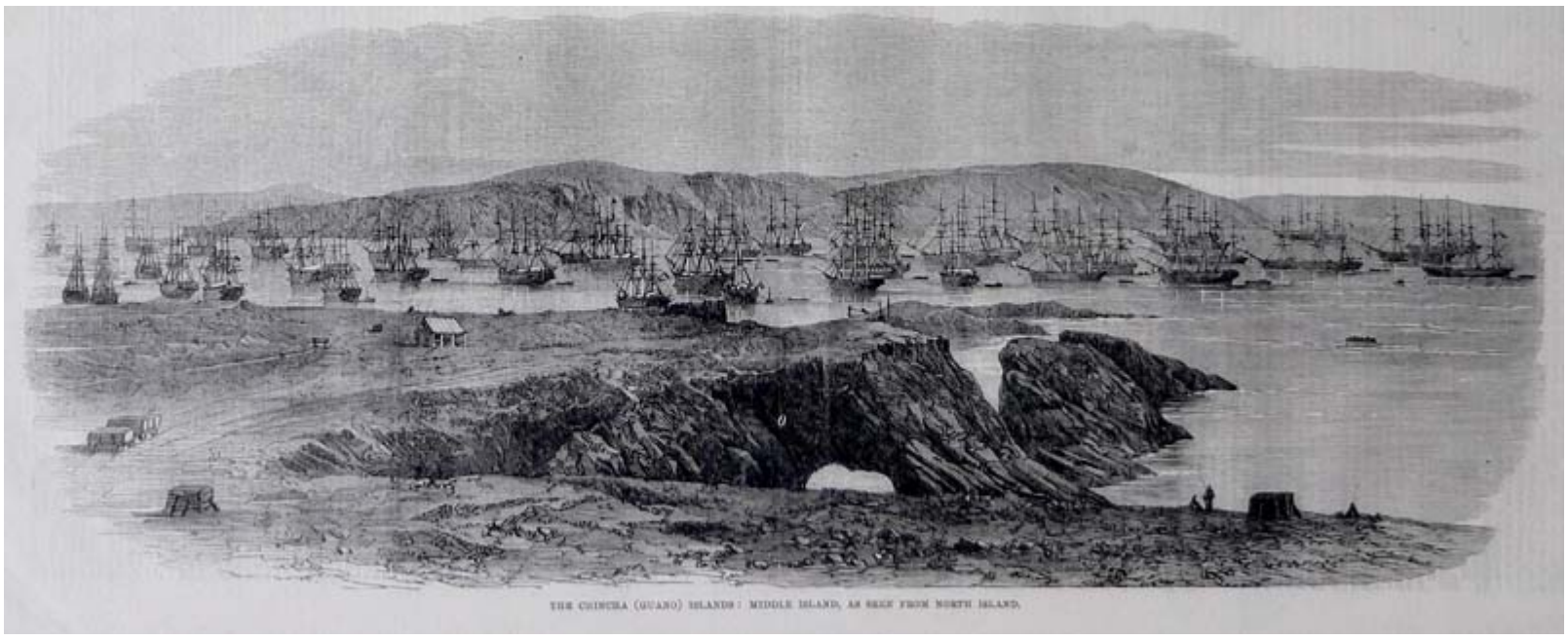

Fig. 5. The Chincha (Guano) Islands: Middle Island, as seen from North Island. Source: *The Illustrated London News*, February 21, 1863, 200.

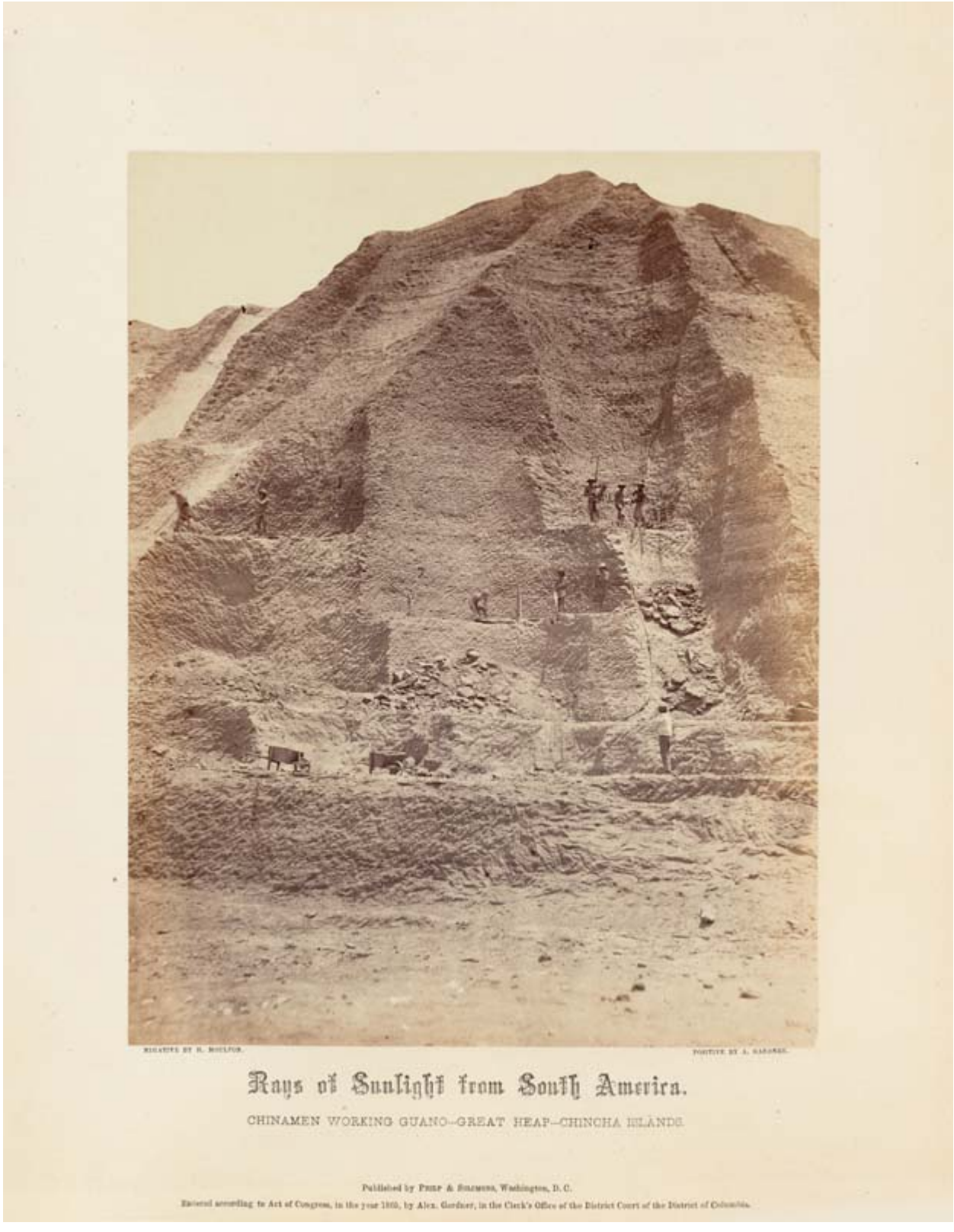

Fig. 6. Chinese labourers working the “Great Heap,” Chincha Islands. Source: Alexander Gardner, Rays of Sunlight from South America, 1865, New York Public Library, https://digitalcollections.nypl.org/items/84c5d6c1-b6d8-d30e-e040-e00a18065090.

The guano trade operated on the Chinchas had sweeping and violent repercussions for the ecology of the islands and the workers transported to them. Accounts from the 1850s describe 100 ships being loaded simultaneously as hundreds more waited offshore (figure 5).[4] Contemporary photographs depict the staggering deposits of guano and the scale of the systematic efforts to raze them to the ground (figure 6). Those tasked with doing so were typically indentured Chinese laborers, contracted in the tens of thousands under coercive terms as part of the so-called “yellow trade” (*la trata amarilla*).[5] As Edward D. Melillo has suggested, companies such as Antony Gibbs & Sons, “faced with a post-slavery world, used new configurations of the long-distance labor trade to extract maximum surplus value from their workers” who were, in the process, transformed into debt peons.[6] From the moment “workers were bonded along the Pearl River Delta,” explain Lola Loustaunau et al., “the disruption of human metabolism was constantly present,” often resulting in disease and death. Mortality rates during the five-month voyage to Peru reached 42 percent during the period of the Gibbs monopoly owing to the abhorrent conditions and treatment aboard the vessels. Once on the islands, workers lived in primitive barracks and received minimal rations and water. Soldiers were tasked in part with preventing worker suicides. Mining was conducted up to seven days a week, spent prying the guano apart using hand tools under the direct sun before breaking the larger mounds into smaller quantities for loading, releasing toxic ammonia vapours. Workers regularly died in the pits in which they worked, their bodies left where they fell as their colleagues were forced to continue working around them.[7] As Loustaunau et al. conclude, what firms such as Antony

Gibbs & Sons required in order to make the Peruvian guano trade profitable was “semi slave/semi-free labor that was entirely disposable, without rights or autonomy” which could, as a result, be “used up and disposed of in ways that capitalized on its superexploitative character.”[8]

Fig. 7. The original Georgian farmhouse at Tyntesfield was gradually surrounded by John Norton’s Gothic Revival additions during the early 1860s.

Fig. 8. The hall, living room and study are to the right, the boudoir is in the middle and the family chapel is to the left in this image.

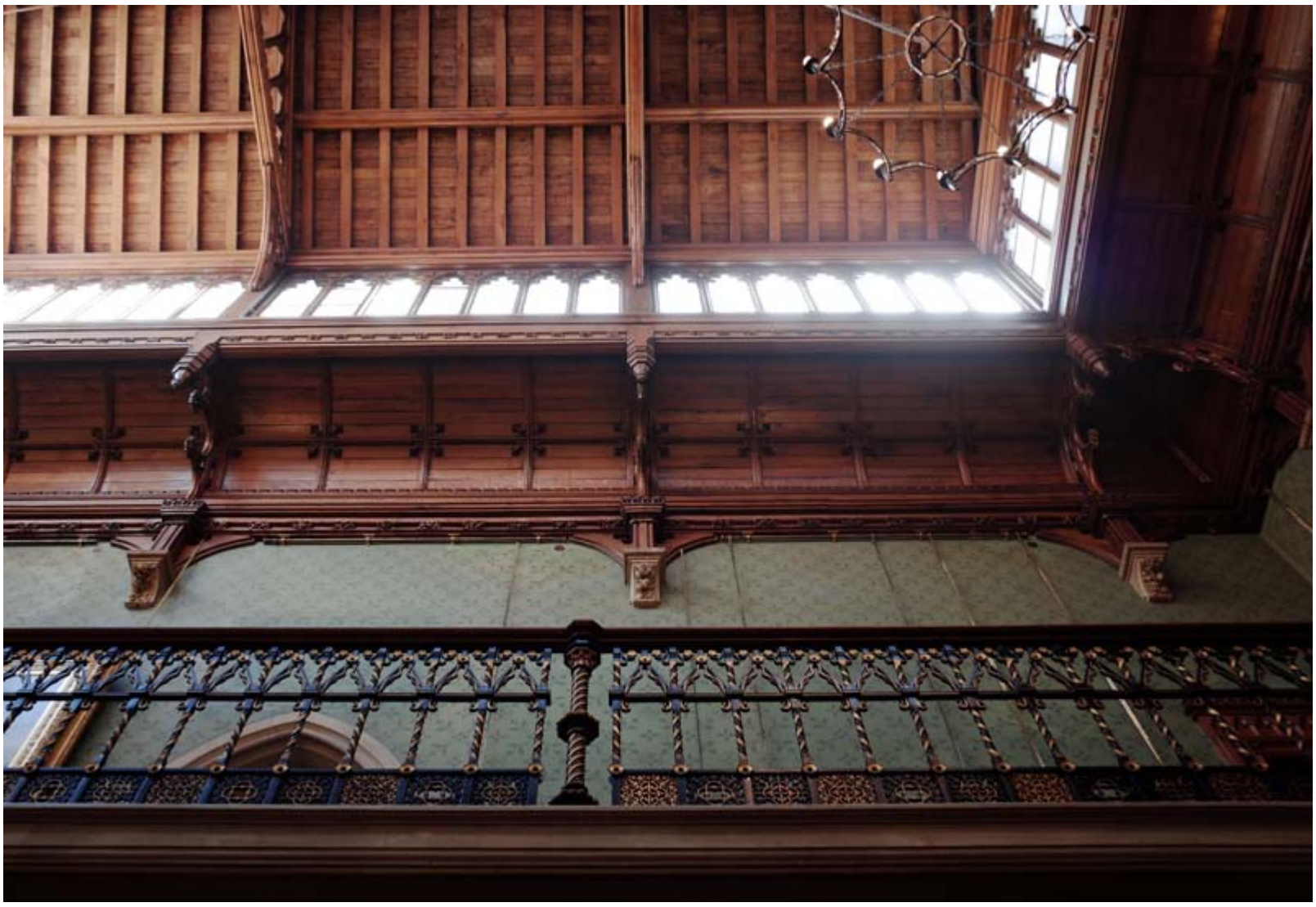

Fig. 9. The galleried landing and clerestory above Tyntesfield's central hall.

Between 1840 and 1880, the Peruvian guano trade delivered profits of approximately $13 billion in today's USD, primarily to British firms and to Antony Gibbs & Sons in particular, which earned around £100,000 ($10 million USD) per year at the height of its monopoly.[9] The year after the monopoly ended William Gibbs commenced a three-year period of renovations at Tyntesfield, significantly remodelling the original Georgian farmhouse according to the plans of John Norton (1823–1904) and the interior design of J. G. Crace (1809–89), both close acquaintances of Augustus Pugin. Norton's additions subsumed the existing house within a constellation of new volumes centred on a double-height hall complete with a large stone fireplace and galleried landing above. Flanking the hall are the ante room, study, and library—all lined with English Oak—as well as Blanche Gibbs's boudoir where carved wainscot panelling depicts different plants grown on the estate, including the Chilean Bellflower—a link to the Chilean saltpetre trade into which Antony Gibbs & Sons moved once the monopoly period had elapsed (figure 16). Portraits of members of the Gibbs family line the walls alongside paintings displaying rural and maritime themes—pieces in a collection estimated by the National Trust to exceed 72,000 items in total. A leering, life-size cardboard cut-out of William Gibbs looks out, inexplicably, onto the front entry of the house from a second-storey window (figure 11).

Fig. 10. The study contains antiques acquired by William Gibbs through the merchant activities of Antony Gibbs & Sons.

Fig. 11. The family chapel is in the background. William Gibbs looks out from a second-storey window in the turret to the left of the image, near the entrance to Tyntesfield House.

As I walk around Tyntesfield, navigating the ambivalent gazes of the volunteers, my mind keeps returning to the slightly confused image of an uninterrupted stream of Peruvian guano flowing onto the estate, depositing layer upon layer of material to eventually form the crystalline, lithic architecture one arch and buttress at a time. The building seems to participate in the verisimilitude of the image—its organic, Gothic features deliberately invoking an architecture that has emerged from the earth. Yet amidst the lavish display of the wealth it generated, the clearest link I can find to the guano trade in the architecture of Tyntesfield is in an otherwise unremarkable servant's corridor leading from the hall past the kitchens to the

rear courtyard abutting the Gibbs family chapel and crypt. In this corridor, a painted glass window seems to portray cormorants and boobies on small diamond panes separated by others depicting flourishing plants bearing flowers and fruit (figure 14). Other than this window, which receives no interpretation or explanatory plaque, the only reference I can find to guano on the entire estate is on a small sign in the hall: “By the late 1850s guano profits had enabled William [Gibbs] to amass a vast fortune. This wealth gave the family the confidence to embark on the grand Gothic remodelling of Tyntesfield in 1863–6.” Even here, the subtle semantic shifts in the sign’s explanation of the estate’s provenance—from guano, to wealth, to the confidence to renovate the existing house—incrementally sever the connection between the elevated form of living on display and the abhorrent conditions of the industry that funded it.

Fig. 12. Further additions made once Tynestfield House was inherited by William’s son, Antony, are visible in the colour difference in the stone.

Fig. 13. Weathering on the Gibbs family chapel.

Fig. 14. A painted glass window with cormorants and boobies, two of the bird species responsible for the guano deposits on the Chincha Islands.

My intention isn't to be moralistic about the National Trust's heritage interpretation at Tyntesfield; nor is it to advocate for a negative history as a corrective against this interpretation. Rather, my interest is to understand how this presentation of architecture works—deliberately or otherwise—to obscure the circumstances of its production; what that obscurity reveals about how colonial logics condition historical knowledge; and how architectural history might work to denaturalize them. These are questions that Daniel Abramson, Zeynep Çelik Alexander, and Michael Osman describe as a re-examination of the tools of architectural historiography, in particular "how practices of evidence and narrative intertwine with core concepts in history writing."[10] What might Tyntesfield be understood to evidence beyond versions of the same contracted narrative presented on the sign in its hall? What can it clarify for the history of chemification, as explored in my previous report—its origins, outer edges, and historical continuities? And what kinds of methodological approaches does the writing of such a history require in order to complicate formulaic narratives of accumulation at the center through imperialistic exploitation of the periphery?

Answers, I suggest, can be found within the broader history of agricultural chemistry to which Tyntesfield inescapably belongs. The Gibbs guano monopoly was established less than a decade after the German chemist Justus von Liebig published his vision for "a truly scientific organic chemistry" based on rational methods of analysis and experimentation.[11] In 1840, Liebig's *Organic Chemistry in its Applications to Agriculture and Physiology* was immediately translated into English, receiving widespread attention in the United Kingdom over the following years against the tumultuous backdrop of the Corn Laws and the Great Famine.[12] *Agricultural Chemistry*, as the text became known, outlined a mineralist model of soil fertility, challenging the prevailing humus theory by arguing that plants subsisted primarily on inorganic elements in the soil, rather than the organic decomposition of flesh, compost or manure.[13] "It must be admitted as a principle of agriculture," argued Liebig, "that those substances which have been removed from a soil must be completely restored to it [...] A time will come when the fields will be manured with a solution of glass (silicate of potash), with the ashes of burnt straw, and with salts of phosphoric acid, prepared in chemical manufactories, exactly as present medicines are given for fever and goitre."[14] In Liebig's model, the "magazine of inorganic matters" that determined plant growth—chief among them nitrogen, potassium, and phosphorous (NPK)—could be understood on a systematic basis and, therefore, controlled, severing

the once stable connection between soil and geography, and giving rise to open, energy-intensive agricultural systems in place of traditional crop and fallow methods.[15] The new "rational agriculture," Liebig argued, was based "on the principle of restitution" and stood in contrast to the "spoliation system" of existing models, which depleted the soil as agricultural production intensified.[16] This model of soil management ushered in what agricultural historians refer to as the second agricultural revolution (1830–1880): a transition period from seventeenth- and eighteenth-century innovations in crop rotation, livestock management, market centralization, and enclosure to the eventual mechanization, genetic modification, and increased chemicalization of monocultural farming during the third agricultural revolution of the twentieth century.[17]

Fig. 15. Greenhouses in Tyntesfield's orangery. Small amounts of guano were supposedly brought onto the estate in the nineteenth century to demonstrate its benefits to local farmers.

Guano became an early tool for enacting this transition. Over the course of the nineteenth century, fertilizers precipitated an eighty-fold increase in the productive capacity of agricultural soils around the world.[18] Although the guano of the Chincha Islands had been used for centuries by the Quechua people, and had been known of in Europe since at least the seventeenth century, the nineteenth-century threat of soil exhaustion in England, combined with gains in soil science by the likes of Liebig, retrained attention on guano's high amounts of soluble nitrogen and phosphorous. In the six years prior to the commencement of the Gibbs monopoly, between 1841 and 1847, the average importation of guano into England subsequently increased by a factor of 130 to 220,000 tons per annum.[19] This rate of extraction would double over the next two decades of the Gibbs monopoly. For Karl Marx these shifts in fertilizer use completely inverted the foundations of existing theories of ground rent in the work of classical economists such as Malthus and Ricardo. Fertility "in our days," wrote Marx in *The Poverty of Philosophy*, is not "so natural a quality as might be thought."[20] No longer was it determined by the "indestructible powers of the soil," as it had been for Ricardo, rather it could be readily improved at comparably low capital/labor cost using modern fertilizers. The globalization of agricultural chemistry in this way also functioned as a proxy for the globalization of capital.

Fig. 16. Wainscot panelling in Blanche Gibbs's boudoir depicts botanical specimens including the Chilean Bellflower, a subtle nod to the saltpetre trade in which the Gibbs family business became involved in the 1860s.

Unlike its predecessors—poudrette, ashes, bonemeal, and dried blood from urban slaughterhouses—the nutrients of which were conveyed in an almost closed circuit from the city to nearby rural areas and back again in the form of grains, fruits, vegetables and livestock, guano was extracted and shipped to capitalist nations from distant islands under slave-like conditions. Marx viewed this dependency on exhaustible resources and their cheapening through the exploitation of labor as the major ecological crisis of the nineteenth century, famously described as a metabolic rift in which intensive agriculture no longer found "the natural conditions of its own production within itself, naturally arisen, spontaneous, and ready to hand, but these exist as an independent industry separate from it."[21] For both Marx and Liebig, the Gibbs-dominated guano trade came to represent a process in which the earth "was robbed of its richness, the soil was depleted of its nutrients, and the separation between town and country increasingly became international" on the back of a global capitalist market and more reliable long-distance trade.[22] In its transgression of human and ecological boundaries in pursuit of both mineral and capital accumulation, the second agricultural revolution thus ushered in what Melillo describes as "a prolonged phase of 'restlessness' for both the earth and those who reshaped its contours."[23]

Fig. 17. The entrance to the Museum of English Rural Life at the University of Reading.

Leaving Tyntesfield, I alight from the Bristol-to-London train at Reading on a sunny Monday morning. Walking through the center by foot, it's not long before I arrive at The Museum of English Rural Life (MERL), an institution dedicated to recording the history of the English countryside. MERL's displays include agricultural machinery, homewares, and thematic exhibitions, as well as a large educational garden with plant varieties of relevance to the exhibits inside. The historical locus of the museum is set out between key dates in the history of the English countryside that adorn the walls of MERL's entrance hall: from 1801, when 80 percent of the English population lived in rural areas; to 1882, when the first refrigerated lamb arrived in the UK from New Zealand; and from 1901, when 80 percent of people lived in towns; to 1947 and the introduction of legislation designed to intensify the productivity of post-war British agriculture.

Fig. 18. The educational garden at the Museum of English Rural Life. The archive is located on the ground floor of the building.

The main reason for my visit to MERL, however, is to access the archives of a company that traced its history to the commercialization of Liebig's agricultural chemistry in the nineteenth century: Lawes Chemical Manure Company. In 1839, at the Rothamstead Experimental Station in Hertfordshire, John Bennet Lawes observed that treating bones and mineral phosphates with sulphuric acid significantly increased yields on his turnip fields. From a dedicated laboratory housed in a converted barn, Lawes repeated his trials over the following years, commencing an uninterrupted period of crop experiments at Rothamstead that would last more than a century. As Lawes explains in his memoranda, his methods involved growing "some of the most important crops on rotation year after year for many years in succession on the same land without manure, with farmyard manure, and with a great variety of chemical manures being applied year after year on the same plot."[24] The experiments revealed that the superiority of phosphates treated with acid was due to the increased solubility of the phosphorous and its subsequent accessibility to plants, effectively mirroring the characteristics of organic guano—an innovation that had eluded Liebig years earlier in his failed attempt to manufacture a commercial fertilizer of his own. Lawes quickly patented the manufacturing process in 1842 under the name of superphosphate, the implications of which for the soils of the Australian colonies I was able to appreciate first-hand while trawling through the archive of Dookie Agricultural College and Experimental Farm in Victoria, as recounted in my previous report.

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succeeded his father (of the same name) at the age of seven in the manor and lands of Rothamsted which had passed to him through connection by marriage with the family of Wittewronge. The original manor house, once belonging to the Bardolphs, had been bought by Sir John Wittewronge of Stanfordbury early in the seventeenth century and in the course of that century re-built and much enlarged. The young squire, after an education at Eton and Brasenose which he appears to have thought unsatisfactory (or at least unsatisfying), became greatly interested in the science of chemistry and particularly in the growing of the plants from which drugs were derived. "At the age of twenty," he has recorded, "I gave an order to a London firm to fit up a complete laboratory, and I am afraid it sadly disturbed the peace of my mother's mind to see one of the best bedrooms in the house fitted up with stoves, retorts and all the apparatus and appliances necessary for chemical research." On the home farm he sowed poppies, hemlock, henbane, colchicum and belladonna. Fifty years later "some of them were still growing about the place." For some years after Lawes came into possession in 1834 he devoted himself to this hobby until one day a casual remark from Lord Dacre, to the effect that he had found ground bones most useful on one of his farms, but not on others, as a fertiliser, stirred him to set to work to discover the reason. The application of bones treated with sulphuric acid as a chemical manure had already been practised. Lawes not only demonstrated its usefulness but found that a similar treatment of the mineral phosphates—apatite, coprolite and so on—produced an even better fertiliser. He patented his "superphosphate" and speedily made his fortune. The supply of bones available for the farmer is small but the supply of the mineral phosphates is almost unlimited, and at the beginning of the last war the annual manufacture of "superphosphates" in Great Britain amounted to 1,000,000 tons.

CHEMIST AND AGRICULTURIST

At this point, says Sir Daniel Hall in his *Book of the Rothamsted Experiments*, the life of Sir John Lawes divides into two parts. He became from the date of his patent a chemical manufacturer carrying on an extensive London business. While, however, obliged to spend two days of every week in London, his devotion to agricultural work continued to increase and the profits of commerce were employed in the creation and maintenance of the station at Rothamsted. In all, 132 detailed Reports of the work were published during Lawes's life, and it is obviously impossible to summarise this body of achievement here beyond describing in Lawes's own words the two main lines of enquiry which he followed. His first endeavours were, he explained later in his Memoranda, "to grow some of the most important crops of rotation each separately year after year for many years in succession on the same land without manure, with farmyard manure, and with a great variety of chemical manures, the same manures being applied year after year on the same plot." The other group of experiments were chiefly intended "to ascertain how animals could be most economically fed for human consumption," but they have thrown a vast amount of light on many other aspects of animal and human dietetics and nutrition.

THE BROADBALK FIELD

The results of the cropping experiments and their influence on agricultural practice are widely known. The celebrated Broadbalk field had no doubt been under arable cultivation for two or three centuries when in 1839 it last produced a crop of turnips. Its yearly sowing with wheat began in 1843 but for the first eight years the manuring was of a varied description so that only three of the plots have received exactly the same treatment for the whole 100 years. The area of Broadbalk is about 11 acres divided into half-acre plots running down the whole length of the field and separated by strips. One of the plots has received no manure of any description for a century, yet it still averages roughly 16 bushels per acre which is actually higher than the average yield of wheat the world over. It should be said that the soil of Rothamsted, clay with a foundation of flints, was by no means rich at the beginning of the experiments. This long-continued crop serves to show what vast reserves of plant nutriment are contained in the soil.

Other plots have received every year farmyard manure, or various combinations of chemical manures, in order to discover the part played in the nutrition of the plant by each of the constituents extracted by it from the soil. To quote Sir Daniel Hall: "The long duration of the experiment serves to eliminate many of the sources of error in field experiments. Also, by gradually exhausting the soil of particular

ROTHAMSTED RESEARCH INSTITUTE. The new buildings

THE FAMOUS BROADBALK FIELD

ONE OF THE LABORATORIES

Fig. 19. Images of Rothamstead Experimental Station in Hertfordshire. Source: W. E. Barber, "100 Years of Rothamstead," *Country Life* (July 1943), 152.

Indeed, Rothamstead Experimental Station served a similar purpose to Dookie, bolstering the position of Britain during the rapid spread of institutions dedicated to experimental agricultural chemistry throughout nineteenth-century Europe and the United States. “For more than half century,” argues a Lawes Chemical Manure Company pamphlet at century’s end, “[Rothamstead] has been the largest and most systematically conducted experiment station in the Universe.”[25] Investigations were made into the maximum number of harvests the typical soils of the earth’s crust could sustain under different cropping regimes before they were exhausted. Published reports extended the findings of Liebig and other agricultural chemists working on plant metabolism and soil fertility.[26] Unlike Dookie and its European and American counterparts, however, Rothamstead was tied to a private company, effectively as its research arm, bolstering the many claims made in Lawes marketing material, which regularly boasted of “the most up to date machinery” and the best “raw materials,” enabling the company to “produce a finished product of the higher grade” with the help of its in-house chemists.[27]

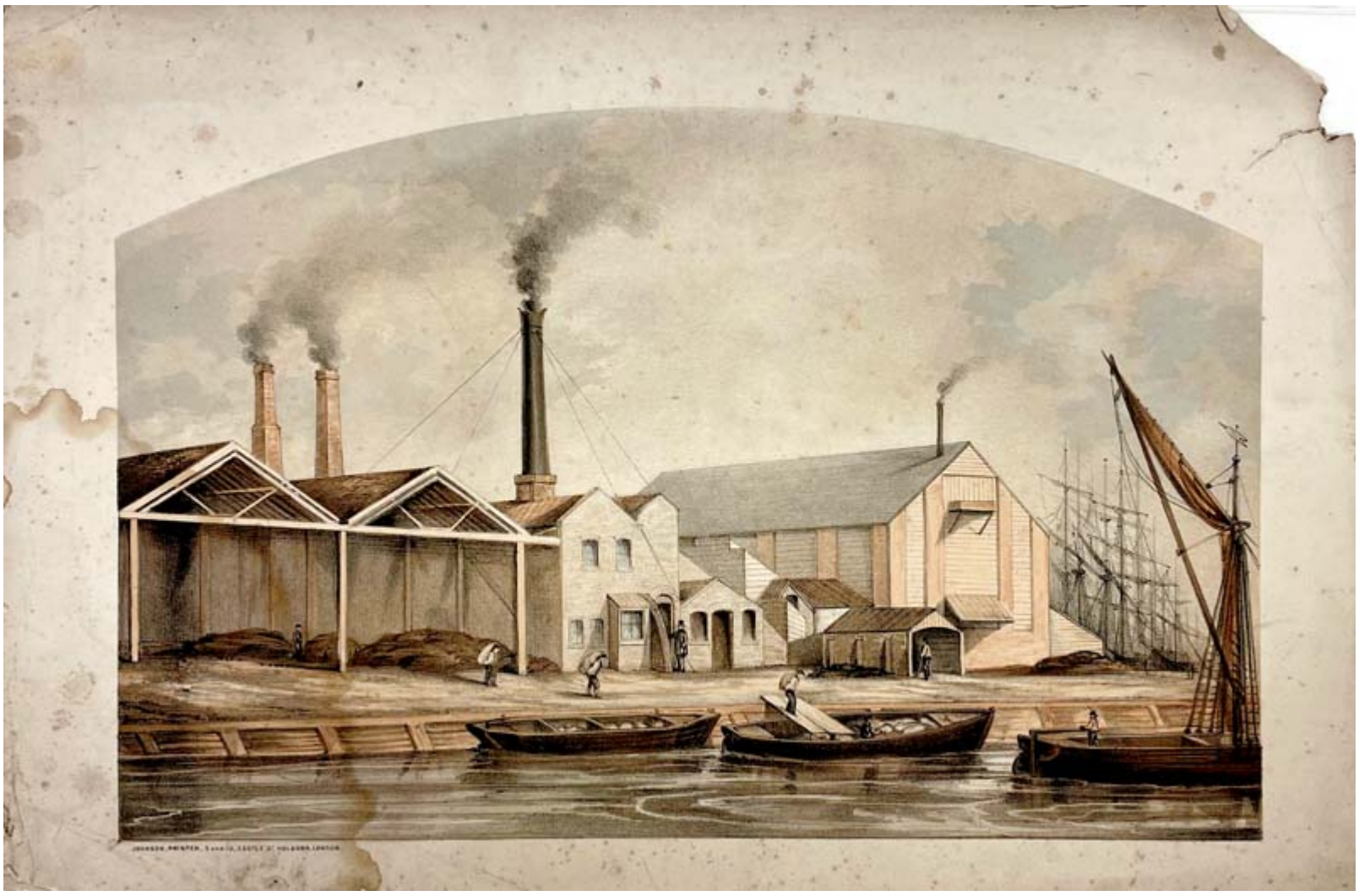

Fig. 20. Lawes Chemical Manure Company at Barking in c. 1850. Source: Lawes Chemical Company Ltd. Fonds, TR LAW PH, University of Reading.

Fig. 21. Lawes Chemical Manure Company at Barking in c. 1850. Source: Lawes Chemical Company Ltd. Fonds, TR LAW PH, University of Reading.

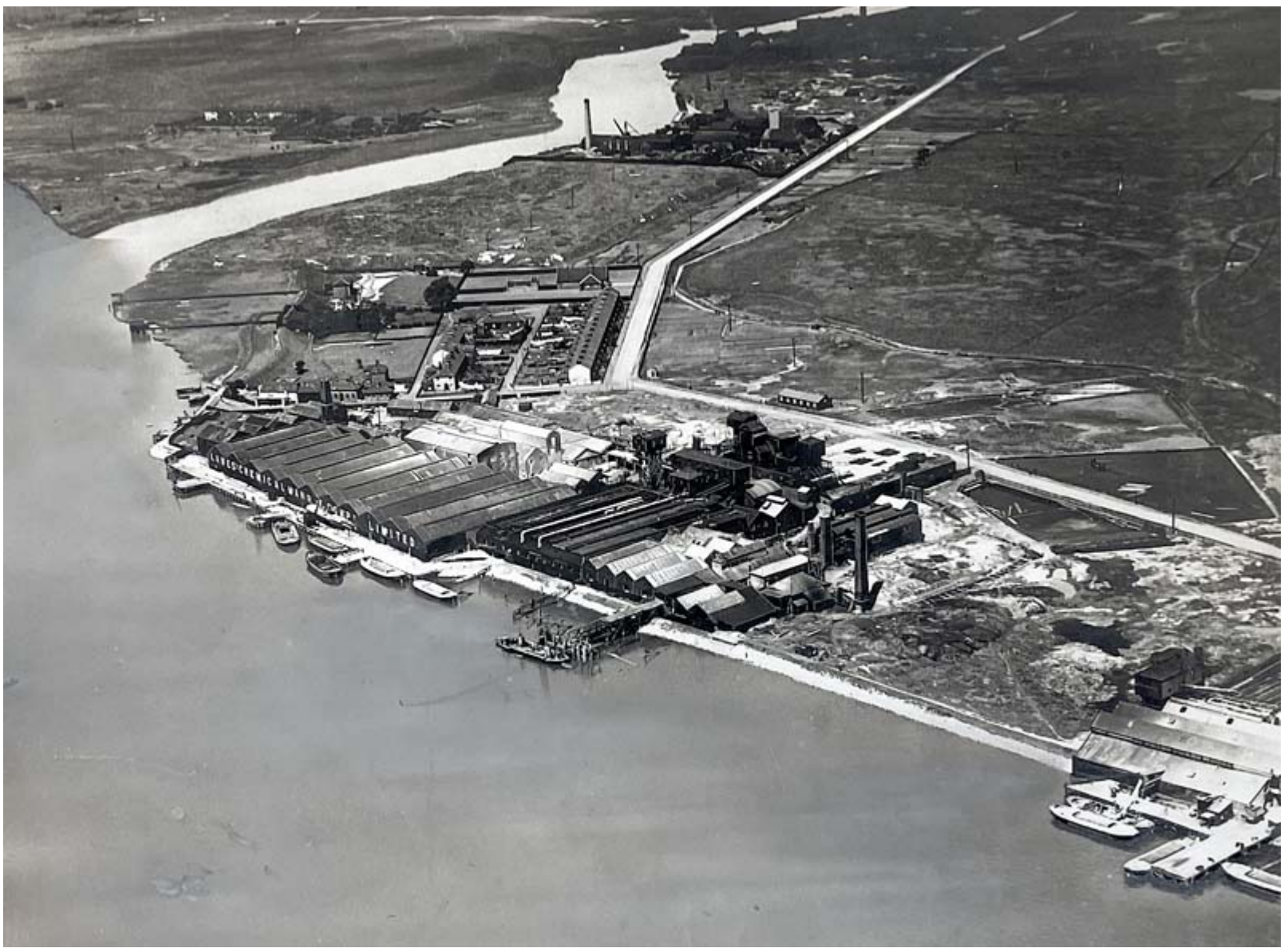

Fig. 22. Aerial view of Lawes Chemical Manure Company at Barking in c. 1920. The village of Creekmouth is visible in the background. Source: Lawes Chemical Company Ltd. Fonds, TR LAW PH, University of Reading.

Two years after securing the patent for superphosphate manufacture in Britain, Lawes purchased 100 acres of land fronting the Thames at Barking Creek, on the outskirts of London, where he established “one of the most remarkable industrial systems of its kind” in the domain of chemical manufacturing: an “immense works” that functioned as “a universal source of agricultural profit.”[28] Already in the 1850s, Lawes erected a small village, named Creekmouth, directly adjacent to the fertilizer works for company employees, complete with around 50 houses, a school, church, store, and pub. By the 1880s, warehouses, wharves, sheds, and factories were spread across 35 acres, processing 10,000 tons of Spanish pyrite per

annum to produce more than double this quantity in sulphuric acid (figure 22). A wide variety of fertilizers, including Lawes' Dissolved Peruvian Guano and "superphosphates of all grades" were produced at Barking every year, totalling 50,000 tons in annual sales between the United Kingdom, Europe, the United States, and the colonies where the superphosphate industry was still in its infancy.[29] With reliable supplies in place for the production of sulphuric acid, and with the depletion of the world's guano deposits by the likes of Antony Gibbs & Sons, chemical fertilizer manufacturers pivoted to securing mineral phosphates—coprolites and apatites—within a new geography of phosphorous extractivism spanning North America, Africa, Europe, and the Pacific Islands.

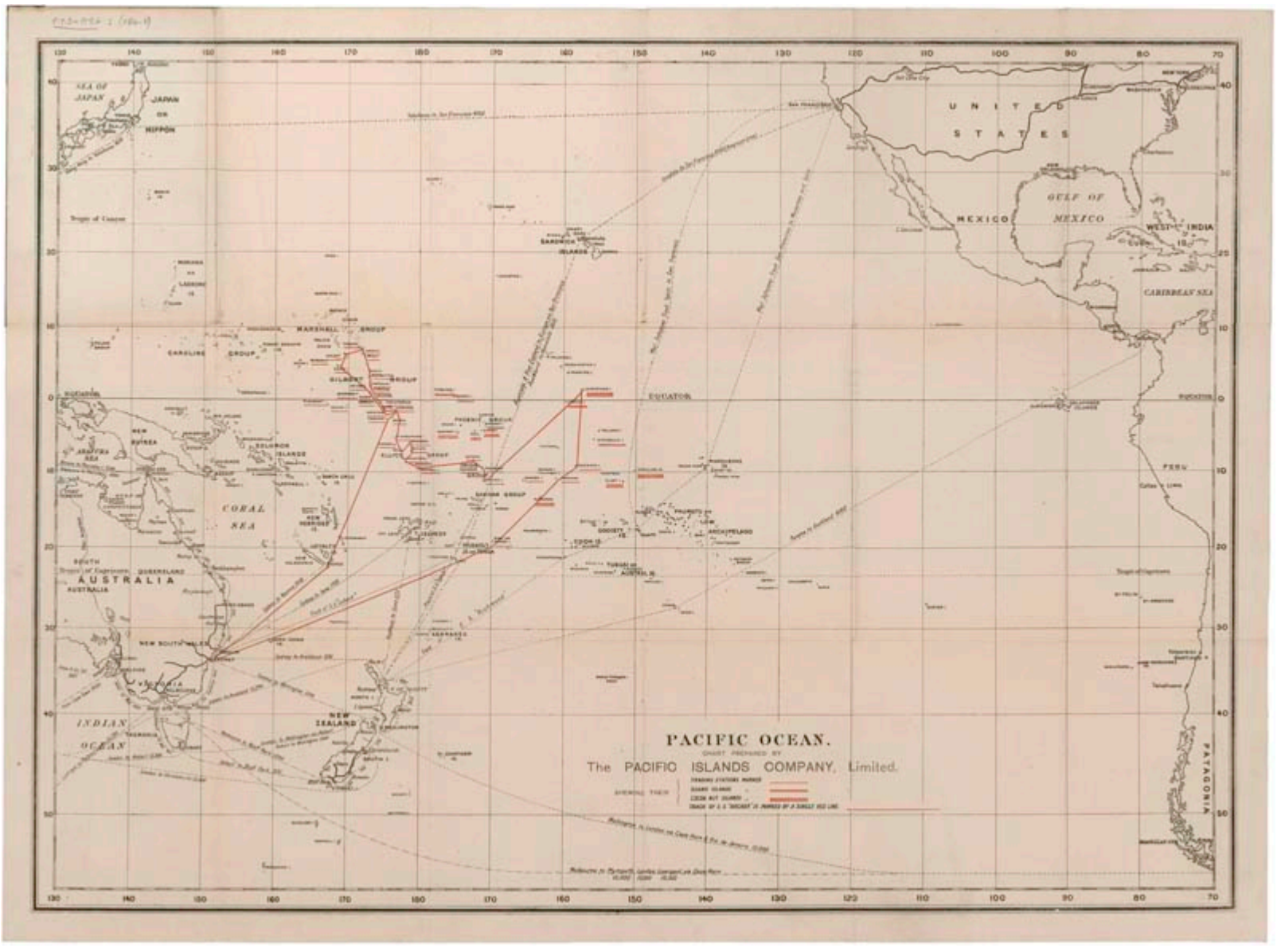

Fig. 23. Map of the PIC's trading interests throughout the Pacific Ocean. Source: Pacific Islands Company Limited, Chart showing Trading Stations, Guano and Coconut Islands held by the Company, c.1900, National Archive of Australia, 1340195.

Fig. 24. The Scalpel stands on the site of the former headquarters of the Pacific Islands Company and its successor, the Pacific Phosphate Company. The building is tenanted, among others, by the National Australia Bank.

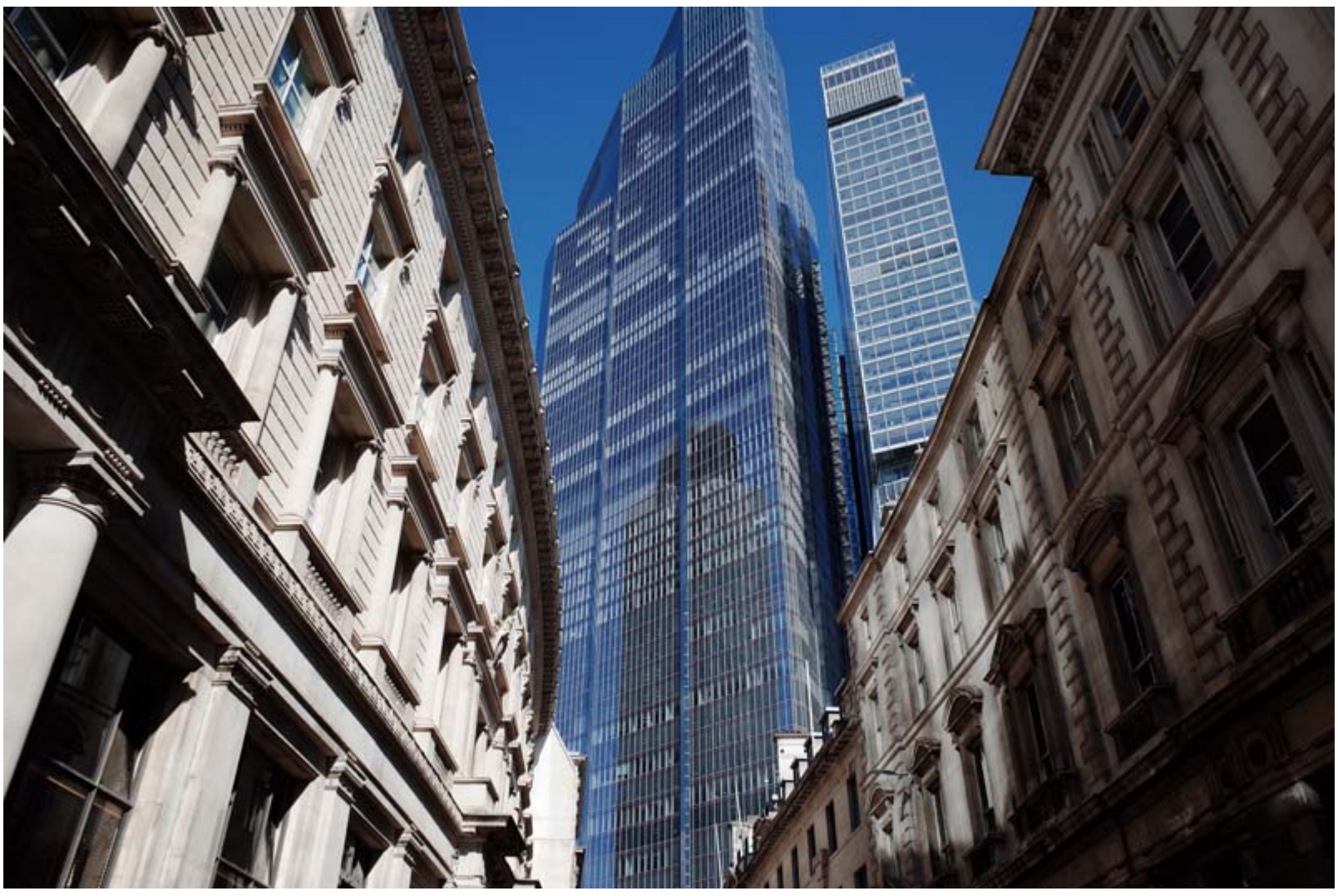

Fig. 25. 22 Bishopsgate towers over the remaining historic fabric of the City of London, occupying the site of the former headquarters of Antony Gibbs & Sons, just around the corner from The Scalpel.

In 1881, world production of superphosphate fertilizer amounted to approximately 1,000,000 tons, rising to 11,000,000 tons at the outbreak of World War One—a trajectory mirrored in its inverse by the decline of guano exports over the same period.[30] This accelerating demand for superphosphate led to the formation of new companies seeking to supply the world's insatiable fertilizer plants with the raw materials they now required. One such firm was the Pacific Islands Company (PIC), established by John Thomas Arundel in the 1870s to operate as a mixed business involved in inter-island trade, guano mining, and copra production, primarily on islands now located in the Republic of Kiribati (figure 23). Its headquarters were located on

Leadenhall Street in the City of London, on the site now occupied by The Scalpel, directly opposite the Richard Rogers + Partners Lloyds of London building (figure 24). Around the corner, the former headquarters of Antony Gibbs & Sons has been replaced with the newly opened 22 Bishopsgate (figure 25). Both buildings recede into the glassy skyline, recent instances of the gradual erasure of the historic fabric of the City where British imperial power and privilege has been dispersed for centuries.[31] As I have suggested elsewhere, the Pacific Islands Company presented a paradigmatic example of Greater British enterprise in the Pacific, its directors, staff, procurement practices and distribution networks combining the capital and expertise of a vast array of actors spanning England, Australia, and New Zealand.[32] By the turn of the century, its directors included Arthur Charles Hamilton-Gordon—the Lord Stanmore—the first High Commissioner for the Western Pacific (1877–83), as well as Robert Herbert, the first premier of Queensland (1859–66) and John Bramston, former Assistant Under-Secretary of State for the Colonies (1876–98). With the PIC's discovery of enormous deposits of rock phosphate on the islands of Nauru and Banaba, however, the company was liquidated and reformed in the early twentieth century as the Pacific Phosphate Company (PPC).

Fig. 26. More than 30 architects were purportedly employed by Lever in the realization of Port Sunlight village.

Fig. 27. Every housing block in Port Sunlight adopts a different style to its neighbors.

Fig. 28. Tudor is the predominant style adopted for the housing in Port Sunlight.

William Lever—the “millionaire soap king” and later the Lord Leverhulme—was a major investor in the new PPC venture, its sole purpose being to exploit the mining rights it had acquired on highly lucrative terms from the German (Nauru) and British (Banaba) imperial governments. Arriving in Liverpool, I travel across the River Mersey to Port Sunlight: a garden suburb and factory developed by Lever in 1888 as a model village to house his growing workforce. The guided tour offered by the Port Sunlight Village Trust leads us past the Lady Lever Art Gallery (1922), the former hospital, parks and garden allotments, a school, church, and pub—all paid for as part of a profit-sharing model Lever viewed as a form of enlightened capitalism. For Lever, who had only recently opened a coconut oil processing facility in Balmain in Sydney (to avoid paying duties on the importation of soap from Port Sunlight), Arundel’s invitation to invest in the PPC came

at a fortuitous time. As part of the deal brokered between the two, Lever was able to secure a takeover of the PIC's expansive holdings throughout the Pacific (figure 23), in particular coconut plantations in the Solomon Islands, opening-up vast reserves of coconut oil for his soap production.[33]

Fig. 29. Flemish brickwork was also popular for the housing in Port Sunlight.

Fig. 30. Lever lived on a large estate on the Wirral Peninsula. The house shown here is where he stayed when visiting Port Sunlight.

Fig. 31. The Port Sunlight soap works were once accessible through the brick arches in the background of this image. The garden suburb therefore ran directly into the sprawling industrial complex.

The profits being shared at Port Sunlight were funneled into England from a vast and disaggregated territory of extraction. In Lusanga on the Congo River, Lever planned an African counterpart to Port Sunlight, a "model colony" named Leverville run by the Lever Brothers subsidiary, *Les Huileries du Congo Belge*.[34] In the British Solomon Islands, Levers Pacific Plantations eventually acquired 400,000 acres of land spread across multiple islands. But, as Gregory Cushman has argued, it was Lever's investment in the Pacific Phosphate Company that ultimately secured the growth of Lever Brothers in the early twentieth century. Approximately 800 houses were developed at Port Sunlight during the period of the PPC's phosphate operations on Nauru and Banaba, each household equipped with running water, a bath, and flush toilet in a village regarded as a "shrine for the worship of cleanliness."[35] Although not its core business, the extraction of Pacific rock phosphate—a kind of shadow commercial empire for Lever—marked the beginning of Lever Brothers' transformation into a vertically integrated corporation that capitalized on the rising interest in personal hygiene and urban cleanliness, enabling its consumers throughout the anglosphere to "make use of distant ecosystems and rinse away unwanted waste—to participate in neo-ecological imperialism."[36] Following a merger between Lever Brothers and Margarine Union in 1929, the resulting company, Unilever, immediately became one of the world's most pervasive corporations. "All of this," Cushman concludes, "got its start with soap factories and the purchase of Arundel's vast network of trading depots and guano islands in the Central Pacific."[37] The profits derived from the PPC's phosphate mines then allowed this network to be developed further.

Fig. 32. Approximately 800 state-of-the-art houses were developed at Port Sunlight during the period of the PPC's phosphate operations on Nauru and Banaba.

On the back of Lever's early investments, the PPC installed increasingly elaborate mining machinery and infrastructure on both islands, prefabricated in Europe and Australia to facilitate larger and more reliable rock phosphate exports. Preliminary processing, including crushing and drying, occurred on the islands prior to loading and shipping. To work the mines and operate the machinery, approximately 800,000 Pacific Islander, Japanese, and Chinese workers were indentured within the Pacific phosphate industry before World War One.[38] The records of the PPC—now accessible at the National Archives in Kew—capture the structural conditions of this massive mobilization of people onto Banaba and Nauru. Annual reports throughout the 1920s reveal the disparate terms under which different categories of employee were engaged by the company. Rations for Europeans were roughly four times those for Chinese mechanics, five times those for Pacific Islander workers and six times those for unskilled Chinese laborers. White staff were afforded more sophisticated hospitals, freshwater showers, and state-of-the-art tropical housing compared with the seawater baths and windowless, crowded dormitories built for each group of indentured workers. Wages, bonuses, instances of hospitalization, and mortality rates were characterized by similar discrepancies among the heavily racialized workforce.[39] Protests against these conditions were used by PPC management as justification for further controls on the islands, including the introduction of police forces and increased surveillance.[40] Labor, processing, maintenance, and freight costs were regularly plotted in graphs against the fluctuating market price of rock phosphate for annual reports—figurations of corporate accumulation reflecting a managerial logic thoroughly divorced from the conditions determining productivity (figure 33).

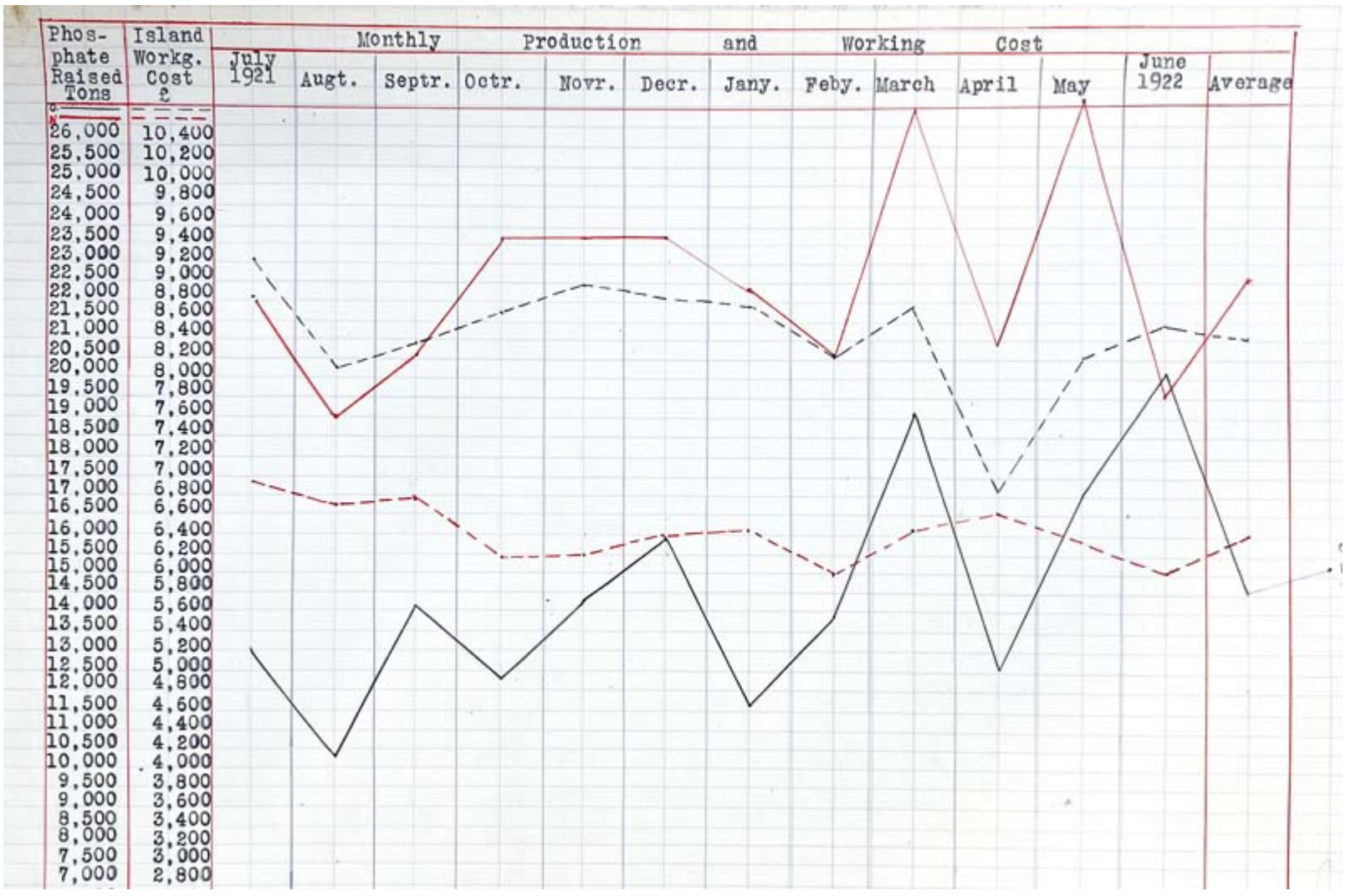

Fig. 33. Tons of phosphate raised versus total island working costs for Nauru and Banaba, 1921–22. Source: British Phosphate Commission, Island Efficiency and Cost Figures for Ocean Island and Nauru, 1920–23, National Archives of Australia 824.

Marion W. Dixon describes this institutionalization of unfree "free labour" within the Pacific rock phosphate industry as "a coercive, racial labor regime" that further entrenched the global division of labor already evident in the mid-nineteenth-century guano trade. As Dixon argues, "this era of 'global reconstruction' [...] was forged with the abolition of chattel slavery and through the subsequent intense struggles over labor and access to land for the continuation and expansion of commodity production in existing and new territories."[41] The process of chemification is therefore not only evident in the acceleration of commercial agriculture under industrial conditions but also in the emergence of new regional hierarchies "between a generalized wage labor force in the urban-industrial complexes of the imperial states and coerced labor in the frontier regions."[42] The challenge for the historian is to deduce a mode of history writing capable of traversing these disparate sites and trajectories of chemification without producing a narrative that becomes unwieldy and confused or reductive and simplistic.

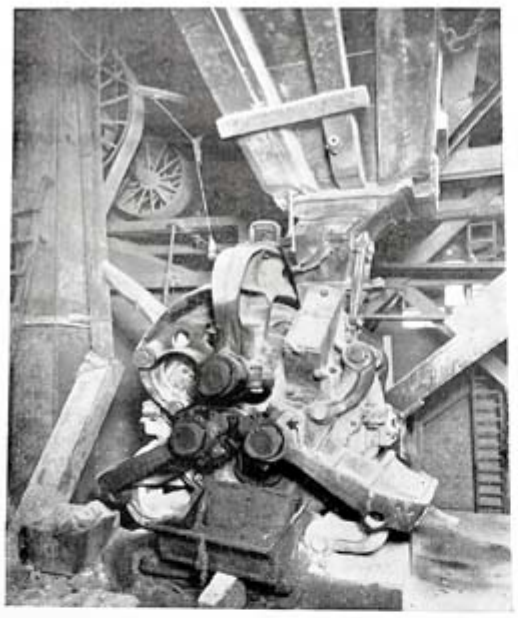

Fig. 2.—Maxecon-Kent Ring Roll Mill

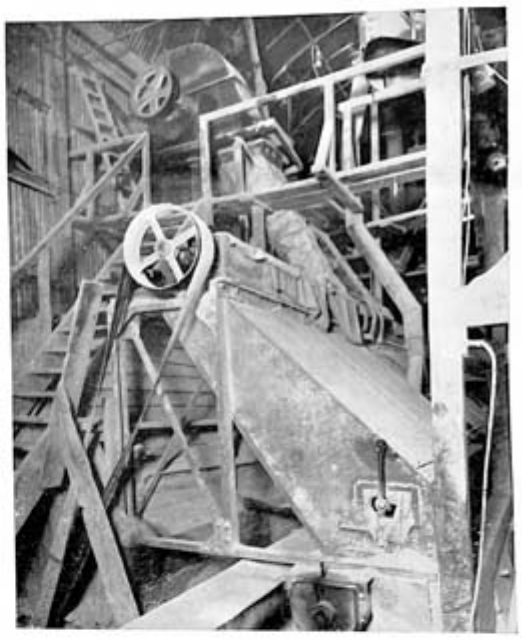

Fig. 3.—Vibrating Screens for ground Rock

large lumps, whereas Florida " pebble " seldom contains pieces larger than a 2-in. cube. To produce good superphosphate it is essential that only very finely ground material should be used. Rock containing large lumps is first taken to a jaw crusher (Fig. 1) with a bucket elevator, feeding a hopper above. This reduces the lumps to approximately ½-in. cubes, and the material is in suitable condition to be fed to the fine grinding apparatus, a Maxecon-Kent ring roll mill (Fig. 2), to which it is taken by a bucket elevator. This mill consists of three rollers arranged at the angles of an equilateral triangle and surrounded by a ring with which they are kept in close contact by means of powerful springs. The uppermost roller is belt driven at a speed of 200 r.p.m., the ring, and hence the other rolls, being driven from it by friction. The rolls have convex faces, while the face of the ring is concave. The ring, having lateral freedom of movement, adjusts itself to the material being ground in such a way as to find the position where resistance is least and least wear and tear takes place in the crushing. Material which has passed between the rolls and the ring falls over both sides of the ring and is discharged through an opening at the bottom.

The material discharged from the mill is passed over vibrating screens set at a steep angle (Fig. 3), the dust passing to an air separator and the over-size material being returned to the mill for regrinding. That portion of the material which has attained the desired fineness (80 per cent. through a 100 mesh) is carried by screw conveyors to storage bins, whence an elevator system takes it to the mixing department. Here it is weighed out in 8-cwt. batches by an Avery automatic weigher. This machine, seen in Fig. 4, was installed here on May 31, 1912, and since that date has been in continuous use without any expenditure on repairs. A check weighing of an 8 cwt. batch taken only a few days before our visit

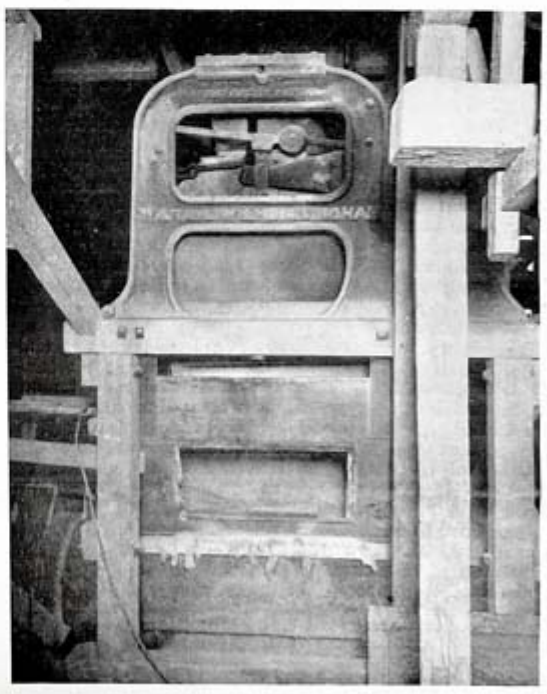

Fig. 4.—Avery Automatic Weighing Machine

Fig. 34. The Lawes Chemical Manure Company works at Barking were celebrated in industrial chemistry literature for the scale and degree of automation with which they handled the imported rock. Source: “The Manufacture of Artificial Fertilisers,” *The Industrial Chemist* (April 1933), 2.

Once loaded and shipped by the PPC, Pacific rock phosphate arrived at ports around the world bearing little trace of the conditions under which it had been picked, scraped, and blasted from the coral substrate of each island. Claiming the longest history of any early-twentieth-century superphosphate manufacturer, the Lawes works at Barking were widely celebrated in industrial chemistry literature for the scale and degree of automation with which they handled the imported rock (figure 34). Shipments were unloaded at the company’s private wharf using electric cranes before being moved to storage sheds by Lister trucks and portable conveyors. Processing commenced with grading the rock through crushers until it was broken down into half-inch cubes. Bucket elevators then transported the phosphate to a fine grinding apparatus comprised of three concave metal rollers, which deposited the now powdery material onto 100-mesh vibrating screens. Screw conveyors next moved the phosphate to storage bins connected by elevators to the mixing department. Batches were automatically weighed before proceeding into the superphosphate mixer where the mined rock first came into contact with sulphuric acid. The mixing process required only one minute before the pasty product was deposited into storage dens for the remaining chemical reactions to take place (figure 35). Once finished, the dry powder was bagged and distributed to Lawes outlets throughout the wider anglosphere (figure 36).[43] By 1930, superphosphate production—using similar processes to the Lawes works at Barking—had increased by 4000 percent in New Zealand and 200 percent

in Australia, the primary consumers of Pacific rock phosphate after World War One. During this period, the deposits on Banaba and Nauru were set aside for the exclusive use of manufacturers throughout Greater Britain, an undertaking managed by the British Phosphate Commission until 1981.[44]

Fig. 35. Fresh superphosphate at the Lawes Chemical Manure Company works in Barking ready for bagging, c.1930. Source: Lawes Chemical Company Ltd. Fonds, TR LAW PH, University of Reading.

Fig. 36. Bagged Lawes Chemical Manure Company granular superphosphate, c.1950. Source: Lawes Chemical Company Ltd. Fonds, TR LAW PH, University of Reading.

On the train to Liverpool, I reflect on the dramatic effects of this influx of phosphorous into antipodean soils and what their chemical transformation meant for the material viability of settler-colonial dispossession in Australia in particular. I think somewhat differently now about what I labelled "invisibility" in my first report, by which I meant to refer to the elusive quality of fertilizer to disappear into other things and hence resist historicization. I now see the importance of retraining attention from the *effects* of the application of superphosphate to the material/chemical transformations involved in its production alongside the energy/work upon which those transformations relied. Doing so, as I have attempted to in this report, reveals a wider set of technics and relations that, working together, converted phosphorous into what Jason W. Moore calls historical nature. "[H]istorical natures are not 'produced' in linear fashion," Moore explains, "but co-produced by the biosphere and capitalism; historical natures are products of capitalism, but also of new capitalist arrangements."[45] I find it useful to think about the various technologies of facilitation—legal, financial, logistical, scientific, political—that enabled the Gibbs guano monopoly in these terms, becoming less uniform but more pervasive and reified into the twentieth century as phosphorous was no longer sought in deposits of guano but rather in rock phosphate. As Moore continues:

> An ecological revolution occurs when the innovations of capital, science, and empire forge a new unity of abstract social labor, abstract social nature, and primitive accumulation. These unities are world-ecological regimes. Technical and organizational innovations allow for rising labor productivity. Ways

of mapping, quantifying, and discovering new historical natures—and new use-values—allow for the rising appropriation of unpaid work/energy. And the coercive-intensive process of territorial conquest and dispossession opens new, largely uncommodified, natures to the penetration of global value-relations.[46]

Fig. 37. A Lawes Chemical Manure Company stand at an agricultural fair, c.1900. Source: Lawes Chemical Company Ltd. Fonds, TR LAW PH, University of Reading.

The accumulation of phosphorous in the soils of the industrialized world, the eutrophication of water bodies from fertilizer runoff, and the more indirect, unforeseen ways in which intervening in the biogeochemical cycle continues to interact with processes of climate change and ecological decline—the unintended outcomes of Liebig's "rational agriculture"—are symptomatic of phosphorous's transformation into historical nature.[47] The patents, debentures, leases, contracts, ships, dormitories, driers, crushers and mixers deployed along the way by Gibbs, Lawes, Arundel, Lever and others are the technical correlates of this transformation, incrementally calibrating unfree labor and predictable chemical processes towards the sustained accumulation of profit. As the most "architectural" extant products of this profit, Tyntesfield and Port Sunlight remain opaque—both as sites of history in general but especially in their relation to the colonial systems of extraction that made them possible. Similar opacities characterize the businesses with which they are affiliated: the absorption of Lever Brothers into the almost impenetrably large Unilever; the eventual acquisition of Antony Gibbs & Sons by HSBC; and the conversion of the PPC into the multi-national British Phosphate Commission. What Tyntesfield and Port Sunlight evidence—to return to an earlier question—is therefore as much the lucrative terms on which capital participated in the global metabolic rift of the long twentieth century as the myopic, sanitizing effects of time. A sign tucked away in a darkened corner of the Port Sunlight Museum (figure 38) tentatively suggests this may be about to change: "We recognise that, so far, we have not explored the problematic aspects of the business enterprises practised

by Port Sunlight's founder, William Lever, in our museum or public spaces." The sign continues, declaring that the "fuller and more balanced" story the Port Sunlight Village Trust wishes to tell will "piece together and share the history of William Lever's global colonialist enterprises." A small pamphlet from 2022, available online, provides a brief overview of the racist history of Lever's business practices in the Belgian Congo, promising further research to unpack Unilever's guarded corporate archive. I leave wondering if this revisionist history will also take stock of Lever's phosphate empire—described by Lever himself as a "gold brick"—or whether, as at Tyntesfield, it will remain consigned to the marginalia.[48]

Fig. 38. A sign in the Port Sunlight Museum outlining the Port Sunlight Village Trust's commitment to anti-racism in the presentation of the history of Lever Brothers.

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[2] Jane Hutton, *Reciprocal Landscapes: Stories of Material Movements* (New York: Routledge, 2020), 38, 44.

[3] Hutton, *Reciprocal Landscapes*, 42.

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[5] Edward D. Melillo, "The First Green Revolution: Debt Peonage and the Making of the Nitrogen Fertilizer Trade, 1840–1930," *The American Historical Review* 117, no. 4 (2012), 1029.

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[14] Justus von Liebig, “Organic Chemistry in Its Applications to Agriculture and Physiology,” in *Liebig's Complete Works on Chemistr*y, ed. Lyon Playfair (Philadelphia, PA: T. B. Peterson, 1852), 63.

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[19] Foster, “Marx's Theory of Metabolic Rift,” 377.

[20] Karl Marx, *The Poverty of Philosophy* (New York: International, 1963 [1847]), 163.

[21] Karl Marx, *Grundrisse: Foundations of the Critique of Political Economy*, quoted in Melillo, “The First Green Revolution,” 1035.

[22] Clark and Foster, “Guano,” 76.

[23] Melillo, “The First Green Revolution,” 1031.

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[25] Lawes’ Chemical Manure Company Ltd., *Chemical Manures, and the great benefit derived by all crops from their judicious use* (London: Lawes’ Chemical Manure Company Ltd., c.1895), 5.

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[27] Lawes’ Chemical Manure Company Ltd., *Chemical Manures*, 13.

[28] "Lawes’ Chemical Manure Company,” *Industries of London Illustrated* (1888), 88.

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[30] A. N. Gray, *Phosphates and Superphosphates* (London: International Superphosphate Manufacturers’ Association, 1930), 58.

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[39] British Phosphate Commission, Island Efficiency and Cost Figures for Ocean Island and Nauru, 1920–23, National Archives of Australia 824.

[40] Marion W. Dixon, “Phosphate Rock Frontiers: Nature, Labor, and Imperial States, from 1870 to World War Two,” *Critical Historical Studies* 8, no. 2 (2021), 299.

[41] Dixon, “Phosphate Rock Frontiers,” 296–97.

[42] Ibid., 302.

[43] “The Manufacture of Artificial Fertilisers,” *The Industrial Chemist* (April 1933): 1-3.

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[45] Jason W. Moore, *Capitalism in the Web of Life: Ecology and the Accumulation of Capital* (London: Verso, 2015), 150.

[46] Moore, *Capitalism in the Web of Life*, 150.

[47] Dixon, "Phosphate Rock Frontiers," 303.

[48] Ludewig, "'Lonely Dots'," 352.

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ON FORM: INFRASTRUCTURALISM AND THE SCHUTZGEBIET

Nov 16, 2023 by Jasper Ludewig 1 comment

Jasper Ludewig is a 2023 recipient of the H. Allen Brooks Travelling Fellowship. All photographs are by the author, except where otherwise specified.

I finally find it in dappled light under a tree in Blohms Park, west of the city center. I am in Hamburg, on a stifling summer's day, and I have been walking around for hours looking for a cast-iron statue of a lion (figure 1). Regret for my lack of discipline and subsequently poor lunch decision (*currywurst* and *pommes*, again…) is mixed with frustration at my inability to locate what I am looking for in the hot weather. I must be visibly excited when I eventually see the frozen silhouette of a lion across the park as I attract dubious glances from a group of youths nearby. My excitement is also captured in the number of pictures I take of my discovery. I am not sure what I was thinking, but I certainly didn't need 27 photos of the undistinguished statue, regardless of how interesting its history may be. I enjoy what feels like a major accomplishment and take in the verdant surrounds before trudging back through the wobbly heat to my accommodation near the Elbe.

Fig. 1. The elusive lion statue in Blohms Park, Hamburg.

My lion friend is yet another example of the material dissimulation of the history I have been exploring in this fellowship project. Unlike the obdurate presentation of history I encountered during my travels to Tyntesfield in Bristol and Port Sunlight in Liverpool however, the anonymous statue in Blohms Park makes no claims to its historical significance, nor does it account in any way for its provenance. It is simply there: a hollow-eyed, somewhat graffitied and agitated figure, crushing an unknown species of serpent with its violent claws. Nevertheless, I know this lion well, having seen it many times in photographs of a building that no longer exists, but which once towered over the inner Hamburg suburb of Hamm (figure 2). The Villa Ohlendorff was a neo-Renaissance *Stadtpalais* (city palace) built between 1872 and 1874 to the design of the architect Martin Haller. Its owner, Heinrich von Ohlendorff, was the largest importer of Peruvian guano in nineteenth-century Germany, entering the trade in the 1860s shortly after the period of the Antony Gibbs & Sons monopoly discussed in my previous report. The villa was spread across two vast levels, containing 18 rooms on the parterre and a further 14 on the first floor. Marble stairs, columns, walls and bathrooms were offset by an oak-paneled dining room and a gold-leafed ceiling in the ballroom (figure 3). A windowless octagonal chamber adjoined the salon, dedicated to playing the card game skat without distraction by the blustery northern weather. The house was set in six hectares of parkland containing exotic trees, a waterfall, fountain, grotto and a greenhouse for Ohlendorff's extensive orchid collection (figure 4).[1] Two large staircases flanked the building's entry, conveying visitors to the opulent interior, adorned at either end by a cast-iron statue of a lion. Following the destruction of the Villa Ohlendorff during the allied bombing of 1943, the Blohms Park lion is all that remains of Heinrich von Ohlendorff's once sprawling guano palace.

Fig. 2. The Villa Ohlendorff, c.1920. Source: Commons.

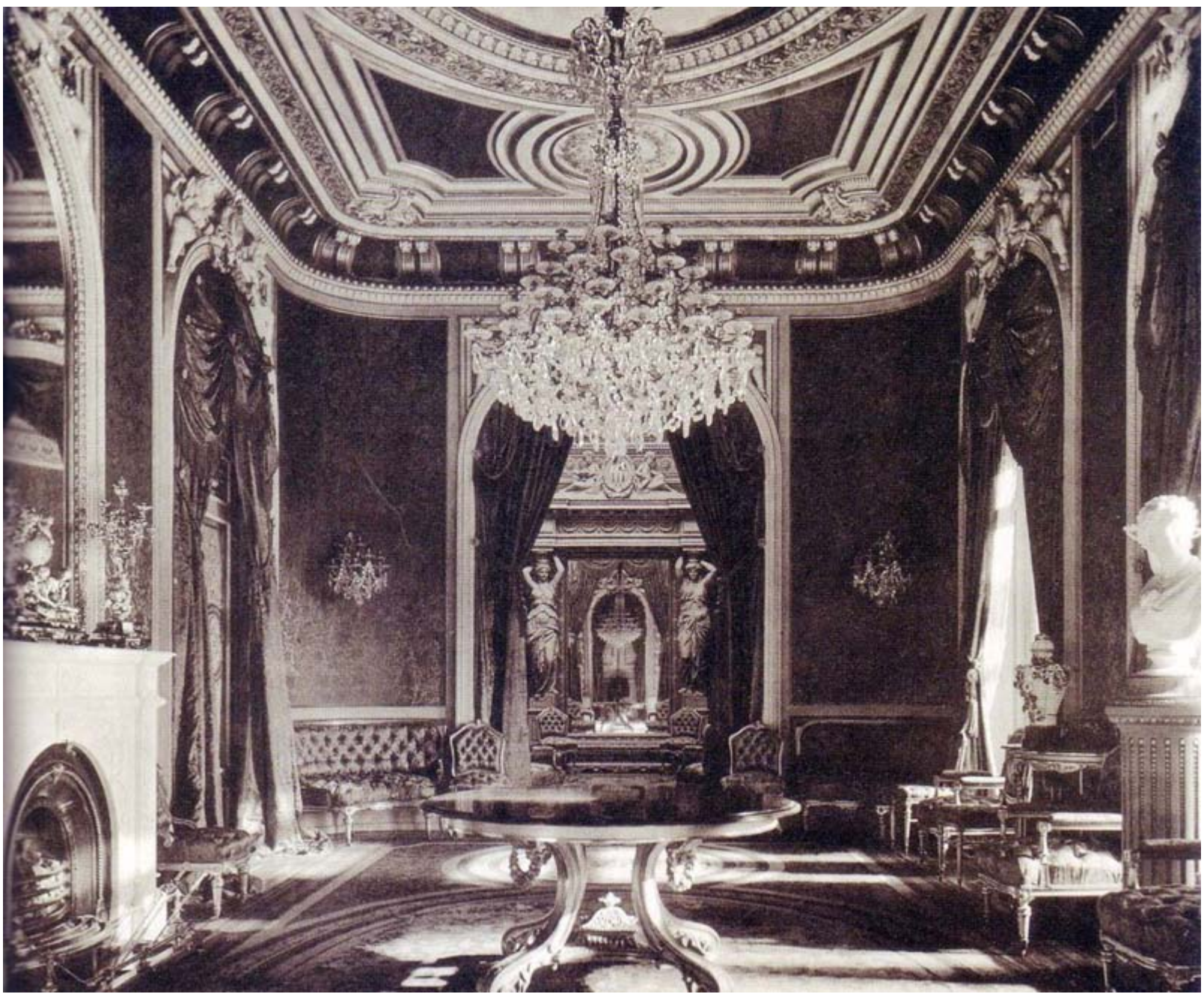


Fig. 3. Interior of the Villa Ohlendorff c.1875. Source: Commons.

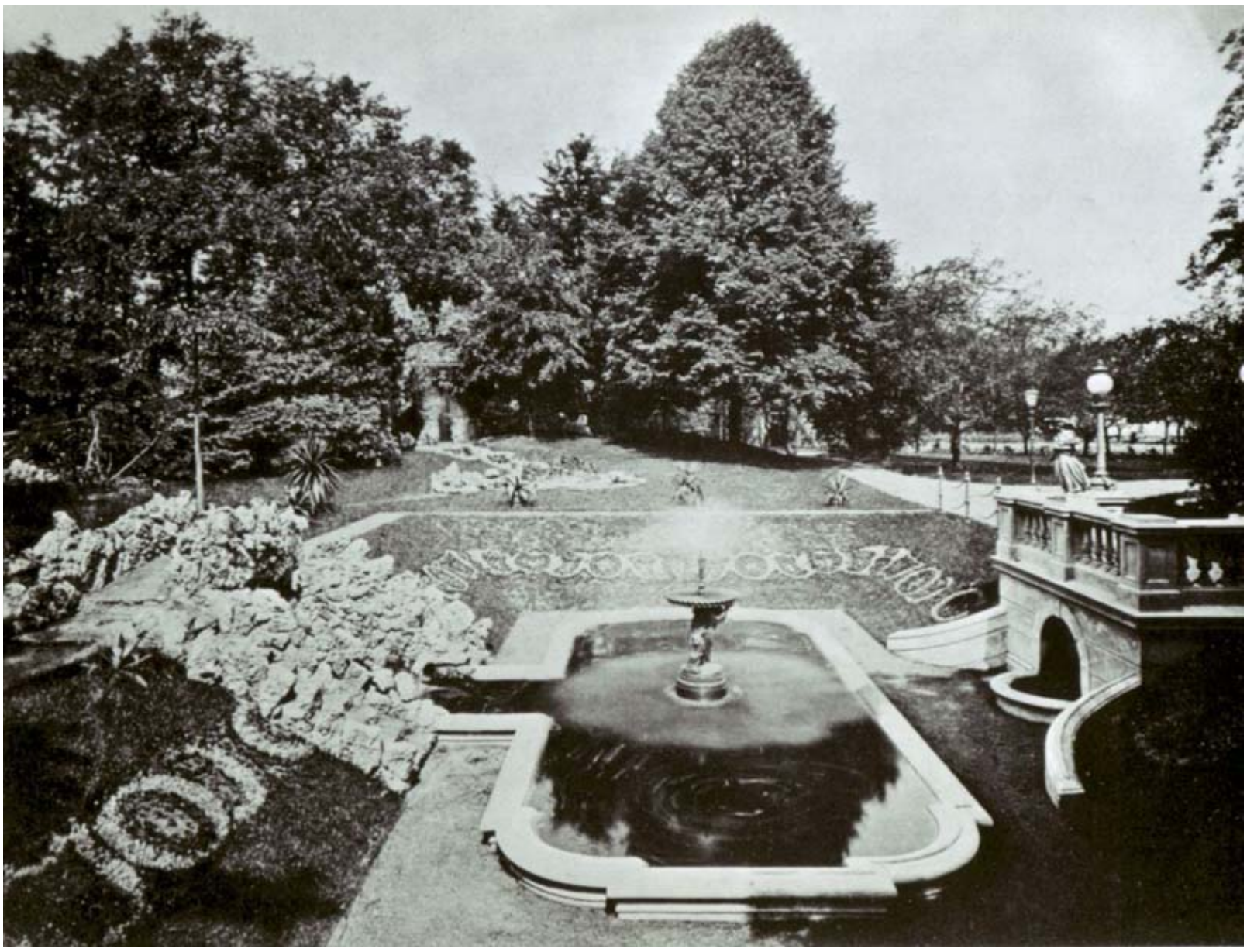
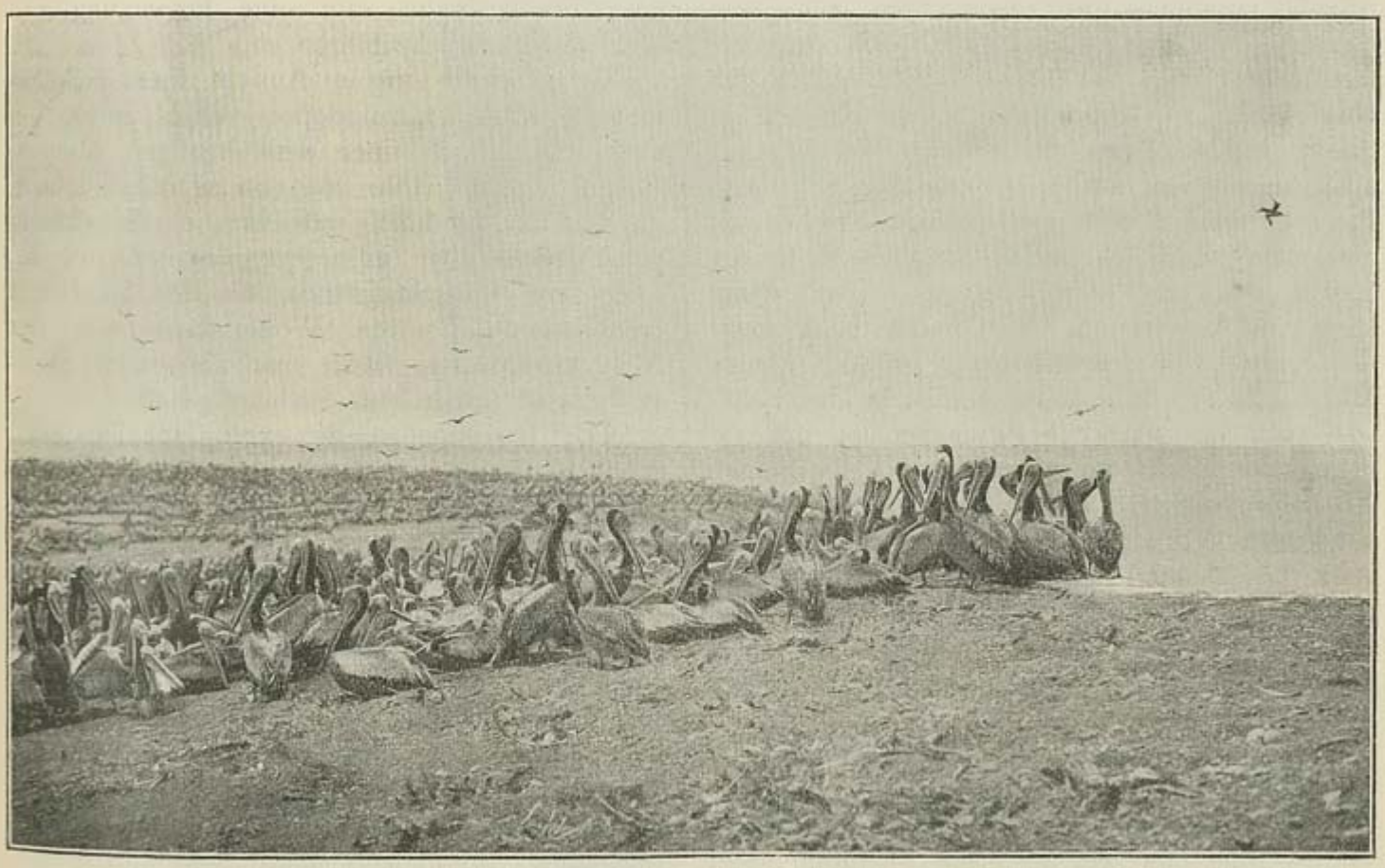


Fig. 4. The fountain and waterfall in the grounds of the Villa Ohlendorff, c.1875. Source: Commons.

As in Bristol and in Liverpool, so in Hamburg: Ohlendorff's ostentatious home again obfuscated the conditions under which the capital invested in it had been acquired. Just as the Peruvian guano trade during the Gibbs monopoly period relied upon an elaborate and coercive labor regime to realize the latent value of the Chincha Islands within the emerging markets of industrial capitalism, so too did Ohlendorff & Co. profit from the "superexploitative character" of indentured Chinese labor in Peru (figures 5 and 6).[2] The extracted material, once processed and sold as fertilizer, contributed to a dramatic increase in agricultural productivity: between 1870 and 1910, the value of annual harvests doubled in Germany as rates of chemical fertilization increased by over one thousand percent in line with Liebig's entrenched model of "rational agriculture." In supplying the fuel for this growth, Ohlendorff & Co. eventually established industrial facilities in Hamburg, London, Antwerp and Emmerich am Rhein, processing up to 140 shiploads of Peruvian guano annually.[3] The company developed a major presence in the European fertilizer industry more broadly as a result, competing with the likes of Lawes Chemical Manure Company and delivering a personal fortune to Heinrich and his brother Albertus. In 1883, Ohlendorff & Co. was reconstituted as the Anglo-Continental Guano Works, transitioning to chemical fertilizer production—especially superphosphate—throughout Europe and England prior to the seizure of its assets outside of Germany following World War One.

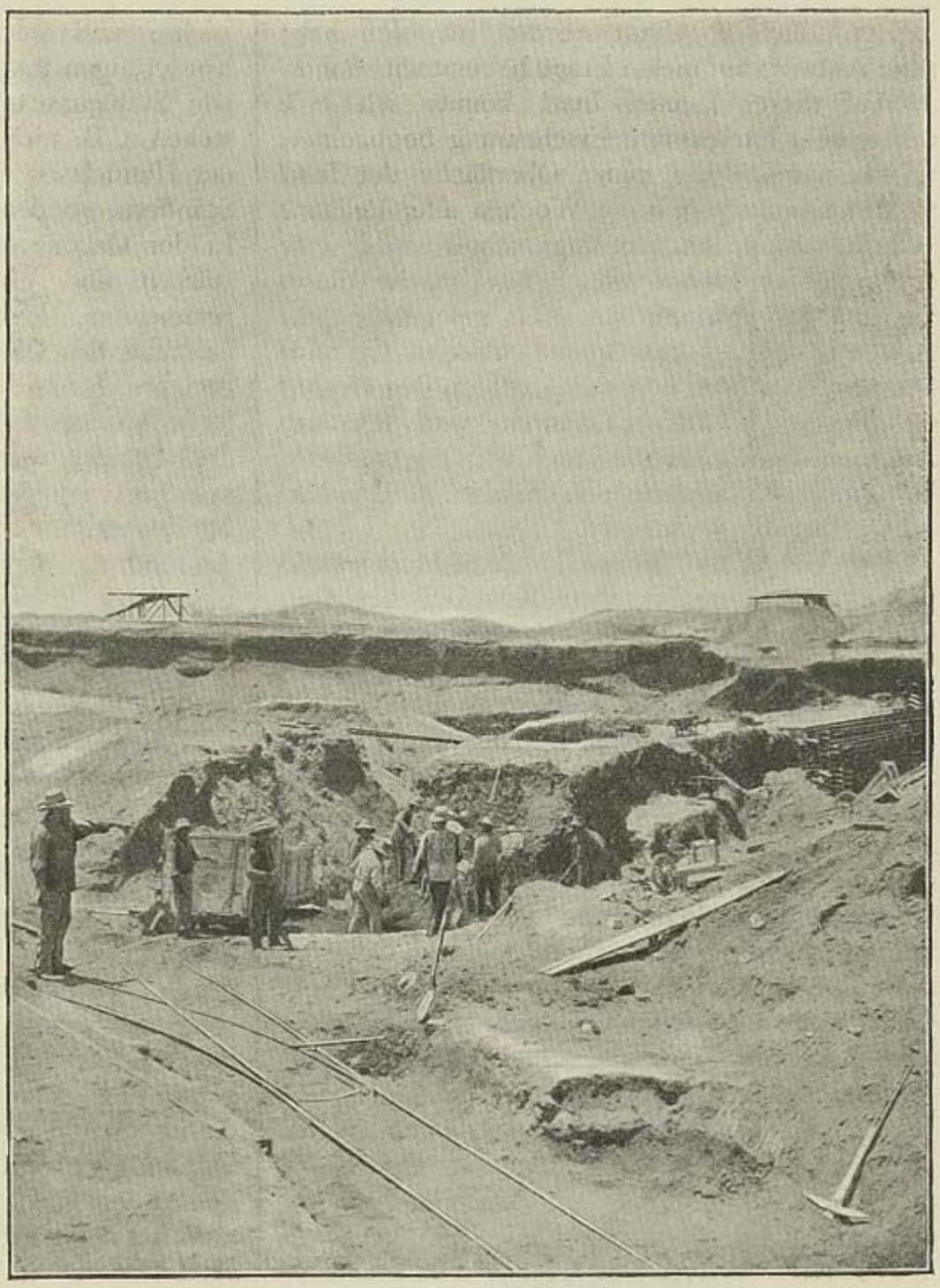
Abb. 208.



Brütplatz des Pelikans auf den Chinchas-Inseln. (Nach photographischer Aufnahme des Verfassers.)

Fig. 5. “Pelican breeding grounds on the Chincha Islands.” Source: Walter von Ohlendorff, “Die Guanolager in Peru und Chile,” *Prometheus: Illustrierte Wochenschrift über die Fortschritte in Gewerbe, Industrie und Wirtschafft*, no. 436 (1898), 311.

Abb. 209.



Guano-Lager auf der Insel „Lobos de Afuera“.

Fig. 6. “Guano deposits on ‘Lobos de Afuera’.” Source: Walter von Ohlendorff, “Die Guanolager in Peru und Chile,” *Prometheus: Illustrierte Wochenschrift über die Fortschritte in Gewerbe, Industrie und Wirtschafft*,

no. 436 (1898), 313.

The original objective of this fellowship project was to understand the role of synthetic fertilizers in enacting a kind of triple displacement in the Australian colonies, whereby the biogeochemical transformation of Indigenous Country into the landscapes of colonial agriculture was enabled by the coercive expropriation of resources and labor throughout the Indo-Pacific, which in turn ensnared certain Indigenous populations and ecologies within the expanding geography of Australia's settler colonial project. The term chemification, proffered by the sociologist Marion W. Dixon, has proven useful as a heuristic in organizing this thinking. According to Dixon, chemification encompasses "the processes by which imperial states gained territories (and land, labor, etc.) through industrial power built on assemblages of production, energy, and materials connected via a handful of chemicals."[4] However, in my travels to date, I have already found it necessary to extend my consideration of these processes to encompass the various continuities between the proto-industrial guano industry of the nineteenth century, developed by the likes of Ohlendorff & Co. and Antony Gibbs & Sons, and the heavily industrialized superphosphate industry of the twentieth century in which manufacturers such as Cuming Smith & Co. and Lawes Chemical Manure Company were active internationally. Drawing on Jason W. Moore's work on "historical nature," my last report argued that this shift from guano to rock phosphate involved scientific, imperialistic, and capitalistic innovations that expanded the possibilities for primitive accumulation by further cheapening nature and labor alike.[5] Australian settler colonialism, given its disproportionate reliance on synthetic fertilizers, was thus an agent in the instantiation of the structures of global capitalism elsewhere.

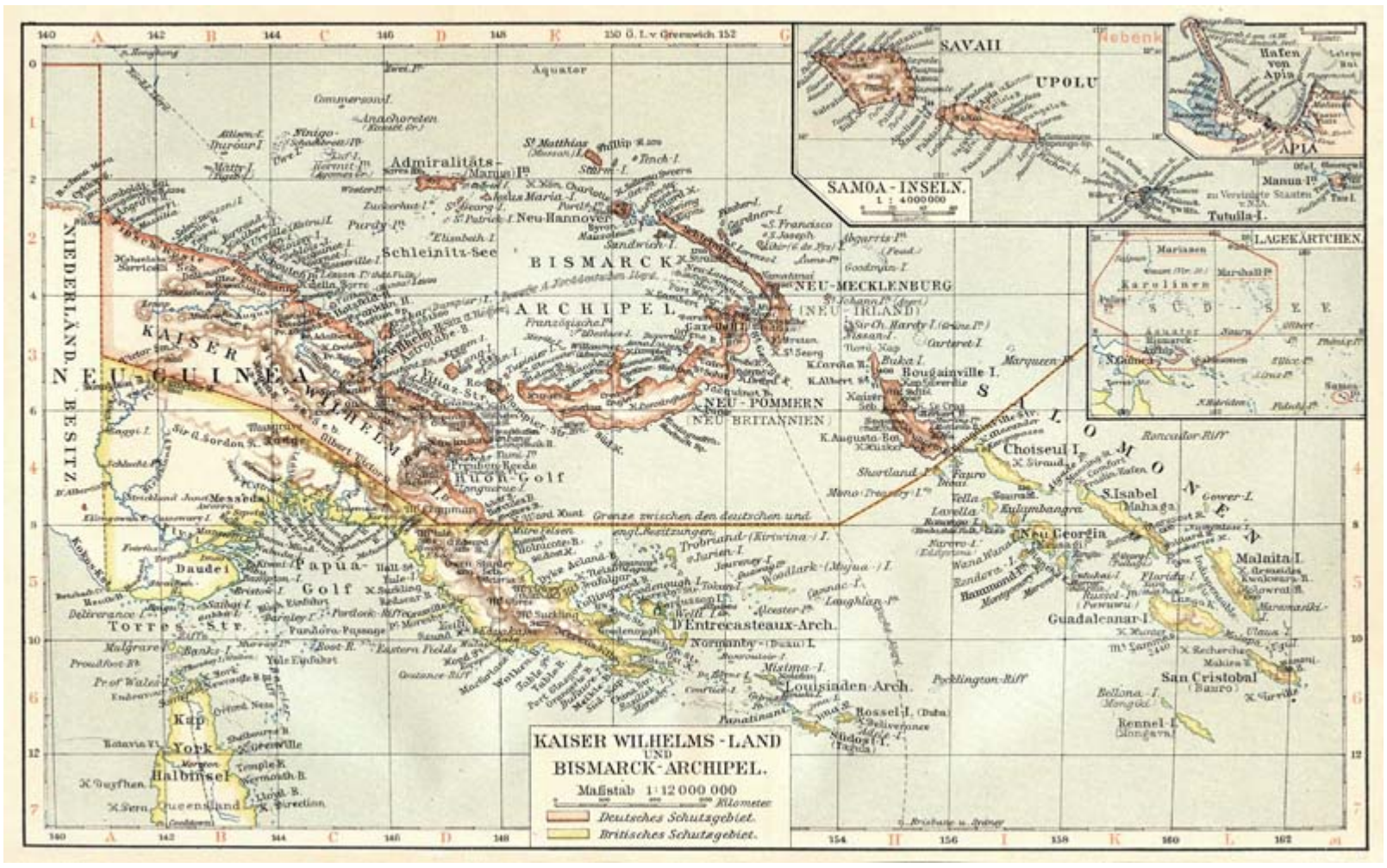


Fig. 7. Map of the German New Guinea *Schutzgebiet*, which included both Nauru and Angaur following the incorporation of the German Marshall Islands in 1906. Source: Kaiser-Wilhelms-Land, Deutsch-Neuguinea, Landkarte, c.1906, Bibliographisches Institut, Leipzig.

At the risk of straying still further from my original objective, I have spent the last month or so traveling around northern Germany. Germany is significant to this project because Nauru and Angaur—two Micronesian islands of great importance for the Australian superphosphate industry—were located in German colonial territory before World War One (figure 7). As I have traveled from place to place, my thinking has focused on the different kinds of political order that proponents of the chemical fertilizer industry were required to navigate and the types of spatial production these orders both presupposed and enabled in turn. I have found it helpful to conceptualize this relation as a question of *form*: how did the

administrative form of German colonial governance over Nauru and Angaur—in particular, the legal instrument of the protectorate or *Schutzgebiet*—influence the spatial-technical form—buildings, machinery, equipment, infrastructure—deployed to exploit the rock phosphate deposits on both islands? Did this relation also work in the other direction i.e., infrastructural development informing the structures of colonial governance? What is the political relationship between Ohlendorff's guano imperialism in Peru and the colonial phosphate industries established in German Micronesia? To what extent is this relationship still legible in the urban fabric of Germany today? And how does the history of the superphosphate industry figure within the broader history of Germany's ascent as a global colonial power?

Fig. 8. The *Dovenhof*. Source: Commons.

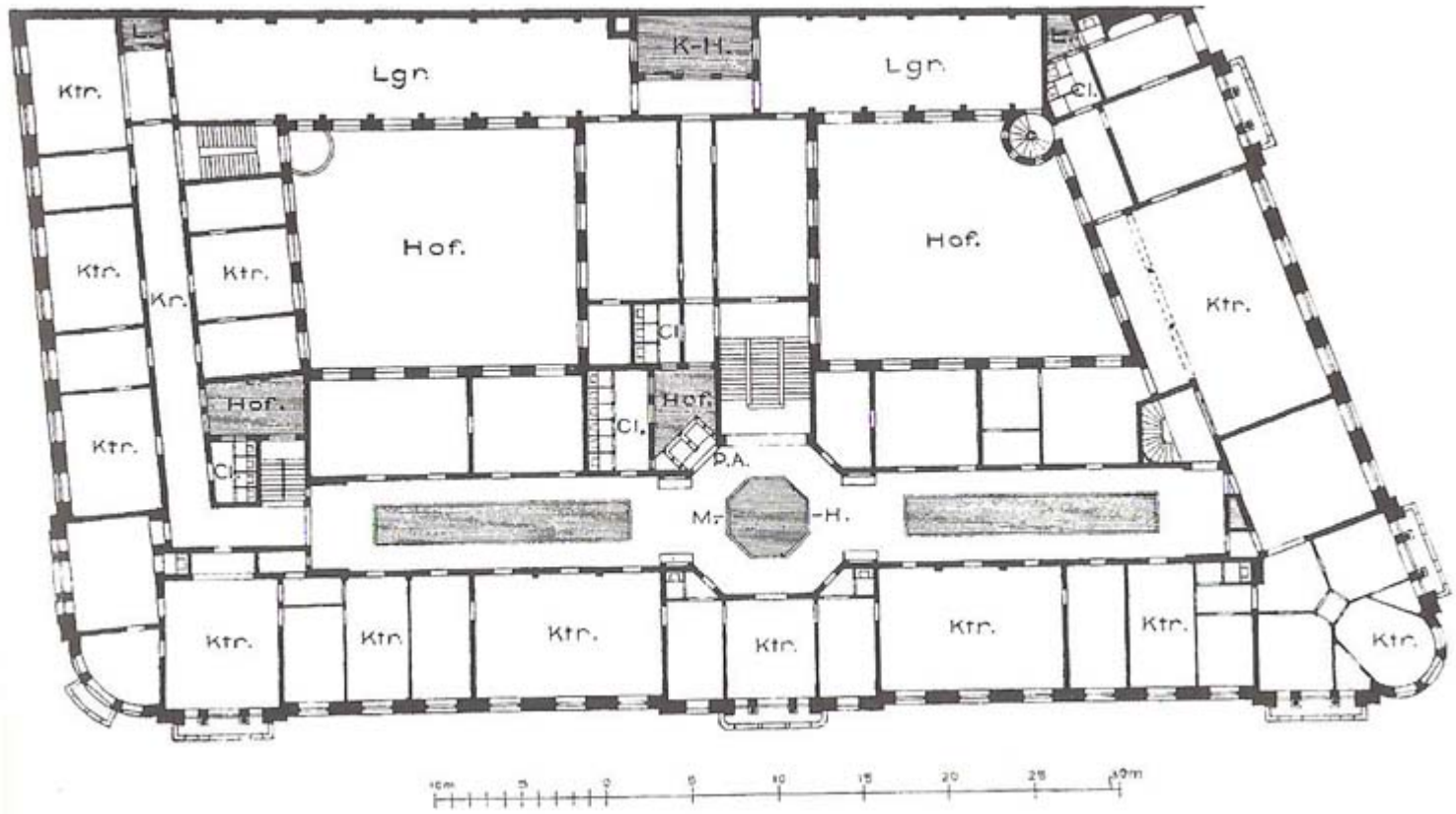


Fig. 9. Ground floor plan of the *Dovenhof*, designed by Martin Haller for Heinrich von Ohlendorff in 1886. Source: Commons.

The story of Heinrich von Ohlendorff's rise to wealth and prominence in Hamburg on the back of his company's guano exploits in Peru presents a useful analogue of the corporate structure of German imperialism and its evolution towards outright colonialism in 1884. It is also a story in which the architect Martin Haller reappears as the designer of choice, not only for Ohlendorff's private and commercial ventures, but for the colonial metropole of Hamburg more broadly. In 1886, three years after the formation of the Anglo-Continental Guano Works, Haller was again commissioned by Ohlendorff, this time to design the *Dovenhof*—the first *Kontorhaus* (office building) in the city. The Dovenhof represented a diversification in Ohlendorff's business interests, the wealth extracted from Peru now being reinvested into an incipient real estate empire in Hamburg at a moment when the global fertilizer industry was transitioning away from guano towards more potent synthetic alternatives. The four-story building presented a neo-Renaissance façade to the street, curving at its corner and rising from street level to an unusual domed turret embedded into the main volume of the building between tall pilasters (figure 8). Mirrored glass windows and its scale in comparison with the surrounding urban form immediately signaled the modernity of the Dovenhof notwithstanding the conservative treatment of its façade.[6] A tall octagonal vestibule—perhaps a nod to the octagonal skat room in the Villa Ohlendorff—connected the main circulation routes through the building, which incorporated the first steam-powered paternoster lift in continental Europe. Central heating and electric lighting maintained regular conditions inside the partitioned offices (*Kontore*), which opened onto corridors illuminated during the day by lightwells (figure 9). Two large courtyards punctuated the overall volume, bringing yet more light into the offices while also separating them from the storage rooms running along the back of the building.[7]

Fig. 10. The *Dovenhof* was demolished in 1967 to make way for the former headquarters of the newspaper *Der Spiegel*.

Fig. 11. The glazed masonry façade of the Martin Haller-designed *Afrikahaus*.

Fig. 12. Two life-size elephants occupy the courtyard of the *Afrikahaus* and are visible from the street.

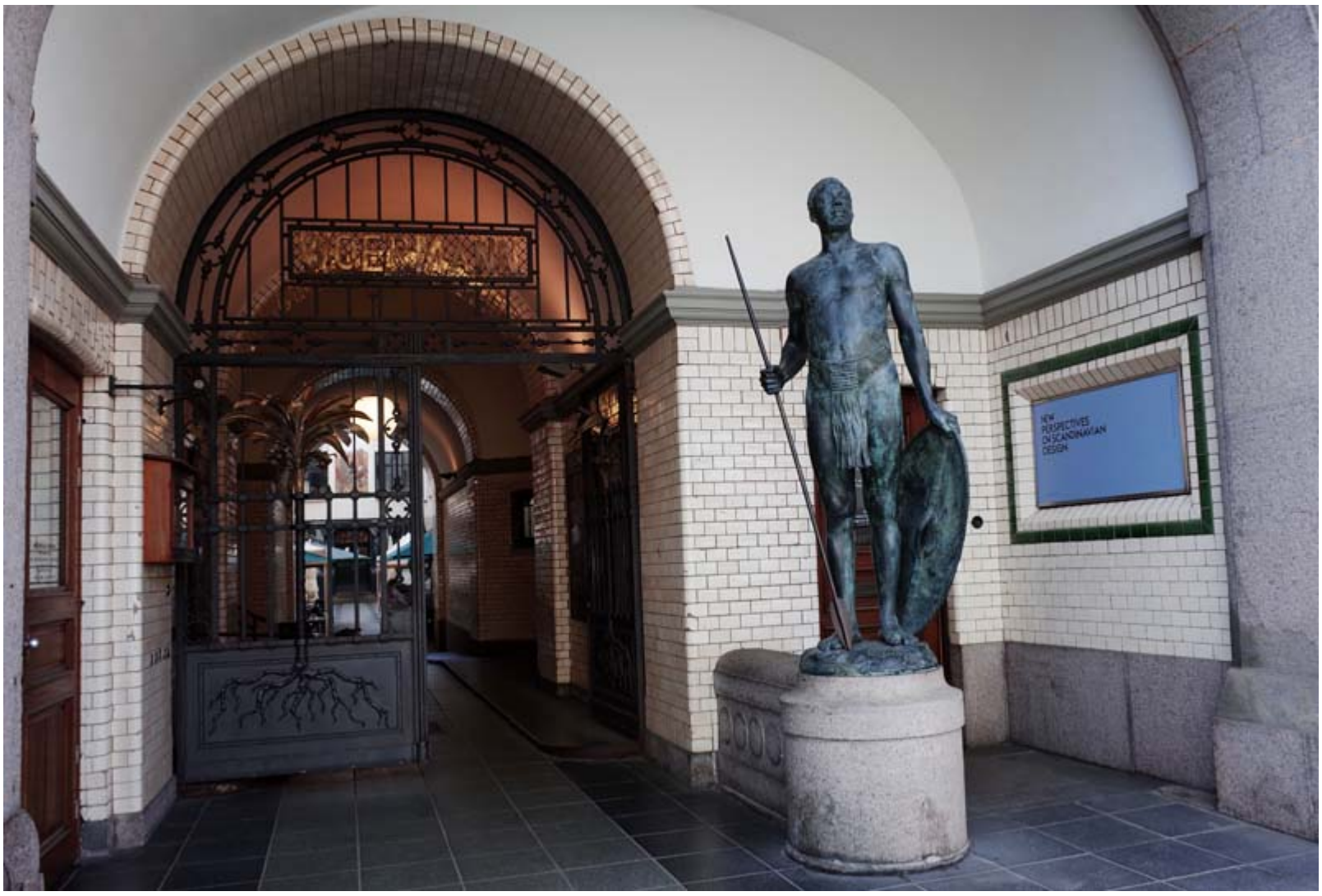


Fig. 13. The entry portal to the *Afrikahaus* includes a sculpture of a Hehe warrior by Walter Sintenis.

The Dovenhof was a prudent exercise in speculation, located directly adjacent to the *Zollkanal* (customs duty canal), which marked the outer perimeter of the Hamburg free port and the emerging *Speicherstadt* (lit. "warehouse city"). The building's tenants—importers, underwriters, lawyers and creditors—were therefore in the closest possible proximity to the *Speicher* (warehouses) through which overseas trade flowed into Hamburg. Other Kontorhäuser soon followed the example set by Ohlendorff's Dovenhof, which was demolished in 1967 to make way for the offices of *Der Spiegel* (figure 10). Two prominent examples remain intact and are important points on the self-guided colonial walking tour developed by a network of organizations involved in the Hamburg Postcolonial initiative.[8] The *Afrikahaus*, commissioned in 1899 by Adolph and Eduard Woermann for their company C. Woermann, was again designed by Martin Haller (figure 11). C. Woermann operated shipping services between and throughout German colonial holdings in Africa, boasting several company offices at key ports along the west coast. The Kontorhaus in Hamburg served as its global headquarters. Haller's design for the self-supporting glazed masonry façade of the Afrikahaus incorporates the livery of the company's fleet, as well as a variety of "African" ornaments including two life-size elephants and the figure of a Hehe warrior completed by the sculptor Walter Sintenis (figures 12 and 13). Offices are arranged around a narrow courtyard and are served by many of the same modern contrivances first incorporated in the Dovenhof.

Fig. 14. The *Laeiszhof* abuts the *Nikolaifleet* canal to the rear and addresses a small plaza formed around its main entry.

Fig. 15. The lightwell and paternoster lift of the *Laeiszhof*

Fig. 16. The central void in the *Laeiszhof* closely resembles Haller's design for the *Dovenhof*, the original *Kontorhaus* in Hamburg.

Nearby, Haller also designed the *Laeiszhof* in 1897—headquarters of the still extant shipping company F. Laeisz—together with Bernhard Georg Hanssen and Wilhelm Emil Meerwein (figure 14). Laeisz was heavily involved in the Chilean nitrate trade until the 1920s when the Haber-Bosch process eliminated the need to mine saltpeter for use as a fertilizer. The company was also involved in shipping in general, especially the importation of bananas and other fruit from Africa. To house its diverse activities, Haller returned to the Dovenhof as a precedent, again incorporating a large lightwell in the center of the building, which extends to the boundaries of its site abutting the *Nikolaifleet* canal. An operational paternoster lift still fills the interior with a drumming and whirring sound, propelling businesspeople between the building's six floors (figure 15). White-painted walls and wrought iron balustrades bounce the filtered daylight around the central void of the building, combining with the electric lighting to produce a calm warm glow (figure 16).

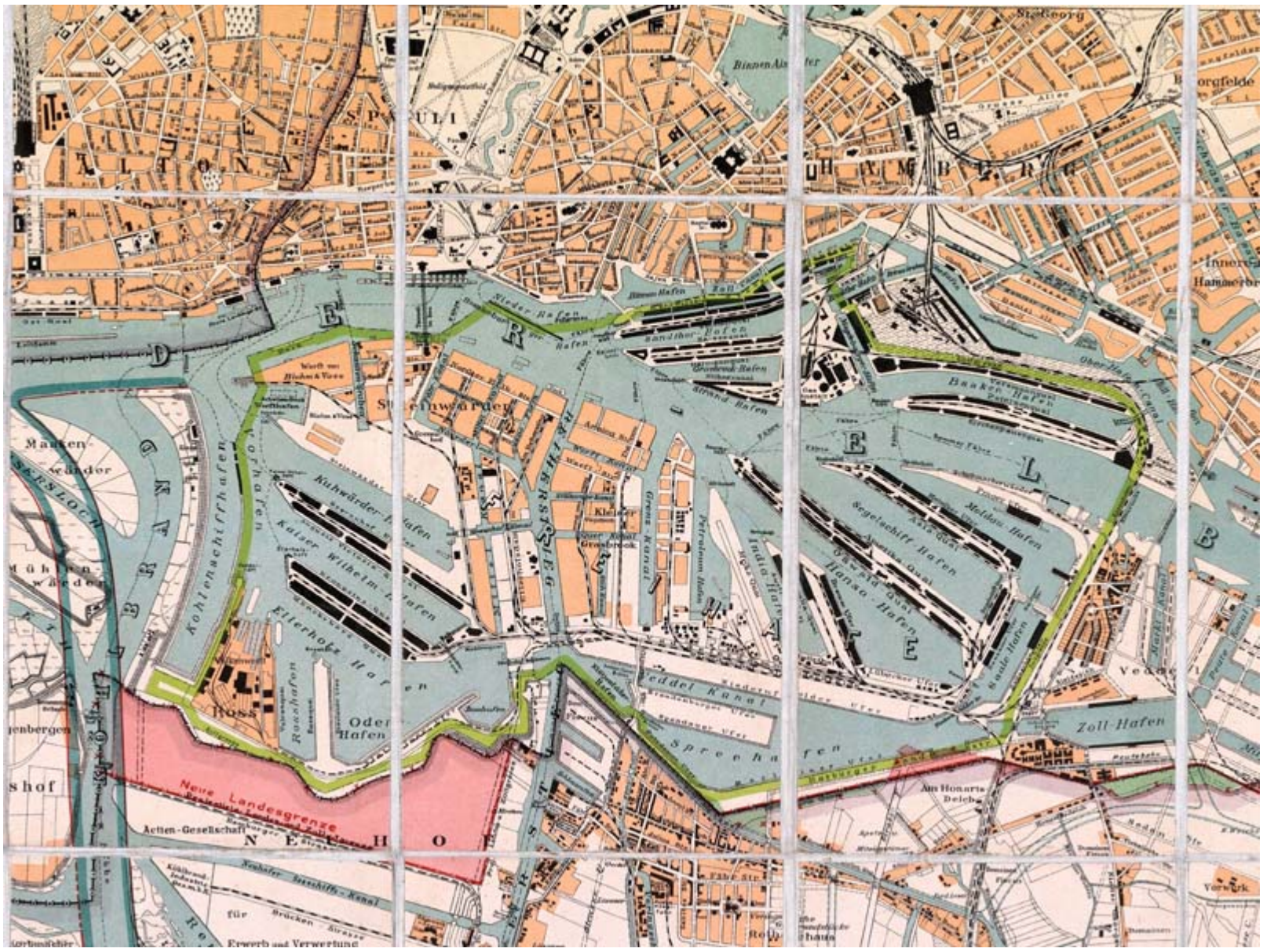


Fig. 17. The limits of the Hamburg freeport are shown in green. Source: Richard Krause, *Plan der Elbinseln Wilhelmsburg, Neuhof u. Hohe Schaar sowie Moorburg, Altenwärder u. Waltershof*, 1900.

Fig. 18. Warehouses in Hamburg's *Speicherstadt*.

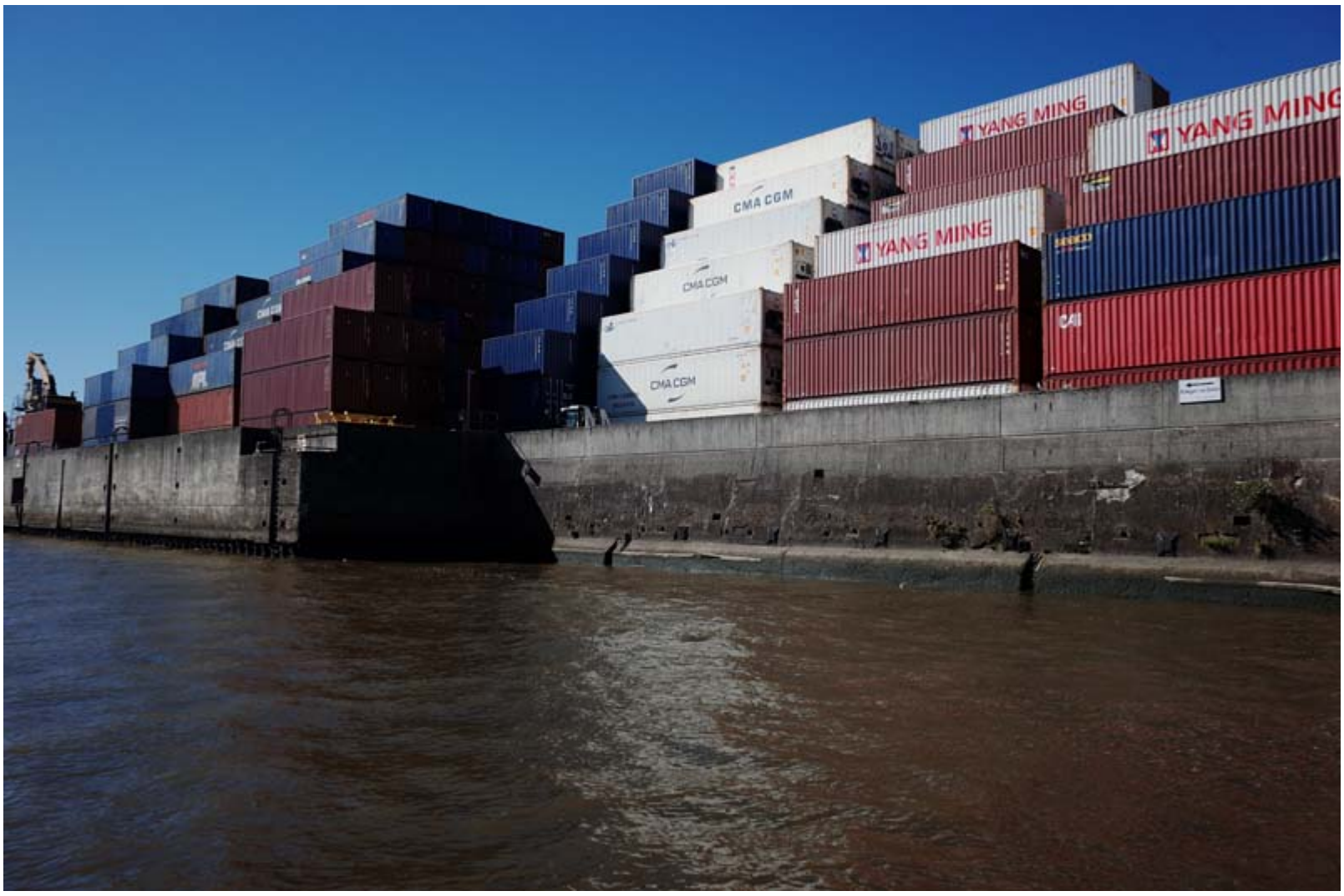


Fig. 19. Shipping containers occupy the former site of Ohlendorff's Anglo-Continental Guano Works.

Fig. 20. The *Guanofleet*, which once served Ohlendorff's Anglo-Continental Guano Works, can be seen in the overgrown creek mouth to the left. The silver dome is a theatre dedicated to recitals of Disney's The Lion King musical.

Like the Haller-designed Dovenhof, Afrikahaus and Laeiszhof, all of Hamburg's Kontorhäuser were located near the Speicherstadt, which grew to become the world's largest warehouse complex before World War One as a result of its status as a duty-free port (figure 17).[9] Imported raw materials and goods—bananas, coffee, cacao, cotton, copra—were unloaded from seagoing vessels onto barges that navigated the free economic zone's network of canals before being raised up to nine stories into the large, mechanized Speicher lining the canals (figure 18). All goods were received, stored and processed in the Speicher without attracting any duties until they entered the city as so-called *Kolonialwaren* (colonial wares). Crucially, as visible in figure 17, the duty-free zone not only encompassed the Speicherstadt, but also the industrial

facilities developed on numerous islands on the opposite side of the Elbe: Wilhelmsburg, Steinwerder, Veddel and Kleiner Grasbrook. The *Guanofleet*, a narrow canal in Hamburg-Steinwerder, still recalls the once sprawling industrial footprint of Ohlendorff's Anglo-Continental Guano Works, now replaced by a sea of shipping containers (figure 19). "India Harbor," "Asia Quay" and "Africa Spit" were also once found throughout the Hamburg free port in areas now used to store second-hand cars bound for Africa, as well as a theatre dedicated to recitals of Disney's The Lion King musical (figure 20).

Fig. 21. The Godeffroy & Sohn trading post in Apia, Samoa. Source: J. Ullstrom, *The Pacific Trading Post*, Alexander Turnbull Library, Wellington, 23078019.

Fig. 22. The "Hamburg Street" in Lomé, Togo, c.1909. Source: Kurt Schwab and Fr. Böhme, *Die deutschen Kolonien* (Berlin: Publisher Unknown, 1910).

The Hamburg free port, which both enabled Ohlendorff's multifaceted commercial enterprise and undergirded Haller's career as an architect, was a spatio-political outcome of Hanseatic imperialism. This history long preceded the country's unification under Chancellor Otto von Bismarck in 1871, let alone its entry into formal colonialism in the 1880s. By 1846, Hanseatic firms already maintained close to 160 trading posts and so-called "*Konsulanten*" (consulates) globally, rising to 280 over the next two decades.[10] The

Hamburg merchant Johann Cesar Godeffroy, operating out of Samoa from the mid-1850s, developed a vast network of trading stations spanning Tonga, Wallis and Futuna Islands, Niue, the British Gilbert and Ellice groups, the Spanish Carolines and the Marshall Islands (figure 21).[11] Godeffroy & Sohn eventually purchased coconut and cotton plantations worked by more than 1200 laborers and frequented by a company fleet of around one hundred ships, the majority of which had been built in Hamburg.[12] In 1878, Godeffroy & Sohn was reconstituted as the Deutsche Handels- und Plantagengesellschaft der Südsee-Inseln zu Hamburg (German Trading and Plantation Company of the South Sea Islands), which would go on to play a decisive role in the commencement of phosphate mining on Nauru. By 1880, companies headquartered in Bremen and Hamburg had established approximately twenty trading stations on the west coast of Africa alone, acquiring goods, wares and resources that were regularly conveyed back to Europe by C. Woermann, F. Laeisz and others (figure 22). The establishment of the Hamburg free port, which followed the city's accession into the German Customs Union in 1888, thus maintained the position of trade within the economic and political life of the city during the period of German colonialism.

Fig. 23. The Hamburg town hall, designed by Martin Haller.

Fig. 24. The *Ehrenhof* connects the Hamburg town hall and the stock exchange

Fig. 25. City crests affixed to the base of the second row of columns in this image run around the façades facing into the *Ehrenhof*, representing the historical geography of Hamburg merchants' involvement in global trade. Allegorical figures representing each continent are seen above.

Heiko Möhle has observed that, in Hamburg, "the path between politics and the economy has always been a short one."[13] What in fact separates the two, however, is less a path than an enclosed square of approximately twenty meters in length—the so-called *Ehrenhof*—that spans the distance between Hamburg's town hall (1897) and the city's stock exchange building (1840), home to the *Hamburger Handelskammer* (Chamber of Commerce). The financial-administrative complex spatializes what Möhle describes as "a close relationship with a long history." As the representative body of Hamburg's merchant elite, "the Handelskammer defined the city's economic interests, while the Senate worked to implement those interests politically."[14] Unsurprisingly, the design for the town hall in which the Senate resided was

prepared (yet again) by the architect Martin Haller, whose career is emblematic of the commercial opportunities arising in the metropole as a result of German imperialism (figure 23). Haller's design for the town hall formalized the interstitial space between it and the stock exchange—thereby creating the Ehrenhof—through the addition of two portals flanking a central square and fountain (figure 24). City crests and allegorical relief art run along all four facades facing into the square, representing the historical geography of Hamburg merchants' involvement in global trade. The crests are arranged around the courtyard in a loosely geographical manner, starting with the Americas—New York, San Francisco, Rio de Janeiro and Valparaiso—then moving to the Asia-Pacific—Hong Kong, Melbourne, Sydney, Batavia, Singapore, Manila and Yokohama—before arriving at ports throughout Europe and the United Kingdom (figure 25). A series of strange figures intending to portray each continent is incorporated atop the city crests along the back façade of the stock exchange building—including, for example, an Australian Aboriginal woman adorned with a bow and arrow. In establishing the Ehrenhof as a kind of fulcrum between the Senate and Handelskammer, stitching them into a continuous architectural and urban fabric, Haller's design worked to naturalize the imbrication of Hamburg's foundational imperial institutions—the latter, an embodiment of the imperial, pre-colonial interests of the city's merchants; the former, a vehicle for consolidating those interests during the period of high colonialism.[15]

Fig. 26. Hamburg's Bismarck statue overlooks the city and faces towards the mouth of the Elbe in the North Sea.

Engaging with Hamburg's urban history reveals the extent to which German colonialism can be understood as a political concession to the commercial interests (and indefatigable lobbying) of Hanseatic traders. In 1883, Adolph Woermann authored a memorandum sent to Bismarck on behalf of the Hamburger Handelskammer seeking enforceable protections for Hanseatic trading interests in Africa. "The interior of Central Africa," argued Woermann, "with its dense population capable of high levels of consumption and the vast trade potential described by all travelers, offers a particularly favorable region for distributing European industrial products, especially since not only all commodities, but also all labor is paid for not with cash [...] but always with imported goods."[16] The eventual colonial intervention of the German state in Africa came a year later in response to the sustained requests of the Bremen trader F. A. E. Lüderitz who likewise sought protection from the Reich over his business interests north of the Cape Colony. His request was finally granted by Bismarck in June of 1884, leading to the establishment of German South West Africa

as the empire's first Schutzgebiet. Bismarck's oft-cited refrain, "*Die Flagge folgt dem Handel*" (the flag follows trade) placed German merchants' interests at the center of formal colonialism, a fact commemorated in Hamburg with the erection in 1906 of an imposing statue of the former chancellor overlooking the city and facing towards the mouth of the Elbe in the North Sea (figure 26).[17] Other Schutzgebiete soon followed: in Africa—Kamerun (1884), Togoland (1884) and German East Africa (1885); the Pacific—Kaiser-Wilhelmsland (1884), Bismarck-Archipel (1884), Marshall-Inseln (1885), Salomon-Inseln (1885), Nauru (1888), Die Karolinen (1899), Die Marianen (1899) and Deutsch-Samoa (1900); and China with the annexation of Kiautschou in 1898.[18] As the legal scholar Cait Storr has argued, the expansion of the German state into these regions under Bismarck and his successors, and the "political balance between private equity and state subsidy" is best understood not as a "rapid expansion of 'the German empire' in the late nineteenth century but as an episode in a far longer history of the shift from one form of European imperialism towards another—from the non centralised merchant trade network run from the Hanseatic cities, towards the centralised state imperialism of the new Reich."[19]

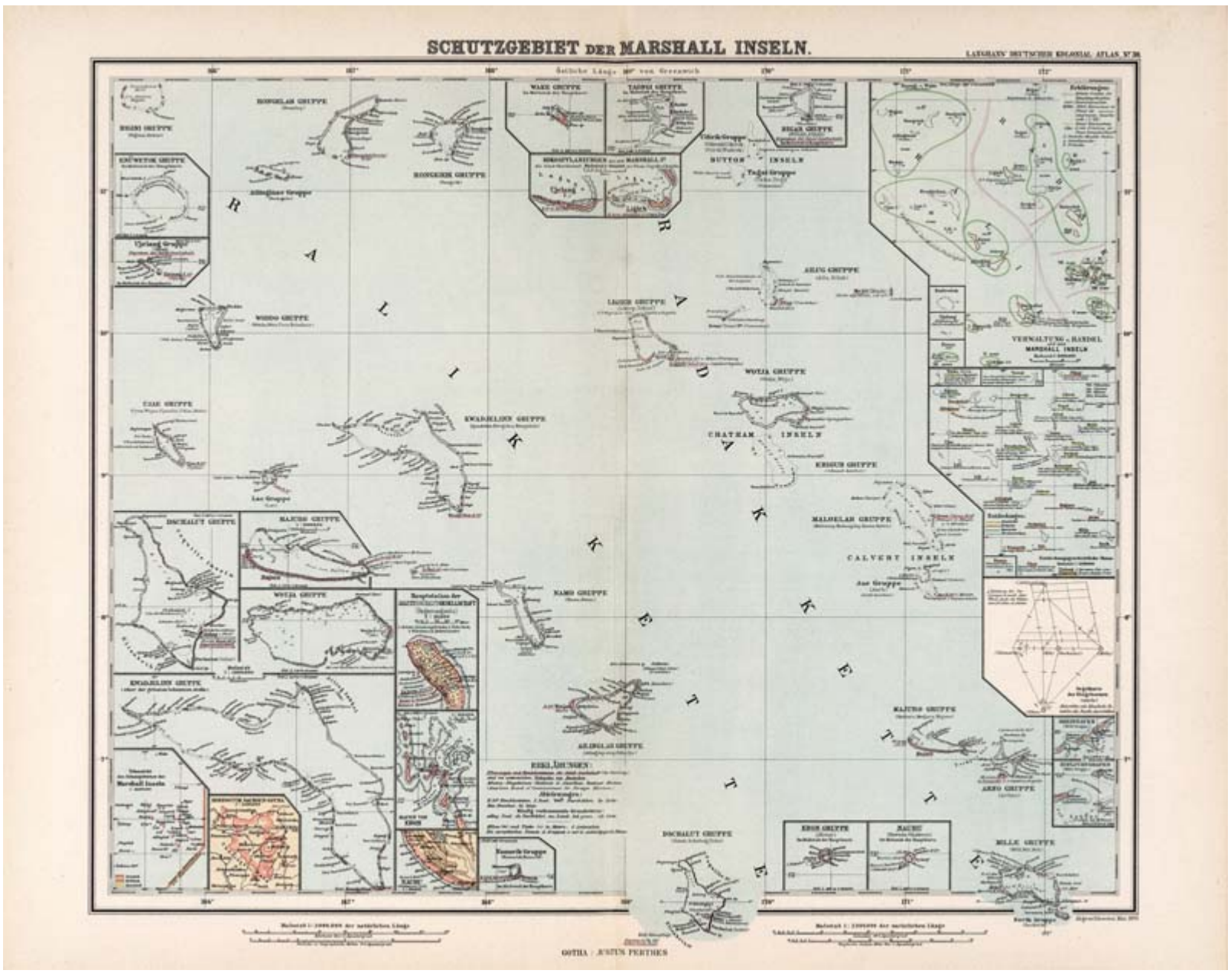


Fig. 27. The German Marshall Islands Schutzgebiet. Source: Paul Langhans, *Schutzgebiet der Marshall-Inseln, Deutscher Kolonialatlas*, Map 30, 1897.

The longer history Storr addresses not only shaped the urban development of Hamburg as a site where the spoils of German imperialism—including the guano imported by Ohlendorff—were processed in the most frictionless way possible, but also shaped the later administrative form of German colonialism via the legal instrument of the Schutzgebiet. "Whereas classical conceptualisations of protectorate status arose from an agreement between unequal sovereigns for 'protection' of the weaker party," continues Storr, "in the late nineteenth century the label was increasingly used to describe a variety of imperial arrangements in which concepts of sovereignty, territory and property remained ambivalent, if not incoherent." This ambivalence, Storr argues, enabled the German state to conduct a "unique imperial experiment" in which its consular jurisdiction was territorialized in the Schutzgebiete as minimally as possible, "with delegated executive control vesting in German companies themselves, with minimal subsidization and little to no legislative oversight."[20] The Schutzgebiet, in other words, was the fundamental legal-territorial condition of German

colonialism, becoming the de facto manner in which German colonies were established into the twentieth century including on Nauru and Angaur. It incentivized the extraction and circulation of commodities and labor by German corporations as a basis for raising tax revenue rather than incentivizing migration and permanent settlement. This is one reason why many Germans still equivocate when it comes to the country's colonial patrimony: "Yes, we had colonies but not *real* colonies like the British" is a refrain I encountered numerous times over the course of my travels. Insofar as this is an accurate assessment it is one that rests on a spurious distinction between the administrative forms of colonial sovereignty, reducing the plurality of modern colonialism to settler-colonialism only.

The geographer Joshua Barkan has argued for more nuanced understandings of what he terms "corporate sovereignty," or the ways in which political sovereignty has been vested in private power—via, for example, the legal technology of the protectorate—and the subsequent importance of the corporation as an institutional form within liberal capitalism.[21] The late-nineteenth-century German Pacific, owing to its deep political, economic and material entanglements with the evolving colonial metropole of Hamburg, arguably presents Barkan's case in point: in 1884, the Deutsch Neuguinea-Kompagnie was formed as a chartered company to exploit resources and administer the territory of German New Guinea on behalf of the Reich; in 1888, the Jaluit-Gesellschaft was created to perform the same functions throughout the Marshall Islands Protectorate via a merger in Hamburg between Hernsheim & Kompagnie and the DHPG, which was itself formed out of Godeffroy & Sohn a decade earlier as already mentioned; and in 1902, the Jaluit-Gesellschaft was reconstituted as the Pacific Phosphate Company through a joint-stock agreement with the Pacific Islands Company in order to work the phosphate deposits on Nauru and administer the island.

German firms received various exclusive rights and the promise of military protection in these agreements. According to the historian Stewart Firth, in the administration of its Pacific Schutzgebiete, the German Imperial Government effectively functioned as an agent of "private companies, providing legality for whatever the companies wished to do," and supplying them with "cheap land, long mining leases, low royalties and a disciplined, underpaid labour force" subject to minimal regulation.[22] In the German Marshall Islands, the Jaluit-Gesellschaft was given "the right to take possession of ownerless land, the right to engage in fishing for pearlshell [...and] the right to mine guano deposits," in return for which it was expected to "meet the costs arising from the administration [of the Schutzgebiet]" and to collect license fees and "head-taxes."[23] In German New Guinea, the same administrative logic could be discerned in the discrepancy between the paltry European population figures up to World War One and the fact that the territories encompassed by the Schutzgebiet were heavily developed by this time—containing 10,000 hectares of plantations, roads, industrial mining infrastructure, a functional taxation system and a ten-year plan for future works prepared by Governor Albert Hahl.[24] As stated by Secretary of State for the Colonies Bernhard Dernburg in his *Zielpunkte des deutschen Kolonialwesens* (1907), German colonialism should focus on precisely this kind of productive infrastructural development, substituting the "means of destruction (*Zerstörungsmittlen*)" he associated with settler-colonialism—referring in a veiled way to the genocidal war perpetrated by the Reich on behalf of settlers in German South West Africa between 1904 and 1907—for German medical, missionary and engineering expertise aimed at the "utilization (*Nutzbarmachung*) of the earth, its treasures [...] and especially the people."[25] Efficient and reliable extraction and accumulation, not settlement and local state formation, argued Dernburg, were the primary goals of early-twentieth-century German colonialism.

Seit dem Erwerb von Kolonien seitens des Deutschen Reiches hat die Firma auch dort begonnen, in bedeutendem Maße ihre Tätigkeit zu entwickeln. Sie hat in den Kolonien Kamerun, Togo, Neu-Guinea, Dar-es Salaam

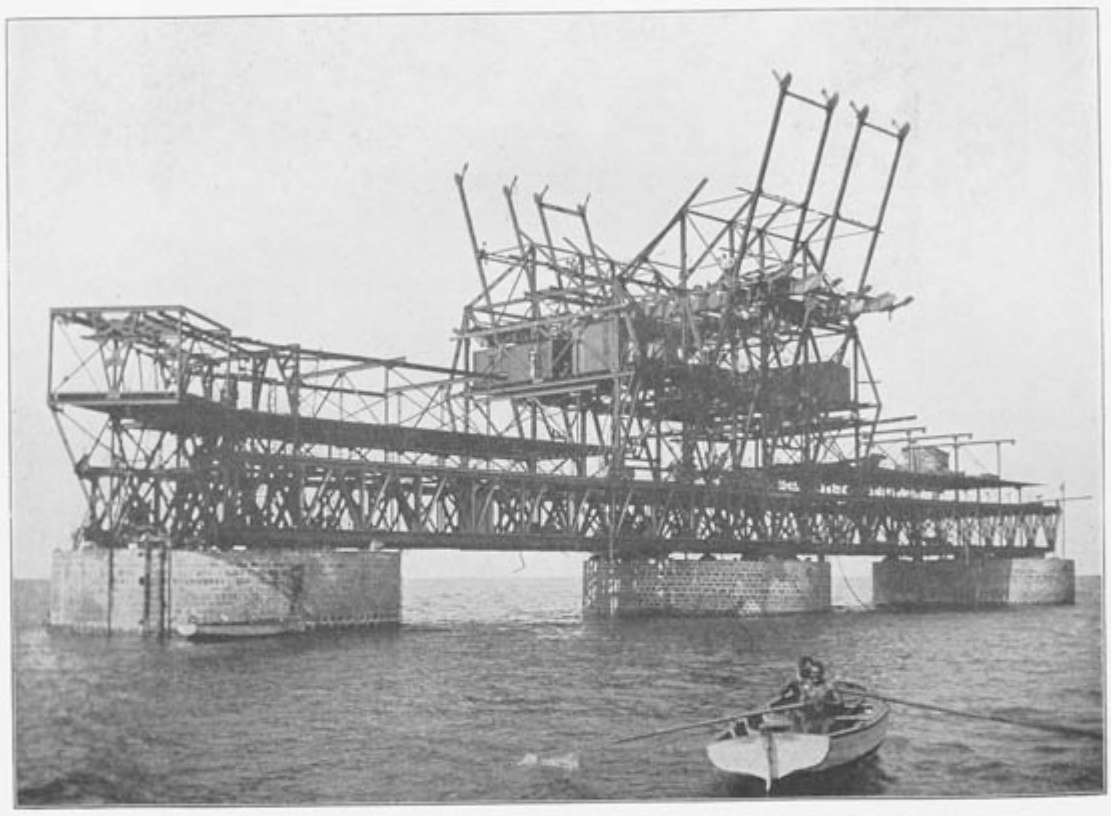
Regierungsgebäude in Tsingtau (Kiautschou).

und Kiautschou die ersten Gouvernementsbauten im Auftrage des Auswärtigen Amtes bezw. Reichs-Marine-Amtes ausgeführt, lieferte ferner zur Zeit der Chinaunruhen den grössten Teil der Wohn- und Lazarett-Baracken, die vom

Löhnung der von der Firma beschäftigten chinesischen Arbeiter in Tapautau (Kiautschou).

Fig. 28. German government building in Tsingtao in F. H. Schmidt catalogue. Source: "F. H. Schmidt, Bauunternehmung, Altona, Hamburg, Tsingtau," *Historisch-biographische Blätter: der Staat Hamburg* 7 (1905/6), Staats- und Universitätsbibliothek Hamburg.

Kriegsministerium für das ostasiatische Expeditionskorps errichtet wurden. Auch im Kiautschou-Gebiet ist ihr in den letzten 8 Jahren ein grosses Arbeitsfeld erwachsen, in erster Linie durch Aufträge des Reichs-Marine-Amtes und des Gouvernements, aus welchem Grunde die Firma in Tsingtau auf eigenem Grund und Boden eine Zweigniederlassung mit grossem Geschäftshaus und ausgedehnten maschinellen Einrichtungen gründete. Hier erstreckte sich ihre Bautätigkeit auf Strassen- und Brückenbau, auf die Errichtung von Kasernen, Regierungsgebäuden und Kranken-



Lösch- und Ladeanlage für die „Société Le Nickel, Paris" im offenen Meer vor Thio in Neu-Caledonien.

häusern, auf städtische Kanalisation und Wasserversorgung, sowie auf die Erbauung von Fabrik-, Geschäfts- und Wohngebäuden für Industrielle und Private. Zur Zeit ist die Firma ausserdem mit der Errichtung diverser Hochbauten in Peking und Tientsin beschäftigt. In Peking hat sie die Erbauung eines Geschäftshauses für die Deutsch-Asiatische Bank übernommen, in Tientsin die eines Gesellschaftshauses für den Deutschen Klub daselbst.

An der hohen Kulturaufgabe, deutscher Arbeit und Bauwissenschaft im Auslande eine Heimat zu schaffen, hat die Firma F. H. Schmidt in allen Erdteilen mitgewirkt und hat sich dadurch seit einer Reihe von Jahren an dem in Deutschland auftretenden Bestreben, deutsche Arbeit und deutsches Können im Auslande zu Ansehen zu bringen, durch ihre Bautätigkeit erfolgreich beteiligt.

Fig. 29. F. H. Schmidt loading and unloading facilities fabricated for the la Société Le Nickel, Paris in New Caledonia. Source: "F. H. Schmidt, Bauunternehmung, Altona, Hamburg, Tsingtau," *Historisch-biographische Blätter: der Staat Hamburg* 7 (1905/6), Staats- und Universitätsbibliothek Hamburg.

The Schutzgebiet therefore presupposed and facilitated an infrastructuralism that was implemented on behalf of the state by private, usually Hanseatic companies. As Storr argues in relation to Nauru in the German Marshall Islands, the governmental history of that Schutzgebiet is one in which legal status *shifted* while administrative form *accreted*: "A simple administrative outline, originally sketched in 1888 by a Hanseatic trading company in a deal with the Bismarckian Reich, was progressively bureaucratised over time. Administrative tasks and practices intensified, were restated and renamed; but the form in which they were organised held firm."[26] Importantly, as Dernburg's overt infrastructuralism already reveals, this gradual administrative intensification and bureaucratization—what Storr labels "accretion"—was also an enterprise premised on German technical expertise. Here, Nauru remains an instructive example: as soon as the Pacific Phosphate Company had been established to work the Nauruan rock phosphate deposits through a complicated agreement spanning Hamburg, Berlin and London, the Hamburg-Altona construction and engineering firm F. H. Schmidt was contracted to supply industrial equipment and facilities for a company settlement on the island, seemingly as a condition of the administrative terms established by the Reich. F. H. Schmidt had built houses, harbors, bridges and maritime infrastructure around Hamburg since the 1840s, portraying its engineering and logistical achievements as part of a wider narrative of German colonial ascendancy: "Since Germany has acquired its own colonies," a promotional pamphlet from 1906 observed, "the company has substantially developed its activities in turn."[27] In German East Africa, F. H. Schmidt provided prefabricated government dwellings. In the German concession of

Qingdao in China, it employed a large local labor force, designing and constructing the barracks, government buildings, brewery, hospitals, factories, offices and villas, as well as much of the civic and maritime infrastructure (figures 28 and 29). Reflecting on these and the many other projects it had completed by the time it was awarded the contract for Nauru, F. H. Schmidt was happy that it had, "for a number of years already, successfully elevated the reputation of German companies, German work and German ability through its building operations."[28] The continuities at play here are revealing: the acquisition of German colonial territory using the legal instrument of the Schutzgebiet—initially deemed most suitable in protecting existing Hanseatic trading interests—also secured new spheres of commercial activity for the same German technical expertise that had been cultivated in the Hanseatic centers since the pre-colonial period.

Fig. 30. The former Deutsche Nationalbank zu Bremen, meeting place for the Deutsche Südseephosphat Aktiengesellschaft.

Fig. 31. The former Deutsche Nationalbank zu Bremen, meeting place for the Deutsche Südseephosphat Aktiengesellschaft.

To better understand how the superphosphate industry figured among the blurred edges of German imperialism, colonialism and infrastructuralism, I traveled west from Hamburg to the neighboring Hanseatic city of Bremen. I find my first destination in the historic center, behind the city's fifteenth-century town hall. The former headquarters of the Deutsche Nationalbank zu Bremen was erected in 1896—a year before Haller's town hall was completed in Hamburg—to the design of the Deutsche Nationalbank's in-house architect, Wilhelm Martens (figures 30 and 31). It was in this building's stately interior that the board members of the Deutsche Südseephosphat Aktiengesellschaft (German South Sea Phosphate Company Limited, DSPAG), which was granted an exclusive phosphate mining concession for Angaur in German New Guinea, would come together for the company's annual general meetings. The first of these was held in 1908 and the founding board members in attendance read as something of a who's who of Germany's financial-industrial-chemical complex: two seats were occupied by the Norddeutscher Lloyd (North German Lloyd) shipping company, which serviced the Reich's Pacific territories and Australia; two were held by the Frankfurt-based mining and chemicals company Beer, Sondheimer & Co; the Deutsche Nationalbank zu Bremen held one position on the board and administered the company's investment capital; one seat each was held by the Deutsche Bank in Berlin and H. & E. Albert of Wiesbaden-Biebrich, a superphosphate fertilizer producer formed in the immediate wake of Liebig's discoveries in the 1850s, as well as the Rotterdam-based mining and shipping company H. Mueller & Co.

The DSPAG was established after Albert Hahl, Governor of German New Guinea, met with the general manager of the Norddeutscher Lloyd, Heinrich Wiegand, in Bremen to outline the commercial viability of the Angaur deposits. Hahl believed the Lloyd was especially well placed to work the island given its established shipping activities in the region. Wiegand agreed, reporting in 1906: "The great importance of the further economic development of the South Seas protectorate for our steamship lines prompted us last year to send an expedition to explore the mineral resources of the island region in conjunction with a number of associated companies."[29] The results of this expedition were favorable and revealed that the majority of Angaur was covered in valuable high-grade rock phosphate. Wiegand quickly got to work in

assembling the cast of board members listed above, while Governor Hahl made the case for granting a mining lease on behalf of the Lloyd to Dernburg as Secretary for the Colonies—this being one of the very first issues to which Dernburg attended in his newly appointed role.

Fig. 32. Preliminary tracks, carts and loading equipment on Angaur, provided to the Deutsche Südseephosphat Aktiengesellschaft by F. H. Schmidt. A Lloyd steamer waits to be loaded in the background, c.1908. Source: Deutsches Bundesarchiv, Sammlung Heinrich Hagedorn, Bild 223-046.

My travels will take me to Angaur in the coming months and I will return to the infrastructural presence the DSPAG established there in greater detail in a future report. Here, I wish only to make two observations. The first is that, like Martin Haller in Hamburg, the construction company F. H. Schmidt reappeared throughout German colonial territories at the turn of the twentieth century, especially where governmental and industrial functions were combined as was the case on Nauru and Angaur. In the autumn of 1908, Lloyd company ships left Bremen for Angaur carrying the first shipment of DSPAG housing and mining equipment, which had been designed and constructed by F. H. Schmidt and included a full arsenal of locomotives, wagons, rails and sleepers, storing and loading equipment, prefabricated timber buildings, water treatment facilities, as well as the devices required to establish a radio connection with the island of Yap in the Caroline Islands (figure 32). F. H. Schmidt therefore provided the company settlements and industrial facilities for both rock phosphate islands in German Schutzgebiete in the Pacific, further expanding its own commercial geography in the process.

Fig. 33. Facilities at the Norddeutsche Hütten AG, c.1908. Source: Commons.

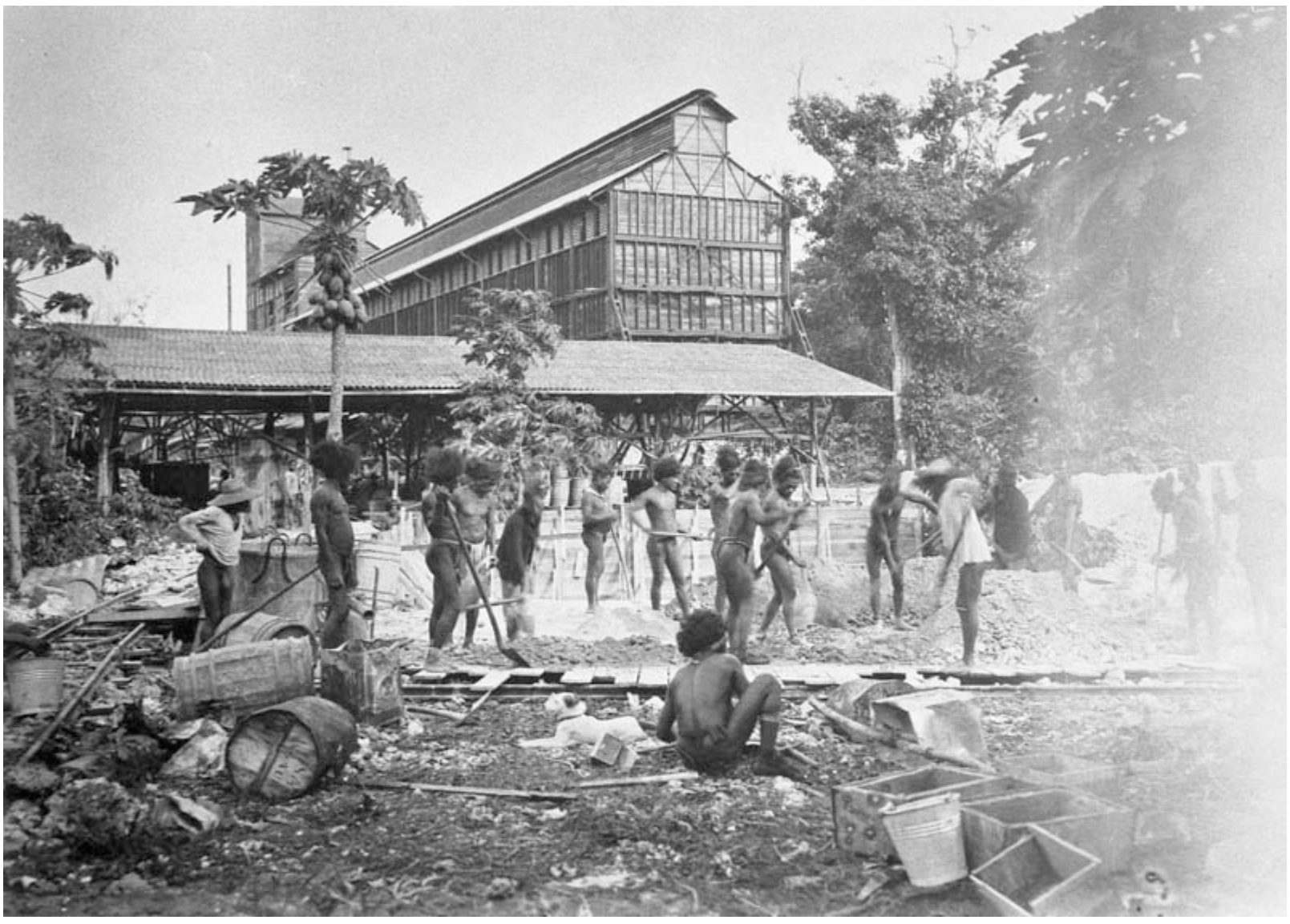


Fig. 34. The so-called *Hoffnungshütte* fabricated by F. H. Schmidt for the Deutsche Südseephosphat Aktiengesellschaft on Angaur, c.1912. Source: Deutsches Bundesarchiv, Sammlung Heinrich Hagedorn, Bild 223-038.

The second observation is that the DSPAG's mining activities on Angaur are best understood in light of the broader expansionist project undertaken by the Norddeutscher Lloyd during Wiegand's tenure as general manager. In the first decade of the twentieth century, Wiegand sought to transform the Lloyd into a vertically integrated industrial corporation, establishing the so-called "Wiegand industries" and becoming a major driver of industrialization along the Weser River. In addition to mining and exporting rock phosphate in German New Guinea, these industries included the Norddeutsche Maschinen- und Armaturfabrik (North

German Machine and Instrument Factory), established in 1902, which supplied the Lloyd's ships and other maritime equipment; the Norddeutsche Automobil- und Motorenwerke AG (North German Automobile and Motor Company Limited), established in 1906; the Norddeutsche Hütten AG (North German Metallurgical Company Limited) and the Norddeutsche Waggonfabrik (North German Wagon Factory), both established in 1908, the latter of which manufactured the trains that transported the coal and ore to the coking plant and smelters of the former, before being loaded again with pig iron conveyed to the Ruhr for steel manufacturing (figure 33). It is likely that the integrated phosphate crushing, drying and loading facility prefabricated by F. H. Schmidt for use on Angaur, named the *Hoffnungshütte* (lit. "hope hut), was understood as a Pacific outpost of the Wiegand industries (figure 34).

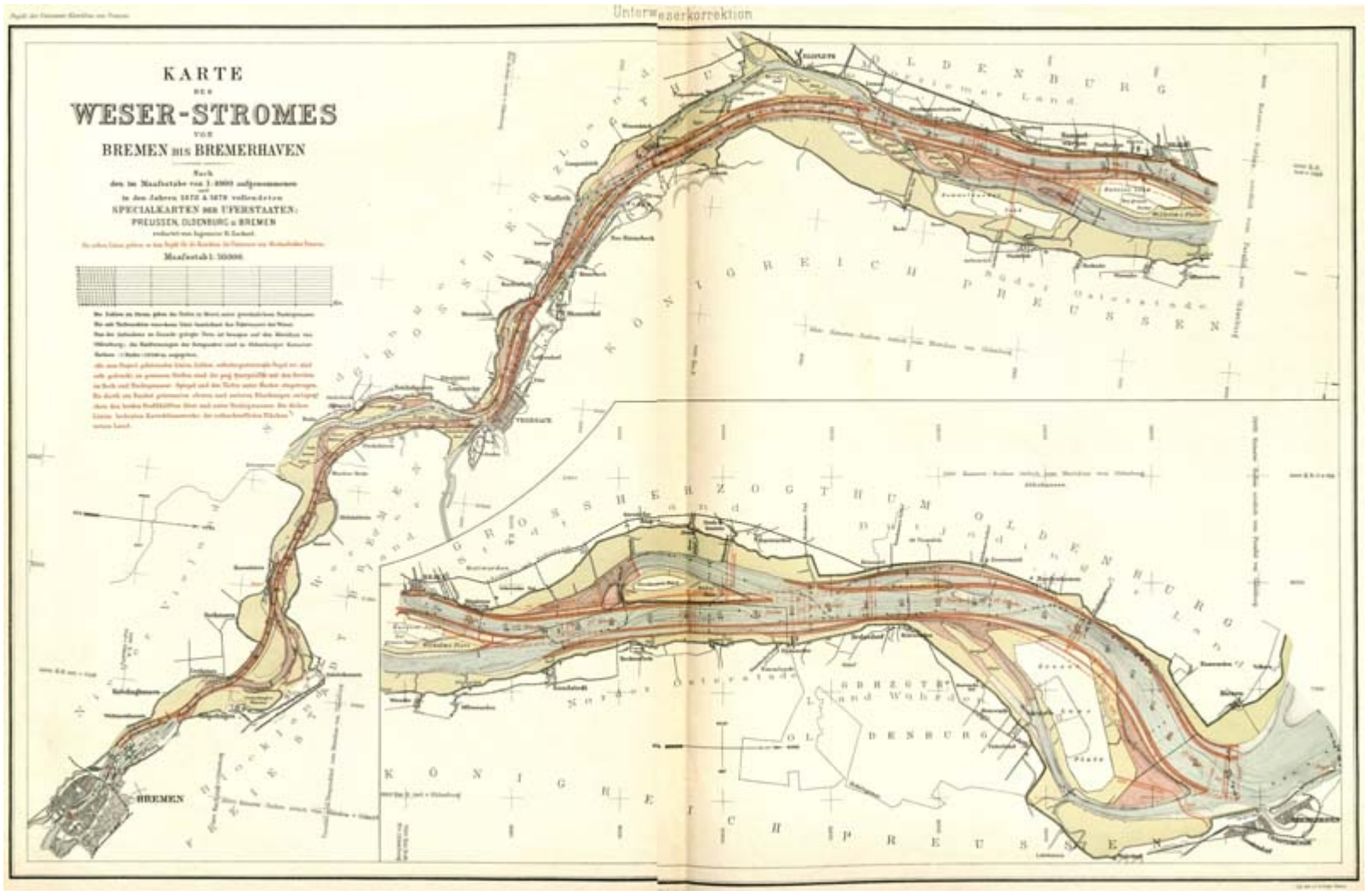


Fig. 35. The regularization of the Weser River is indicated in red in this plan. Source: Ludwig Franzius, *Karte des Weser-Stroms von Bremen bis Bremerhaven*, 1888.

Fig. 36. Pile driving works at the *Weserkorrektion*, c.1889. Source: Commons.

Fig. 37. The Bremen free port, c.1914. Source: Commons.

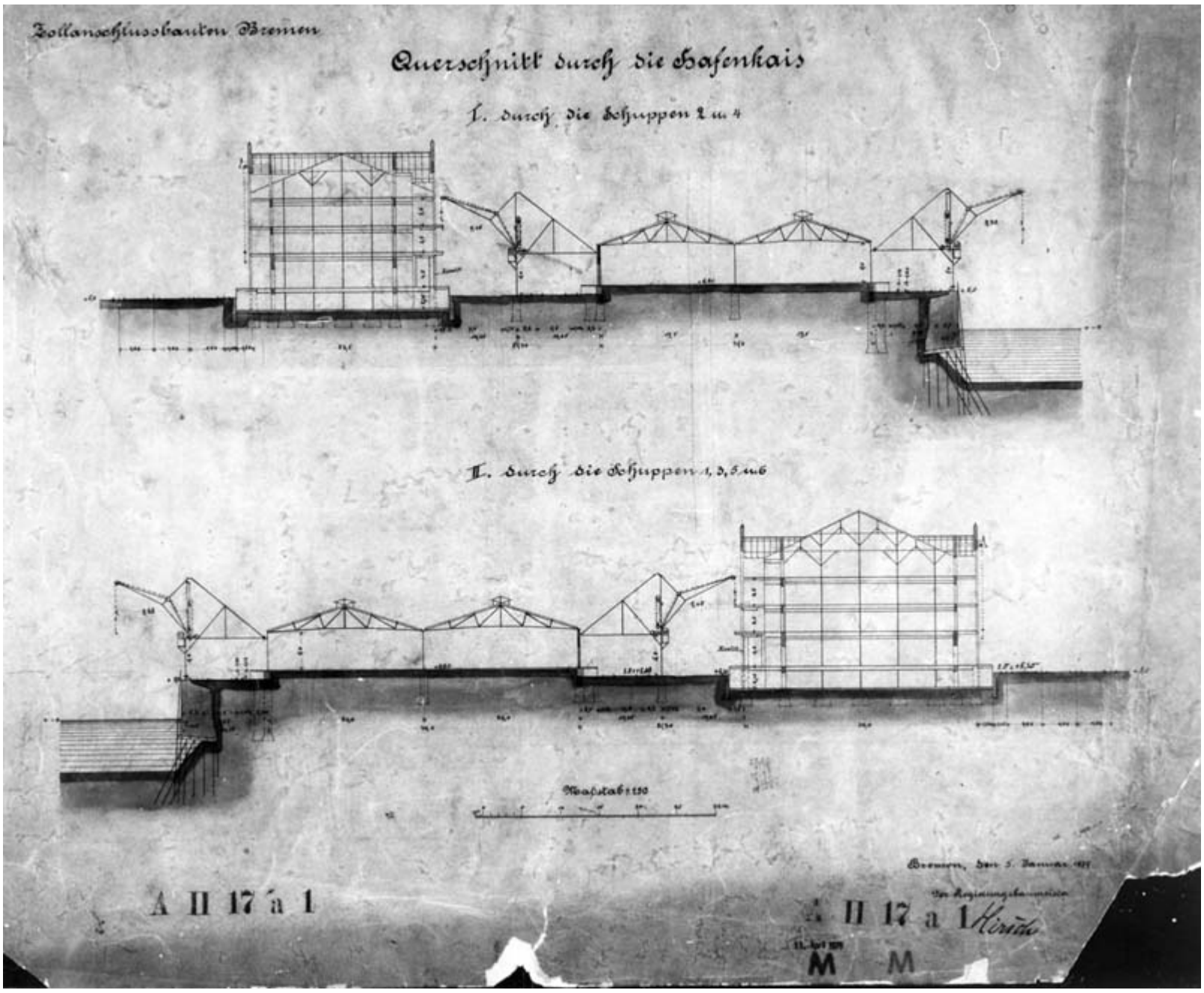


Fig. 38. Section through the harbor quay and warehouses in the Bremen free port. Source: Regierungsbaumeister, *Zollanschlussbauten Bremen, Querschnitt durch die Hafenkais*, 1879. Lilli Hasche, Janne Jensen, Katrin Amelang and Silke Betscher, "3. Baumwollhandel," *Ankerpunkte der Verflechtung: postkoloniale Spuren in der Bremer Überseestadt (Audio-Guide)*, accessed 10 November 2023, https://ankerpunkte.ak-hafen.de/.

Common to both the establishment of the DSPAG's mining activities on Angaur and the expansion of the Norddeutscher Lloyd as a vertically integrated corporation was the comprehensive rationalization of the Weser River. Between 1886 and 1895, the hydrological engineer Ludwig Franzius led the so-called *Weserkorrektion* (Weser correction)—a major project undertaken by the Free Hanseatic City of Bremen to regularize the flow and increase the depth of the Weser (figure 35). Centuries of agricultural expansion and subsequent erosion had, by the nineteenth century, caused sufficient siltation to prevent vessels from reaching the unloading and storage facilities in Bremen, which presented a commercial disadvantage for the city in its competition for trade with nearby Hamburg. Subsidiary harbors had been purchased and developed by Bremen downriver at Vegesack (1671) and Bremerhaven (1830) to combat this issue, requiring all goods to be loaded onto barges before being transported upriver. As Franzius notes in his *Korrektion der Unterweser* (1888): "The aim is to improve the entire upper tidal area above Bremerhaven in such a way that the newly created conditions are maintained by the increased and regulated currents [...] and that the lower tidal area will also experience an improvement as a result of the increased inflow of flood water."[30] To achieve these increases in volume, current and depth, a dredge was used to remove 30 million cubic meters of sand from the riverbed of the Weser; curves were straightened by ramming timber piles into the soft banks and backfilling excavated material; and the edges along the entire length of the river north of Bremen were reinforced by foundation walls and breakwaters using 1.2 million cubic meters of imported stone (figure 36). Gradually, the Weser was transformed into a heavily engineered canal between Bremen and the North Sea along which large seagoing vessels with drafts of up to five meters could safely navigate all the way to the *Europahafen* (Europe Harbor)—declared a free port in 1888—and the later *Überseehafen* (Overseas Harbor) near the city center (figure 37). Here, the throughput of the

logistical system designed by Franzius was accelerated further. Warehouses on long quays up to 400 meters in length were set back from the harbor edge by rail lines and flexible semi-gantry cranes. Goods could be loaded directly into waiting trains or stored in the multi-story warehouses for later distribution and transshipment (figure 38). Together, these measures were referred to as the "Bremer System," devised to minimize cost by maximizing the speed of handling.[31] To manage the operation of this system the city's merchants established a port authority known as the *Bremer Lagerhausgesellschaft* (Bremen Warehouse Society), which continues to operate as BLG-Logistik today—a venture in which the city of Bremen holds a controlling interest.[32]

The Weserkorrektion secured Franzius' international reputation in hydraulic engineering circles. In 1901, he submitted a proposal for the regularization of the Huangpu River in Shanghai in collaboration with the American engineer Lindon W. Bates. In Bates' 1905 proposal for the Panama Canal, he celebrated his German colleague, declaring that "the world is indebted to [Ludwig Franzius], whose monumental success on the Weser attests to the genius which won an erratic river to a regular flow."[33] As argued in the walking tour audio guide produced by the *Arbeitskreis Hafen Bremen* (Working Group Bremen Harbor), the Weserkorrektion and the Bremer System are also indicative of the significance of maritime infrastructure as a fundamental technical and commercial mode through which German colonialism was advanced:

> On the West African coasts, the German Imperial Government commissioned maritime infrastructure to meet the needs of colonial merchants and the logistical requirements of the so-called "Protection Forces" (*Schutztruppen*), for example by the Franconian engineering group MAN. In Kiautschou Bay, on the east coast of China, the Imperial Navy developed a harbor colony with the help of the Hamburg construction company Fehring on the recommendation of Ludwig Franzius' younger brother. [...] The colony was conceptualized as an experimental space where hydraulic engineering methods and techniques could be tested under ideal conditions. In this respect, the Weserkorrektion was neither the sole concern of competing neighboring cities, nor can it be adequately understood as the intellectual accomplishment of a single engineer. Rather, the biographies of the Franzius brothers make it clear that the colonial project not only gave Hanseatic merchants the opportunity to expand their commercial activity, but also served as a practical field of innovation for engineering science and industrial manufacturing, both in colonial territories and in the metropole.[34]

Insofar as the Schutzgebiet was an administrative form suited to the extractive logic of German colonialism it also presented a series of technical problems—both at home and abroad—that relied on the engineering expertise and infrastructural intervention promoted and enacted by the likes of Franzius, Wiegand, F. H. Schmidt and Dernburg. As one such example, the Weserkorrektion remained central to the commercial interests of the Norddeutscher Lloyd and the DSPAG in particular: close to sixty percent of the early rock phosphate exports from Angaur were shipped along the corrected Weser River to Bremen on Lloyd vessels prior to distribution to superphosphate manufacturers. The closest such manufacturer was the Superphosphatfabrik AG Nordenham, which had also been established by the Norddeutscher Lloyd in 1906 as yet another of the Wiegand industries, anticipating phosphate imports from its mining activities on Angaur. The factory complex in Nordenham was located upriver from Bremen, on the opposite side to Bremerhaven, and provided superphosphate fertilizer to the extensive agricultural districts of Lower Saxony. As fate would have it, the company ultimately merged with Ohlendorff's former Anglo-Continental Guano Works in the mid-twentieth century, becoming Guano-Werke AG.

As Dixon argues, chemification is characterized by a simultaneous extension into resource and labor frontiers (Chincha Islands, Malden Island, Lacepede Islands, Nauru, Angaur, Banaba, Christmas Island, Makatea), and a concomitant consolidation and intensification of industrial power in urban-imperial

centers (Hamburg, Bremen, London, Melbourne, Adelaide, Auckland, Wellington). Reflecting on the German superphosphate industry in 1913, the chemical engineer Carl Elschner discerned this intensification in the transition from the "once primitive facilities" found during the time of Ohlendorff's early guano works in Hamburg to the "highly developed superphosphate factories" such as the Superphosphatfabrik AG Nordenham. The latter factories now boasted "larger, ventilated storage and working spaces, rationalized crushing facilities with increased capacity," in addition to widespread automation and mechanization of the production process. The modernization of the superphosphate industry, Elschner argued, was on par with the successes of the more celebrated chemical industries in Germany—especially paints and pharmaceuticals—for which the country had become known in recent decades. "If one were to briefly consider the history of the superphosphate and artificial fertilizer industry, especially in the last thirty to forty years," Elschner hypothesized:

> then I imagine one would come to the conclusion that it readily sits alongside the other branches of German chemical engineering—indeed, I would like to assert that it far surpasses them all, even if the majority of the German people have no real idea of the tremendous value that fertilizers represent annually and, much less, of the incalculable increase in the monetary value of our agricultural products that have been achieved as a result of the German artificial fertilizer industry.[35]

But the value of this industry went beyond simply increasing agricultural production in Germany. It had delivered significant returns to the Reich in the form of phosphate mining royalties raised in the Schutzgebiete; it had provided opportunities for German architects, construction companies and engineers to expand their professional spheres of activity; and it had contributed to the industrialization and modernization of waterways and urban precincts in Bremen and Hamburg. In the process, it had precipitated German corporations' effective self-government of resource colonialism and prompted the state to formalize its approach to the acquisition of colonial territory. As Anneliese Scharpenberg and Hartmut Müller have argued, no German colonial-political measures were adopted in the phosphate industry "that would have incentivized exportation to the motherland and thus shifted the market position in favor of European sales." Instead, trade relations in German Micronesia "were governed exclusively by global economic considerations," influenced by factors such as comparative freight costs, more recent discoveries of phosphate deposits closer to Europe and the introduction of new types of synthetic fertilizer.[36] The gradual shift of rock phosphate exports from Angaur and Nauru towards the Japanese and Australian markets in the early twentieth century was therefore the inevitable outcome of fluctuations in the world phosphate market. This was also entirely by design; the result of the administrative form and entrenched infrastructuralism of German colonial policy and its foundation in the market-based structures of Hanseatic imperialism (figure 39).

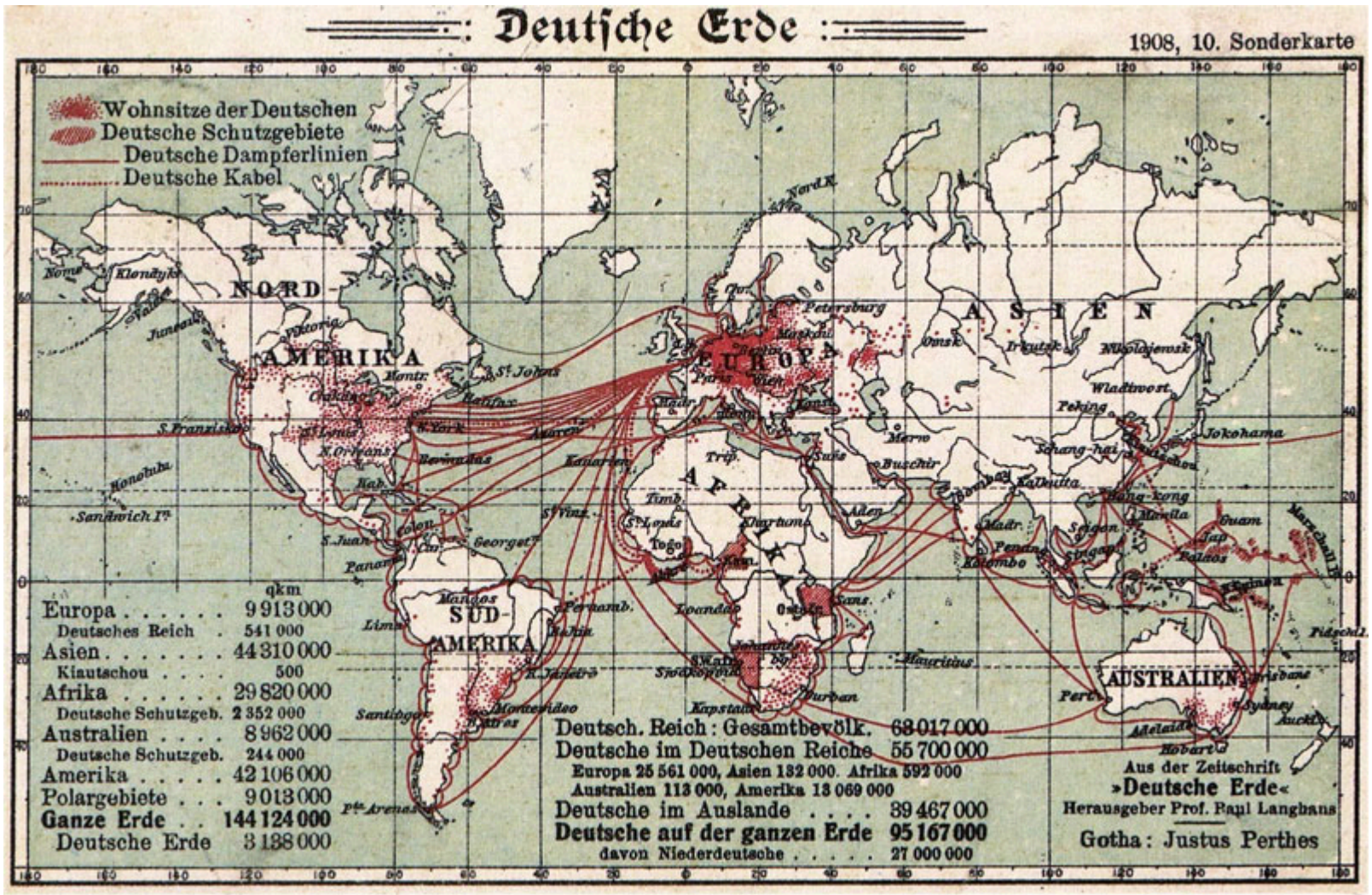


Fig. 39. Map showing German settlements, Schutzgebiete, shipping routes and telegraph cables. Source: Paul Langhans, *Deutsche Erde* (Gotha: Justus Perthes, 1908), map 10.

Fig. 40. The *Antikolonialdenkmal*—also known as "the elephant"—in Bremen's Nelson Mandela Park.

In Bremen's Nelson Mandela Park—which feeds into the larger Bürgerpark that was partially funded by Heinrich Wiegand and the Norddeutscher Lloyd—I stumble across a large masonry elephant known as the *Antikolonialdenkmal* (Anti-colonial Monument). After starting life as the *Reichskolonialehrendenkmal* (Imperial Colonial Monument) in 1931 to promote the reacquisition of German colonies, the statue was rededicated in 1990 to commemorate Namibia's independence (figure 40). The elephant cuts a more imposing figure than the Ohlendorff lion in Blohms Park in Hamburg, and, also unlike the lion, the elephant is appended by a plaque outlining the changing perceptions of German colonialism in the city of Bremen. Facing the elephant, the Weser River lies behind me. I follow its course in my mind: from the warehouses in the old Überseehafen, along its regularized edges, past the former sites of the Wiegand industries at

Vegesack and Nordenham before draining into the North Sea. I imagine something similar for each of the phosphate ports in Australia and New Zealand: thousands of ever-larger ships plying the Indian and Pacific Oceans and the Tasman, Coral and Philippine Seas, descending on two small islands in Germany's Pacific Schutzgebiete. If I cannot find any mention—let alone memorialization—of the colonial history of Nauru and Angaur in Germany, I am curious what I will find on the islands themselves, which is where my travels will take me next.

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ON TERRITORY: EXTRACTIVE SOVEREIGNTY AND AUSTRALIAN EMPIRE

Jan 19, 2024 by Jasper Ludewig Leave a comment

Nauru is a 21-square-kilometer island republic in Micronesia that frequently appears on lists of the world's least visited countries (figure 1). I first lay eyes on it shortly before nightfall from the small old plane that has conveyed me there over 3,300 kilometers from Brisbane: an almost imperceptible terrestrial ripple on the otherwise glassy surface of the Pacific Ocean. The plane's once white internal fit-out is yellowed with age and its fuselage lets out a reluctant croak as we bank towards the short landing strip. Plummeting towards the land, passengers shrieking at the rapid rate of descent, I make out the coral reefs fanning the perimeter of the island and the narrow strip of development—shops, houses and industrial facilities—encircling the dark mass of its interior (figure 2). After taxiing to the airport terminal in Yaren District—Nauru's 1.5-square-kilometer capital—we disembark onto the hot tarmac. The air is heavy and still, carrying the sound of music and the clamor of traffic noise from the nearby Island Ring Road. The sun sets quickly at the equator and before long the low-hanging clouds have been consumed by the muggy night. I climb into an air-conditioned van and am shuttled to one of the three hotels on the island: a sprawling, faded complex that stares out at the oil-slick sea (figures 3 and 4).

Fig. 1. Satellite image of Nauru. The airstrip is visible in the south of the island, as is the coastal development running around its perimeter. The lighter vegetation in the center indicates former phosphate mining sites. The clearings are either active mining sites or the locations of the Regional Processing Centers—the Australian immigration detention facilities run as part of Operation Sovereign Borders. Image courtesy of the U.S. Department of Energy Atmospheric Radiation Measurement (ARM) user facility.

Fig. 2. View of houses along the Island Ring Road from the plane shortly before landing.

Fig. 3. The view from reception at Menen Hotel.

Fig. 4. One of the many stray dogs on Nauru next to Menen Hotel's function center where, on my first night on the island, the President held a private party for his ministers until late at night.

Nauru is a raised coral atoll formed by the erosion of a large volcanic seamount over millions of years. As sea levels dropped, the coral reef became dolomitized by seawater and eroded in the tropical conditions, leaving large limestone pinnacles mounding to around fifty meters to form the central plateau of the island, known today as Topside (figure 5). These pinnacles, many of which still bear impressions of the coral once attached to them (figure 6), were filled in by humus and seabird excrement over millennia to create vast rock phosphate deposits up to several meters deep covered by dense jungle. Human settlement of Nauru is estimated to have occurred at least 3,000 years ago by Micronesians who established a political system on the island based on twelve tribes. A distinct language developed, aquaculture was practiced in the freshwater Buada lagoon, and coconut palms and pandanus trees were cultivated to sustain a fluctuating population of between 1000 and 3000 people (figure 7). The lack of a natural harbor and the extreme isolation of Nauru from other islands—the closest of which, Banaba (Ocean Island), is located some 300 kilometers away in the Gilbert Islands—delayed contact between Nauruans and the European whalers and traders operating in the region until the late nineteenth century. By 1887, the year in which Nauru was incorporated into the German Marshall Islands Protectorate, there were only ten white residents on the island, all of whom were trading in copra.[1]

Fig. 5. Limestone pinnacles are all that remain once the phosphate deposits have been exhausted. The denuded landscape stretches across the entire area of Topside, Nauru's central plateau.

Fig. 6. Many pinnacles still bear the impressions of the coral reef that grew from them thousands of years ago.

Fig. 7. Buada Lagoon, a small freshwater catchment on Nauru's central plateau, was once used for farming Milkfish. A subterranean freshwater pool on the coast served as the island's water supply until it became saline as a result of phosphate mining. Drinking water is now produced by four desalination plants on the island.

European interest in Nauru escalated dramatically with the discovery of its rock phosphate deposits in 1900 by Albert Ellis of the London-based Pacific Islands Company. As recounted in my second report, the Company presented a paradigmatic example of Greater British enterprise in the Western Pacific, combining capital and expertise drawn from throughout England, Australia, and New Zealand to realize the value of Pacific commodities within the markets of industrial capitalism. With Ellis's discovery of phosphate on both Nauru and Banaba, the Pacific Island Company was quickly liquidated and reconstituted as the Pacific Phosphate Company (PPC) in 1902, attracting significant investment from William Lever—later the Lord Leverhulme of Unilever fame—and appeasing the German colonial authorities on Nauru by reserving a portion of the new company's board for German representatives. Within a decade of establishing the PPC, close to 300,000 tons of phosphate were leaving Nauru and Banaba annually, extracted and processed by thousands of indentured laborers and bound for superphosphate manufacturers at ports in Australia and New Zealand (figure 8).[2]

Fig. 8. Indentured laborers from the Gilbert and Ellice Islands c.1910 working the phosphate deposits on Nauru. The phosphate can be seen between the limestone pinnacles. The former surface level of the island, prior to mining, can be seen in the background. Maslyn Williams Nauru Photographs, State Library of New South Wales, PXB 293, Image 59.

Fig. 9. The Nauru Phosphate Royalties Trust building in Arijejen. The Trust continues to pay royalties to the landholders on which phosphate mining takes place.

Following World War One, the phosphate deposits on Nauru and Banaba were set aside for the exclusive use of British polities under the auspices of the British Phosphate Commission (BPC), which from 1949 also acted as the managing agent for the phosphate works on Christmas Island in the Indian Ocean. In 1967, the newly independent Republic of Nauru purchased the BPC's mining assets, which were resumed in 1970

under the Nauru Phosphate Corporation. The profits of the now sovereign phosphate industry were managed by the Nauru Phosphate Royalties Trust (figure 9), which gradually amassed an international real estate portfolio spanning Australia, the Philippines, Fiji, Guam, Samoa, the United States, New Zealand, and the United Kingdom, as well as investing in a failed 1993 West End musical production about Leonardo da Vinci's love life. Financial mismanagement and largely exhausted phosphate reserves eventually ensnared the Nauruan government in unmanageable levels of debt, leading it to pursue diverse avenues of investment through quid pro quo deals with foreign governments: a fleet of ambulances in return for supporting Japan's stance on whaling; millions of dollars of Russian economic support following Nauru's backing of the breakaway Georgian territories of South Ossetia and Abkhazia; Taiwanese investment in energy projects and medical facilities after Nauru recognized its sovereignty at the UN. In 2001, Australia established offshore immigration detention facilities on Nauru, which remain in use under the demonstrably inhumane Operation Sovereign Borders, including the construction of a collection of now abandoned one-room dwellings for those asylum seekers who opted to resettle on the island (figure 10).[3] Shortly before I arrived, the Australian government extended its offshore processing agreement with Nauru, allocating $485 million AUD for 2023 alone, representing an annual cost of $22 million per asylum seeker held in detention at that time.[4]

Fig. 10. The housing provided by the Australian government at Anabar in 2017 for asylum seekers electing to permanently settle on Nauru. The dwellings were entirely empty for the duration of my stay on the island.

If Australians know anything about Nauru, they generally recite this potted history in reverse: from immigration detention to spurious international relations and bizarre investments to, eventually, phosphate, which is in turn usually misrepresented under the common Australian moniker for Nauru, "Bird Shit Island" (n.b., rock phosphate is not guano). However, Nauru's controversies and idiosyncrasies belie a far more enduring and substantive relation between the two countries; one based on over a century of European resource imperialism linking the depletion of rock phosphate on Nauru with the expansion of Australia's sprawling wheat industry; an industry that was itself fundamental to the extension of the settler-colonial project in Australia and the political economy of dispossessed Indigenous land upon which that project was premised (figures 11 and 12). Placing *this* relation at the center of Nauru's tumultuous modern

history both reveals continuities between the different forms of extraction first engendered by the phosphate industry and elaborated since—phosphate, finance, asylum—as well as the long history of Australian sub-imperialism in the Indo-Pacific, which continues to inform Australia's expression of its so-called "external sovereignty" in the contemporary geopolitics of the region.

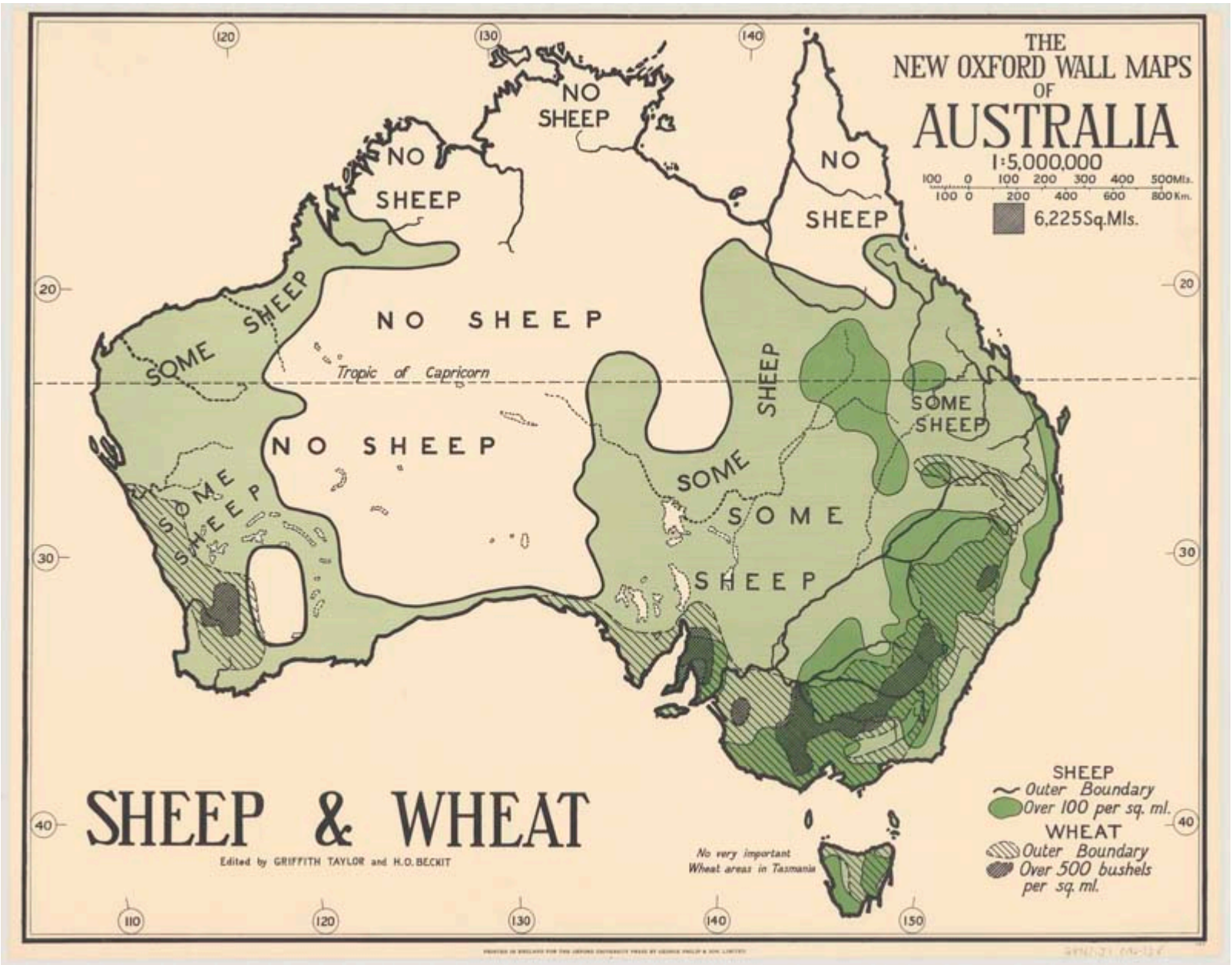

Fig. 11. The hatched areas on the map depict the distribution of Australia's wheat districts in c.1920. Griffith Taylor and H. O. Beckit, *The New Oxford Wall Maps of Australia: Sheep and Wheat* (London: Oxford University Press, c.1920).

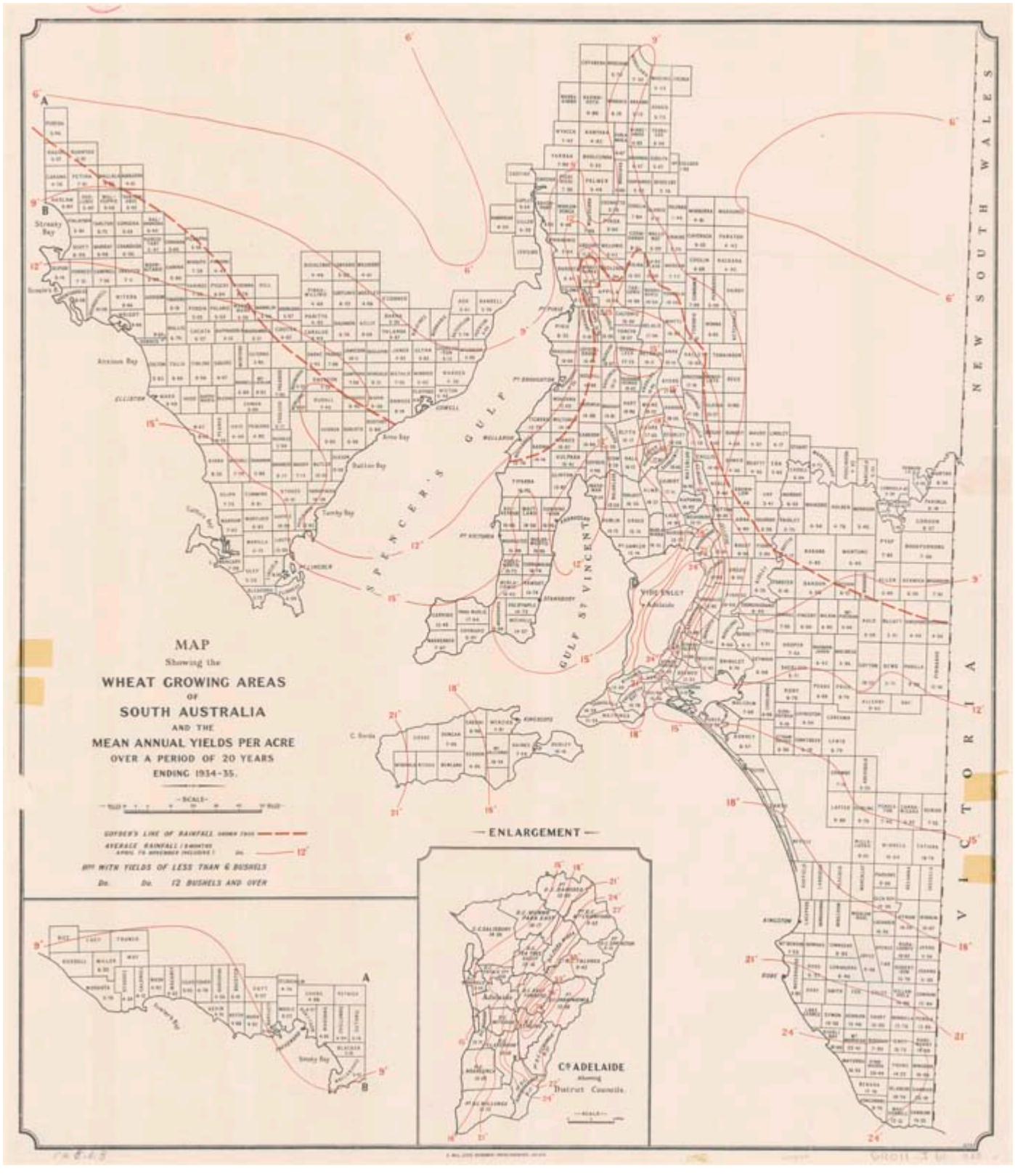

Fig. 12. South Australian Department of Agriculture, Map showing wheat growing areas of South Australia and mean annual yields per acre over 20-year period, 1935, National Library of Australia, 2828157.

In this reflection on my trips to Nauru and Christmas Island over the past few months, I return to a formulation discussed in my previous report and first proffered by the legal scholar Cait Storr in her recent study of the administrative history of Nauru: where legal status shifts, bureaucratic form accretes. According to Storr, the final shift in the legal status of Nauru from UN Trust Territory to sovereign state in the mid-1960s, "appears not as a *break with* but as a *stage in* the bureaucratisation of an imperial administrative form instantiated in the late nineteenth century" under colonial rule.[5] The same can be said for the history of the administration of Christmas Island, from its original annexation by the British Crown in 1888 to its incorporation into the British Straits Settlements and the Crown Colony of Singapore, through to its management by the British Phosphate Commission from 1949 until its purchase by Australia in 1958. According to Storr's formula, the evolution of both islands' legal status was always subtended by the increasing bureaucratic rationalization of colonial jurisdiction, in the sense that "facilitating the outward flow of natural resources" from each territory remained "the raison d'etre of the state's administrative form" as it shifted over time.[6] And where the process of bureaucratization involves rules, jurisdictional areas, hierarchical structures, written documents and maps, these were ultimately all developed and deployed to enable the physical removal, processing and circulation of phosphate from the Indo-Pacific onto foreign soils. Storr's formula thus inadvertently emphasizes the inherently material—technological, infrastructural, architectural—conditions of the extractive sovereignty she describes, even if these fail to enter her analysis per se.

My intention in this report is therefore to relate the linked administrative histories of Nauru and Christmas Island (and Banaba, which I was not able to visit in person) to the residual buildings, mining sites, facilities and industrial equipment I encountered during my travels.[7] In light of the above discussion, I understand these different forms of spatial production both as relics of a colonial industrial enterprise that radically altered the ecological and societal conditions on the islands themselves, as well as vehicles in the stabilization of Australian sovereignty more broadly. As Storr explains, "'Australia' is necessarily understood as a sub-imperial as well as a colonial project. The Australian state is a colonial project built and maintained on the denial of Indigenous ownership of the continent,"[8] but also on its "sub-imperialist posturing in the Pacific region" where the Australian colonies attained regional supremacy through the extractive activities of both public and private forms of authority.[9] As the administrative histories of Nauru and Christmas Island elucidate, the territorial boundaries of 'Australia' have always exceeded the official limits of Australian sovereign territory in what amounted to a sub-imperial technological system linking remote resources with domestic production.[10] The relics of this system remain strewn across both islands, readily accessible to the interested visitor.

Fig. 13. Views from my hire car #1: A house built into a limestone pinnacle.

Fig. 14. Views from my hire car #2: An abandoned four-story mansion in Ewa stands as a monument to Nauru's former wealth during the 1990s.

I quickly lost track of how many times I circumnavigated the Republic of Nauru on the Island Ring Road in my hire car (figures 13 and 14). The trip takes approximately twenty minutes depending on the number of police checkpoints in operation, or whether the President is currently enroute somewhere in his black Lexus limousine. If he is, all cars are required to pull over immediately until he and his entourage have sped past. These were always good opportunities to tune into the island's radio station, which in addition to broadcasting Australian news bulletins on the hour also played a variety of obscure disco songs on repeat —most notably "Oriental Boy" by The Flirts—along with a mix of more recent hits from across the Pacific. Tongaruan's "I'll be Drinking when I'm Hurtin'" was especially popular and remains on high rotation in my household at the time of writing. Other things I did not know about Nauru before traveling there: small quantities of phosphate are still mined and exported from the island, primarily to Australia and South East Asia; an imported Australian lettuce costs $18 AUD in either of the two supermarkets on the island; the country uses Australian currency dispensed by Australian banks; its schools use an adapted version of the official curriculum of the state of Queensland; its legal system is modelled on Australia's; and, when Nauru brought the case to the International Court of Justice in 1989 that the Australian government had breached its fiduciary duty to promote the economic and social wellbeing of the Nauruan people by failing to remediate the phosphate mines worked almost to exhaustion during the period in which the island was a UN Trust Territory, the case was settled out of court four years later with Australia insisting that it would only pay penalties in the form of increased aid to avoid the public perception that it was criminally liable.[11] Australian Aid logos are still littered throughout Nauru, affixed to shipping containers, generators, and buildings. The fact that the lucrative immigration detention facilities on Nauru are physically located in exhausted phosphate mining pits—the hottest, most exposed, windless sites on the island—puts a dark spin on the pervasive ways in which "remediation" and "aid" continue to inform Nauruan and Australian relations thirty years after the lawsuit was settled (see figure 1).

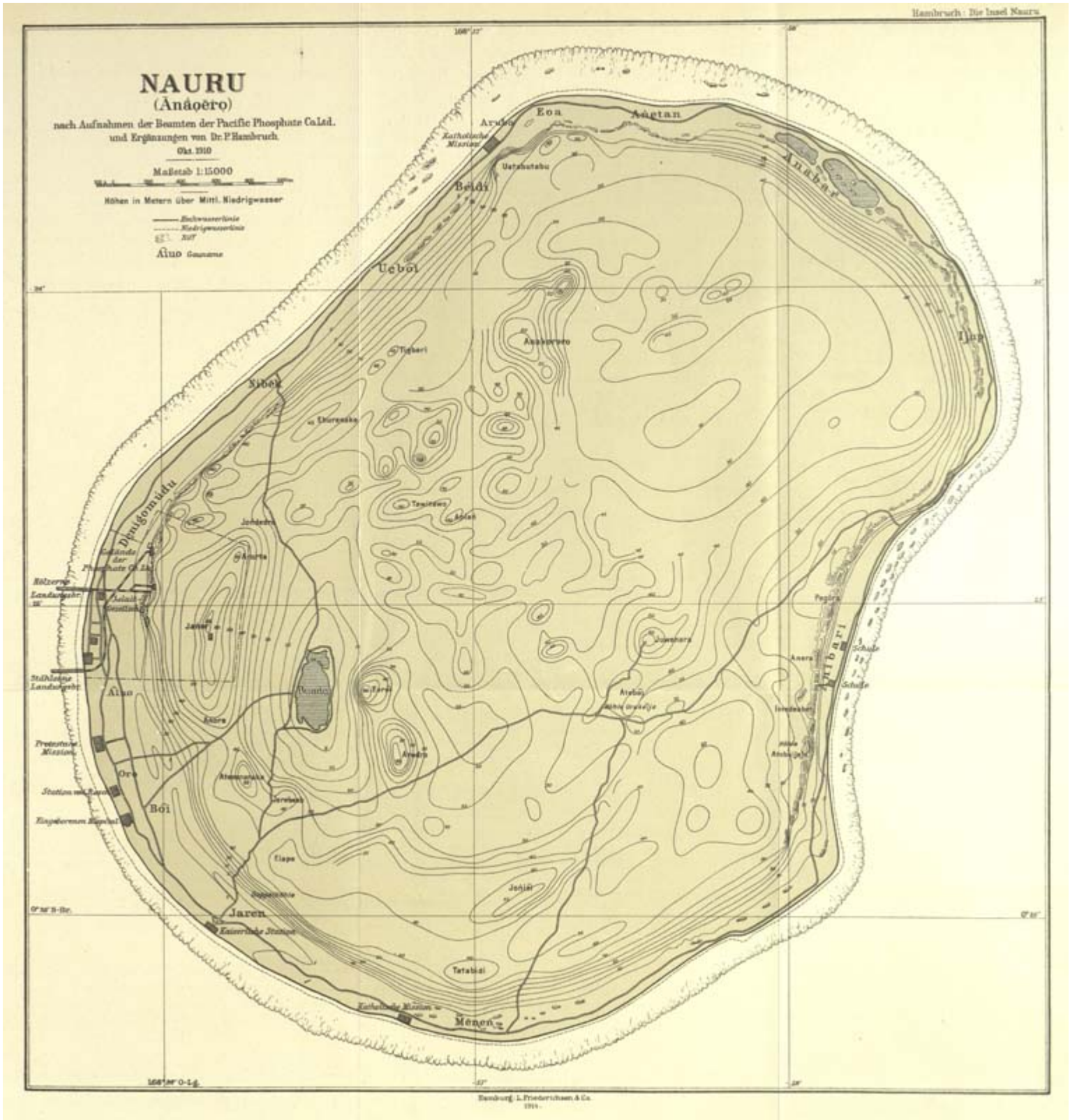

Fig. 15. Paul Hambruch's map of Nauru during the early period of the Pacific Phosphate Company's operations on the island, showing the Company's facilities directly adjacent to those of the Jaluit Gesellschaft. The map was completed in 1914 based on observations made in October 1910. Paul Hambruch, *Nauru nach Aufnahmen der Beamten der Pacific Phosphate Co. Ltd. und Ergänzungen von Dr. P. Hambruch, Okt. 1910* (Hamburg: L. Friederichsen & Co., 1914).

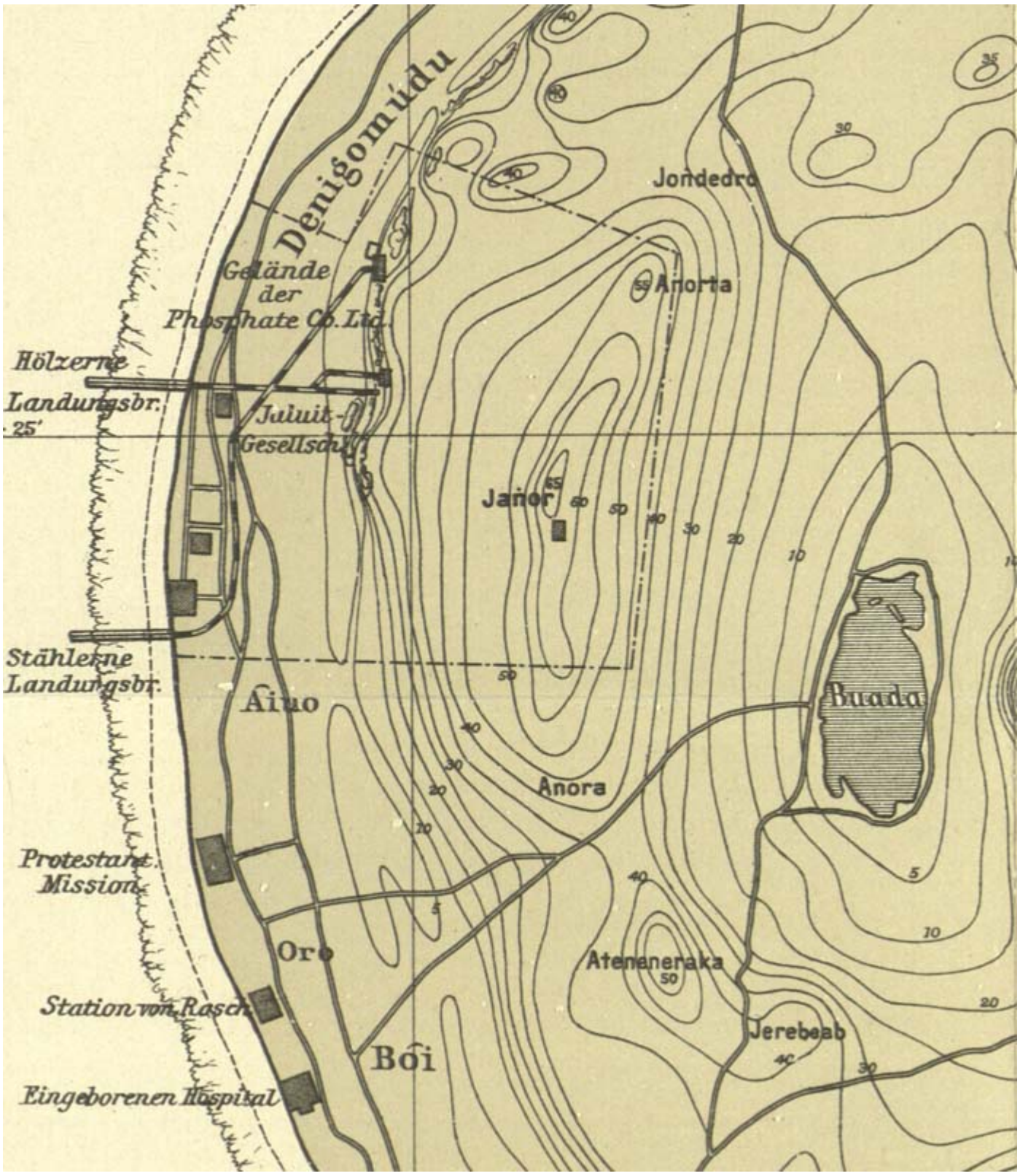

Fig. 16. Detail of Hambruch's map of Nauru depicting timber (*Hölzerne Landungsbr.*) and steel jetties (*Stählerne Landungsbr.*) within the PPC's original mining lease.

Fig. 17. One of two pivoting steel cantilevers currently used by Republic of Nauru Phosphate Corporation to load ships in the deeper water off the coral reef.

Fig. 18. Conveyors transport the crushed and dried phosphate to the cantilevers for loading.

Fig. 19. The steel cantilevers and conveyor system used on Nauru in c.1932, during the period of the British Phosphate Commission. Maslyn Williams Nauru Photographs, State Library of New South Wales, PXB 293, Image 116.

Fig. 20. The BPC's steel cantilevers sit collapsed onto the coral reef, surprisingly intact given the corrosive environment and heavy seas they face.

Eventually, my daily trips around Nauru started to yield results. An important document in this regard was Paul Hambruch's 1910 map of the island, first drawn three years after the Pacific Phosphate Company had exported its initial shipments of mined rock (figure 15). The map shows two large jetties in the Aiwo district —one timber, one steel—protruding beyond the fringe reefs (figure 16). Driving to the site depicted on the map, I find the most recent iterations of the former jetties: large rotating steel cantilever structures connected to the phosphate crushing and drying facilities by a mechanical conveyor belt (figures 17 and 18). Further along the coast, two previous cantilevers, built in the early 1930s during the period of the British Phosphate Commission and destroyed by a German raider in World War Two, remain in place, collapsed face-first into the ocean (figures 19 and 20). With each increase in the length and speed of the loading facilities on Nauru and Banaba, annual exports of phosphate increased in turn, reaching a pre-1930s peak of more than 560,000 tons.[12] To prevent the Company's ever-larger steamers from being washed against the reef while under loading, Nauru also received the deepest moorings in the world, laid in 1200 feet of water (figure 21).

Fig. 21. Nauru's moorings were the deepest in the world, tethered to the seabed by lengths of extremely thick chain, much of which now lies strewn along the coral beaches on the island. Shown here is *Nauru Chief* under loading in c.1932. Maslyn Williams Nauru Photographs, State Library of New South Wales, PXB 293, Image 114.

Fig. 22. A former tramway cut through coral pinnacles at the site of the PPC's earliest mining activities on Nauru.

Fig. 23. The locomotives used to shunt phosphate carts from the mining sites to the loading facilities on Nauru were imported from Britain and Germany. Shown here is a steam locomotive in c.1915. The island's aerial cableway can be seen in the background of the image. Maslyn Williams Nauru Photographs, State Library of New South Wales, PXB 293, Image 69.

Fig. 24. Indentured Chinese laborers and a white overseer scraping phosphate from the limestone pinnacles at Topside in c.1915. Maslyn Williams Nauru Photographs, State Library of New South Wales, PXB 293, Image 60.

Fig. 25. Parts of the twentieth-century industrial equipment used to process phosphate remain dispersed around Nauru today. Seen here are likely the elements of a rotatory drying system, used to prepare the crushed phosphate prior to shipping according to international industry standards regarding moisture content.

Fig. 26. More parts—ducts, hoppers, trays and roof sheeting—in front of a disused phosphate conveyor belt overgrown by the resurgent tropical scrub.

A dashed line on Hambruch's map delineates the boundary of the earliest areas worked by the PPC, extending eastward from the Island Ring Road up the steep incline onto the raised plateau overlooking the loading facilities below (see figure 16). I navigate to the outer edges of the line in my hire car before stepping off the gravel road into the jungle where I find a maze of overgrown paths wending their way around countless limestone pinnacles (figure 22). I soon realize the paths I am following were once the tramways along which phosphate carts were shunted by small steam locomotives, filled by laborers who had pried the rock from the razor-sharp pinnacles by hand (figures 23 and 24). Dispersed all around me is the disarticulated detritus of a century-old mining operation: rusting tracks, cogs, ducts, and implements too disassembled to properly identify (figures 25 and 26). I push further east onto Topside, following a much larger railway embankment on either side of which the landscape has been comprehensively stripped back by mining—the pinnacles starting to disappear under ferns, creepers, and large figs (figure 27). I come across a brick coal store and kiln for fueling the early locomotives and find a small collection of cast-iron bowls, kettles, and ceramic Japanese dishes likely used by laborers on their lunch breaks to save the long trip down to the mess halls in the company settlement on the coast (figure 28). Large steel structures line the embankment (figure 29), possibly remnants of the aerial cableway that once conveyed mined rock from Topside to the processing facilities further downhill (figure 30)—a system designed by the Australian engineering firm J. M. and H. E. Coane, who acted as consultants for the PPC before World War One.

Fig. 27. Limestone pinnacles and the remnants of the aerial cableway connecting Topside to the processing facilities near the port.

Fig. 28. Bowls, dishes, and kettles found near the coal store and kiln at Topside.

Fig. 29. One of the steel structures lining the main embankment at Topside, likely the base for the aerial cableway designed by the engineers J. M. and H. E. Coane of Melbourne.

Fig. 30. The aerial cableway on Nauru in c.1915. Maslyn Williams Nauru Photographs, State Library of New South Wales, PXB 293, Image 65.

Fig. 31. A c.1930s former BPC officer's residence in the residential quarter on the cliffs of Arijejen, once overlooking the phosphate processing facilities on the coast below.

Fig. 32. The house is being slowly consumed by a large Banyan fig, its roots penetrating the asbestos roof and timber floor.

Fig. 33. A different, c.1950s BPC officer's residence in the residential quarter disappearing under a prolific vine.

The redefinition of Nauru after World War One from Germany colony to UN Trust Territory under the League of Nations' mandate system involved a joint payment of £3,500,000 to the PPC from the governments of the United Kingdom, Australia, and New Zealand for the Company's existing rights, titles, and industrial plants on Nauru and Banaba. Henceforth, the operations on both islands were managed by the British Phosphate Commission. The BPC's tripartite model of governance, defined in the 1919 *Nauru Island Agreement*, assigned forty-two percent each of the costs and phosphate accrued by the BPC to the United Kingdom and Australia and sixteen percent to New Zealand. The remit of the Commission was to supply cost-price phosphate for chemical fertilizer manufacturers in all three member states, however in its first two years of operation alone, seventy-two percent of all shipments arrived in Australia; only five percent in the UK and New Zealand respectively; while eighteen percent was sold to other countries at market price to defray the BPC's running costs. The administrative practices of the Commission maintained continuity with those of the PPC, employing the Company's former executives—including Albert Ellis—as commissioners under the new arrangements. A large residential complex was developed on the slope between the port facilities and the mining sites on Nauru to house the families of the BPC's white managers, engineers, geologists and doctors, now in a state of disrepair through gradual reabsorption into the dense jungle (figures 31, 32 and 33).

Fig. 34. The view from the BPC officers' residential quarter overlooking the rows of housing at Location, primarily for Chinese laborers.

Fig. 35. The 1940s-era workers' housing at Location was originally single-story but was extended by the BPC around 1960 to double its capacity.

Fig. 36. BPC housing for single white men near Location and the BPC's main office on the island.

Fig. 37. The British Phosphate Commission's office building on Nauru, built in the 1930s.

Fig. 38. The Pacific Phosphate Company Island Manager's dwelling—Stanmore House—in c. 1919, initially used by the BPC and replaced in the 1930s with the office building depicted in figure 37. Maslyn Williams Nauru Photographs, State Library of New South Wales, PXB 293, Image 46.

Fig. 39. The BPC Mess Room, 1924, located in the main company settlement at Aiwo. T. H. Cude Nauru Island Photographs, 1920–1953, PXE 650 (vol. 2), Image 7.

Fig. 40. Location plan of buildings in the BPC's company settlement at Aiwo, c.1965. T. H. Cude Nauru Island Photographs, 1905–1966, PXE 650 (vol. 1), Image 2.

Continuity in administration between the Pacific Phosphate Company and the BPC also ensured the continuity of the foundational structures upon which phosphate mining on Nauru had been premised since the turn of the twentieth century. The use of indentured labor was significantly upscaled during the BPC period as evident in the rows of two-story walk-up flats located directly next to the boat harbor—a site still known today as Location—where primarily Chinese laborers and their families were housed (figures 34 and 35). Small standalone cottages adjoin the Location precinct (figure 36), built for single white men employed at the nearby mechanical workshop, phosphate loading facilities or in the BPC's main administrative building, which has been repurposed as a site office for the ongoing redevelopment of Nauru's port (figures 37 and 38). White-only recreational and utility buildings (figure 39)—a theatre, staff club, mess hall, stores, etc.—were dotted around the main office building, establishing a racially segregated modern enclave for the white governing minority on the island whose elevated form of living and assertive managerialism signaled to the outside world—including its strong critics in the League of Nations—that the BPC was fulfilling its obligations as an enlightened administrator of Nauru (figure 40). The architecture on the island remained an important tool in stabilizing and maintaining the racial hierarchies inherent in the colonial phosphate industry. Investment in the expansion and modernization of the islands' mining facilities continued to be prioritized over the wellbeing of the non-white workforce, deemed essential but ultimately inexhaustibly replaceable within the system of indenture.

Fig. 41. View overlooking Flying Fish Cove, phosphate loading facilities and the Malay Kampong Group—formerly Edinburgh Settlement—on Christmas Island.

Fig. 42. Jagged limestone cliffs and thick jungle along the south coast of Christmas Island.

Fig. 43. A Brown Booby (*Sula leucogaster*), co-conspirator in the accumulation of Christmas Island's phosphate deposits. Red crabs cling to the limestone cliffs in the background.

Fig. 44. Christmas Island Phosphates is only permitted to work existing mining sites on the island and cannot open new ones. Nevertheless, the sites are dotted throughout the Christmas Island National Park, much of which is coated in a pervasive layer of phosphate dust that washes into the water during the wet season causing degradation of the coral reef.

The same organizational logic and spatial relationships established within the phosphate industry on Nauru and Banaba remain evident 7,000 kilometers away on Christmas Island in the Indian Ocean (figure 41). Like its Pacific peers, Christmas Island is the geological result of an underwater volcano rising 5000 meters from the seabed and building coral reefs now interred as a limestone cap over the island's basalt substructure (figure 42). Decomposing organic matter and the excrement of the thousands of birds that roost on the island each year accumulated on top of this limestone cap over millennia (figure 43), forming rich phosphate deposits that continue to be worked today by the Malaysian firm Christmas Island Phosphates (figure 44). Large road trains—trucks pulling more than two trailers—barrel along the wide roads cut through the Christmas Island National Park on the island's central plateau, dodging the famous red crab on its annual migration from land to sea, before dumping the mined rock at a processing plant connected to the port by a dramatic elevated conveyor system (figures 45–53).

Fig. 45. Road trains barrel through the Christmas Island National Park. The metal guard running along the side of the road is designed to prevent the red crab from crossing. Instead, heavily engineered under- and overpasses have been constructed along the main roadways to assist the crabs in safely conducting their annual migration to the sea.

Fig. 46. The phosphate conveyor at Drumsite, overlooking Flying Fish Cove below.

Fig. 47. The phosphate tip at Drumsite, where the phosphate undergoes further processing before continuing towards the port.

Fig. 48. An enclosed conveyor belt runs along the main road at Drumsite. The feeder, shown here, extracts the phosphate dust produced by the conveyor, which is also bagged and exported.

Fig. 49. The current conveyor system above the old railway incline, halfway up the hill between Settlement and Drumsite.

Fig. 50. The conveyor belt plunges towards the storage facilities at the port.

Fig. 51. Bags of phosphate dust in storage awaiting export.

Fig. 52. The pivoting steel cantilevers that load phosphate from the conveyor system directly into a ship's hold.

Fig. 53. Phosphate dust is tacky and sticks to everything, eventually forming thick layers as seen here.

What immediately sets Christmas Island apart from other phosphate islands, however, is its relative size: approximately six times larger than Nauru and twenty-three times larger than Banaba. It also stands around six times taller than Nauru, reaching 361 meters above sea level to the west at Murray's Hill, named after the Scottish naturalist, John Murray, who first agitated for the Crown to annex the uninhabited island in 1888. Following chemical testing of rock samples taken from one of its inshore reefs during the *Challenger* expedition in the mid-1870s, Murray concluded that Christmas Island was likely to contain large deposits of high-grade phosphate of lime. The Christmas Island Phosphate Company (CIPC) was eventually formed in London in 1897 with Murray as its chairman and mining was commenced two years later by 120 indentured laborers, yielding just ten tons of exported rock by year's end.[13] 36,000 tons were exported in the following year and by 1906, 90,000 tons left the island for markets in Europe and Asia. By 1912, the significantly expanded industrial facilities were capable of processing up to 157,000 tons of phosphate annually, having surpassed a million tons in total exports in the previous year.[14]

Fig. 54. Detail of a 1908 survey depicting the CIPC's phosphate facilities and company settlement west of Rocky Point in the north. Tramways, tanks and quarries are indicated in the areas around Phosphate Hill where the early mining activity was concentrated. John Murray, John D. Murray and C. W. Andrews, *Running Survey of Christmas Island, Indian Ocean* (Edinburgh: The Edinburgh Geographical Institute, 1908), National Archives of Australia, 1121/M.

Fig. 55. Steep hills, limestone cliffs and large Banyan figs are found everywhere on Christmas Island.

Fig. 56. Indentured Chinese coolies on Christmas Island c.1910 under the watch of the District Officer's Sikh protective forces. National Archives of Australia, N29/1, 203206255.

Once again, a map of the island from the early twentieth century proves helpful in locating the original facilities constructed by the CIPC (figure 54). Climbing into my morose-looking hire car, a thoroughly exhausted Toyota Hilux, I ascend from the port at Flying Fish Cove past large cuttings in the limestone cliffs (figure 55), before eventually reaching Phosphate Hill in the north-east of the island, the car's gearbox whingeing with every increase in the steep gradient of the road. There's little to see other than a few non-descript phosphate pits, but the map invokes the story of the work that once took place here. As on Banaba and Nauru, the labor-intensive process of clearing the dense tropical jungle, removing the topsoil and ultimately extracting the phosphate rock required a large workforce in the initial stages (figure 56). To this end, close to 2500 Chinese laborers, indentured from the Sze Yap region of western Kwantung province and from Hainan Island, were contracted by the CIPC each year using the Singapore-based labor agent, Ong Sam Leong.[15] An account of the working conditions on the island in the first years of the Company's operation was provided by the Protector of the Chinese in the Straits Settlements, Lewis Clayton, who visited in 1900:

> The phosphate is at present only being worked at and near the summit of Phosphate Hill. The coolies pick it up from the ground, where it lies in blocks, and throw it into iron trucks running down a slight incline to the head of a double line of rails which descend for a distance of about 500 yards [...] The loaded trucks run right onto a wooden platform and the phosphate is then tipped out of them down 'the shoot'. Coolies at the bottom again pick the stones up and place them in wooden trucks running to the water's edge, which are emptied down a metal line 'shoot' into boats.[16]

In 1909, the system Clayton describes was refined with the introduction of "aerial trams" manufactured by Kerr Stuart in Liverpool, which transferred the phosphate along a cableway from the iron trucks used at Phosphate Hill into the drying sheds at the port. From here, the dried rock was pushed in carts along one of two elevated piers before being tipped into chutes by steam cranes and thereby loaded into the ship's hold. In 1912, following sustained investment in capital works, the phosphate was loaded directly from the storage shed by newly erected conveyor belts (figures 57).

Fig. 57. The *Tonan Maru* under loading by the mechanized cantilevers in 1928. Christmas Island, National Archives of Australia, R32, CIPC 6/25A, 6446584.

Fig. 58. View over Flying Fish Cove showing Edinburgh Settlement, upgraded loading facilities, phosphate tip and the "coolie lines," c.1908. Historical Photographs Relating to Christmas Island, 1905–1925, National Archives of Australia, N29/1, 203206254.

Fig. 59. Housing for European employees of the CIPC c.1910, Phosphate Hill. Christmas Island, National Archives of Australia, R32, CIPC 6/25A.

Fig. 60. The former Christmas Island Club overlooking Flying Fish Cove.

As was the case with the PPC's contemporary operations on Nauru and Banaba, the racial stratification of labor within the CIPC was carried into the housing it provided for its employees. The company's white officers resided in tropical bungalows initially built around Flying Fish Cove that overlooked the phosphate loading facilities and were strictly segregated from the workers' areas (figure 58). The early houses in Edinburgh Settlement, as the residential area was known, boasted large verandahs, extensive eaves, shading devices, and stack ventilation in the steeply gabled roofs (figure 59). Each house, constructed from timber felled on the island, was raised on piers for increased ventilation and rose up to three floors depending on the occupant's status within the company. After hours were spent at the Christmas Island Club where white company employees and their families mingled with members of the District Office—which upheld British rule on the island—over evening drinks. The building now stands boarded-up and deteriorating halfway up the cliff face above Flying Fish Cove, soon to recede entirely into the ravenous scrub (figure 60).

Fig. 61. Detail of a c.1908 map depicting the "coolie lines" running along what is now Gaze Road. The *kongsi* is show towards the beginning of the lines. "Aerial haulage" is shown in red, connecting the phosphate tip further up the hill to the storage shed and loading facilities on the coast. Plan of Flying Fish Cove Christmas Island, Map 1, Miscellaneous Collection Christmas Island Maps, National Archives of Australia, R175, Box 1, 33057600.

Fig. 62. The Mandors quarters, 1930. Christmas Island Housing, National Archives of Australia, R32/C25, 1749820.

Fig. 63. The Mandors quarters today.

On the other side of the CIPC's loading facilities to the Edinburgh Settlement, running from Isabel Beach to Rocky Point, were the so-called "coolie lines"—initially, 25 by 35 feet raised timber dormitories that housed between fifteen and fifty workers each (figure 61). By 1908, close to forty new dwellings had been constructed, the walls from weatherboard and the roofs from double attap. The exteriors of the lines were tarred annually and the interiors were whitewashed every six months.[17] These, too, were soon replaced by updated designs due to the rapid deterioration of timber in the tropical conditions. Outbreaks of beri beri, poor sanitation, crowded living conditions and industrial accidents led to a death rate of up to twenty-five percent among the indentured workforce in the early years of the Company's activities on Christmas Island.[18] To prevent revolt, the Singapore-based labor agent Ong—who received a percentage of the profit from the phosphate sold by the CIPC—employed so-called "*Mandors*" or foremen, promoted from among the indentured workforce and tasked with ensuring the profitability of their former peers (figures 62 and 63). In 1902, two Mandors were killed by laborers in protest against their punitive methods.[19] To diversify his income from the island, Ong also opened a *kongsi*—a Hokkien term for an incorporated business—that sold food to workers at inflated prices to supplement the meagre rations provided by the CIPC, as well as arranging opium supply, prostitution services and gambling rings on the island.

Fig. 64. The railway to South Point under construction through thick jungle and over rough limestone in 1915. Christmas Island, National Archives of Australia, R32, CIPC 5/27A.

Fig. 65. What remains of the South Point railway today: an overgrown embankment running through dense stands of pandanus and along steep limestone cliffs.

Fig. 66. Ferns indicate disturbed ground on Christmas Island. Here, the embankment cuts through a former mining area, enabling the workers to load the phosphate carts from both sides of the railway.

Fig. 67. Remains of the crushing and loading facilities at the South Point settlement.

By 1914, the quarry initially worked by the CIPC on Phosphate Hill had been largely exhausted. Following the discovery of a large high-grade deposit in the area known as South Point, the Company undertook to construct an eighteen-kilometer railway, cleaved through thick vegetation along the rugged southern coast, which would connect the area to Flying Fish Cove (figure 64). Driving along the hand-built embankment today, all that remains are decommissioned steel electricity poles and a concrete waterpipe, stitched along the narrow track (figure 65). Former mining sites appear intermittently, their thick layer of ferns indicating disturbed ground (figure 66). The South Point railway was operational within six years, delivering a substantial increase in the rate of phosphate exported from Christmas Island into the early 1920s. A separate settlement gradually developed, complete with its own mining offices, sports facilities, hospital, barber, power station, gambling hall, police station, brothels and a temple—all arranged around the railroad and crushing plant. Bits and pieces of the town still remain after its demolition in the early 1970s (figures 67).

Fig. 68. Cuming Smith & Mount Lyell Farmers Fertilisers Ltd., “The Story of Superphosphate,” advertisement, National Library of Australia, c.1920, UApam 933.

Fig. 69. Flats built by the BPC in the 1950s along Gaze Road, Christmas Island.

Fig. 70. Housing built for BPC employees and their families in the 1960s along Gaze Road, Christmas Island.

Fig. 71. The former BPC bungalow in which I stayed while on Christmas Island.

Following the acquisition of CIPC by the Australian and New Zealand governments in the aftermath of World War Two, Christmas Island phosphate was almost exclusively shipped to Western Australia, whereas Nauruan and Banaban exports serviced the fertilizer industries on Australia’s east coast and New Zealand (figure 68). The BPC, from its headquarters in Melbourne, thus managed a sprawling extractive territory

spanning four islands across two oceans, staffed by Australian, New Zealander and British engineers, technicians, managers, architects and executives who together controlled a substantial stake of the world's supply of phosphate. Major expansion and modernization projects continued into mid-century, tightening the grasp of the Commission over every aspect of life on the islands: from schooling and healthcare to housing and recreation (figures 69 – 71). Building designs and mining technologies were recycled and adapted from island to island. Annual reports, inter-island conferences and routine audits by the commissioners ensured the entire operation was running as efficiently and effectively as possible. By the 1960s, the islands controlled by the BPC were heavily engineered terrains: comprehensively surveyed, efficiently organized into mining grids, scrupulously scraped back to their limestone foundations. By the 1970s, close to ninety percent of the surface of Banaba had been removed, displacing Banabans to Rabi Island in Fiji. Nauru was also deemed uninhabitable by the late 1960s and a failed attempt was made to relocate the Nauruan population to Curtis Island off the coast of Queensland. Australia purchased Christmas Island from Singapore in 1958, running the industry through the BPC into the late 1970s. Industrial action by workers seeking improved conditions and wage equality with Australia led to a Royal Commission in 1980, which concluded that:

> The institutional framework within which Christmas Island operates is outmoded, discredited, and in many ways repugnant. [...] The British Phosphate Commissioners (BPC) is an organization which has not adapted quickly enough to or willingly enough to the passing of the colonial era. [...] The structure of the Government Administration on the Island, and much of the law that is in force, is more appropriate to a colonial possession than it is to a remote multi-racial mining community on Australian territory.[20]

A new company structure was introduced in response to the adverse findings of the Royal Commission until ongoing unrest and environmental activism led the new venture to declare the commercially unviability of the industry before entering into voluntary liquidation in 1987.

Fig. 72. Deteriorating former phosphate storage shed, Nauru.

Fig. 73. Former phosphate processing equipment, Nauru.

Where political solutions focused on neatly resolving the effects of close to a century of phosphate extraction on Nauru, Banaba, and Christmas Island, the pockmarked landscapes and deteriorating infrastructure left behind by the BPC and its commercial forebears immediately disclose the scale of human exploitation and ecological violence that the colonial bureaucracy attempted to conceal (figures 72 and 73). But this concealment was also a function of the infrastructure itself, which both physically connected the disparate places involved in the overall process of superphosphate production, while also severing—in the minds of consumers—the sites of phosphate extraction in the Indo-Pacific from those of its application on Australian soils. "As the farmer drives his drill across the paddocks at seeding time," begins a 1936 article in the Adelaide paper *The News*, "or carts weighty bags of superphosphate from the nearest railway station, he gives little thought to the origin of that artificial manure which has done so much to increase the yield of his crops and pastures. At Port Adelaide, Wallaroo and Port Lincoln are busy chemical works that manufacture the fertilizer, but it is from mid-Pacific coral islands that the phosphate rock comes which is its chief component."[21] As Brian Larkin has argued, infrastructures work in precisely this way, preparing the ground for other things to act on the world while they themselves disappear from

view: “their peculiar ontology lies in the facts that they are things and also the relation between things. As things they are present to the senses, yet they are also displaced in the focus on the matter they move around.”[22] This mode of analysis has proved challenging for scholars of architecture, whose predilection generally remains to focus on buildings as isolated objects. Its benefit for this fellowship project, however, is to situate individual instances of spatial production—i.e., the buildings, jetties, railways, chutes, cranes, ships, and so on considered in this report—in relation to one another as elements of an extractive system that reorganized islands in the Indo-Pacific to fuel Australia’s particular brand of racial capitalism (figure 74).

Fig. 74. Propaganda for promoting white immigration to Australia as part of the Million Farms Campaign, which used pamphlets and political lobbying in the early 1920s to aggressively tout what it described as “the biggest biological experiment the world has ever known – White Australia.” Joseph Carruthers, *The Great Objective: How the Million Farms Campaign is Faring* (Sydney: Million Farms Campaign Committee, 1921), 15.

Fig. 75. One of the many Taoist temples on Christmas Island.

Fig. 76. A wheatfield in the Wimmera Mallee, c.1935. State Rivers and Water Supply Commission, Wimmera Region, State Library Victoria, RWP/1855.

The notion that Australia was itself an imperial power—and not simply a settler-colonial product of British empire—remains marginal at best in the popular consciousness. On Nauru and Christmas Island, however, the physical evidence of Australian imperialism remains irrefutably on display. Australia’s empire was not the result of the direct colonization, annexation or invasion of territory; rather, it was amassed gradually through the increasing bureaucratization of political authority on islands of value to its economic development. Phosphate is one vector in this broader history of extractive sovereignty, revealing the modes and techniques through which Australian imperialism became instantiated and eventually entrenched in once foreign places. Walking along Gaze Road on Christmas Island—named after Harold Gaze, General Manager of the BPC—past the Chinese Literary Association, the Chinese Cultural and Heritage Museum and Tai Pak Kong, the Taoist temple, I contemplate the complex cultural histories engendered by the colonial phosphate industry (figure 75). In particular, I consider what I at first regard as a glaring hypocrisy: that during the period of the White Australia policy, which officially commenced in 1901 and lasted into the 1970s, white farmers in Australia were entirely dependent on the phosphate mined by Chinese, Japanese, Pacific Islander, and South Asian workers in the Indo-Pacific to sustain their highly politicized form of living, itself premised on Indigenous dispossession (figure 76). By the time I arrive back at my accommodation, my thoughts have corrected themselves: far from being hypocritical, white Australia’s expropriation of Indigenous land, foreign resources, and non-white labor was deliberate, engineered, and essential to its viability. White supremacy in Australia was in fact contingent on Australian imperialism and vice versa; Australian empire in the Indo-Pacific was enacted on the basis of the former colonies’ sovereign independence as a white ethnostate. These co-dependencies were as much infrastructural as they were political and economic: where legal status shifts, bureaucratic and spatial form

accrete. In securing the raw material upon which the extension of Australian settler-colonialism depended, the phosphate industry developed on Christmas Island, Banaba, and Nauru therefore played a decisive role in stabilizing the extra-territorial limits of Australia as both a biological and a political community.

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[1] Cait Storr, *International Status in the Shadow of Empire: Nauru and the Histories of International Law* (Cambridge: Cambridge University Press, 2020), 90.

[2] On the labor trade for the phosphate industry on Nauru and Banaba, see Ralph Shlomowitz and Doug Munro, "The Ocean Island (Banaba) and Nauru Labour Trade," *Journal de la Société des océanistes* 94 (1992): 103–117.

[3] Ben Doherty, "Australia's offshore detention is unlawful, says international criminal court prosecutor," *The Guardian*, 15 February 2020 (accessed 5 December 2023), https://www.theguardian.com/australia-news/2020/feb/15/australias-offshore-detention-is-unlawful-says-international-criminal-court-prosecutor.

[4] Paul Karp and Tory Shepherd, "Nauru offshore processing to cost Australian taxpayers $485m despite only 22 asylum seekers remaining," *The Guardian*, 23 May 2023 (accessed 5 December 2023), https://www.theguardian.com/australia-news/2023/may/23/nauru-offshore-detention-immigration-processing-to-cost-australia-485m-22-asylum-seekers.

[5] Storr, *International Status in the Shadow of Empire*, 25. Emphasis added.

[6] Ibid., 36.

[7] On the history of Banaba, see Katerina Teaiwa, *Consuming Ocean Island: Stories of People and Phosphate from Banaba* (Bloomington, IN: Indiana University Press, 2014).

[8] Storr, *International Status in the Shadow of Empire*, 34.

[9] Ibid., 33. See also Cait Storr, "'*Imperium in Imperio*': Sub-imperialism and the Formation of Australia as a Subject of International Law," *Melbourne Journal of International Law* 19, no. 1 (2018), 336.

[10] Storr, *International Status in the Shadow of Empire*, 35.

[11] See Raymon E. Reyes Jr., "Nauru v. Australia: The International Fiduciary Duty and the Settlement of Nauru's Claims for Rehabilitation of its Phosphate Lands," *New York Law School Journal of International and Comparative Law* 16, no. 1+2 (1996): 1–54.

[12] A. N. Gray, "Table No. 166—Oceania—Shipments from Ocean/Nauru Islands 1921–1929. Bill of Landing Weights (Metric Tons)," in *Phosphates and Superphosphates* (London: International Superphosphate Manufacturers' Association, 1930), 263.

[13] Harold L. Burstyn, "Science Pays Off: Sir John Murray and the Christmas Island Phosphate Industry, 1886–1914," *Social Studies of Science* 5, no. 1 (1975), 25–26.

[14] Burtsyn, "Science Pays Off," 26.

[15] David Jehan, *Shays, Crabs and Phosphate: A History of the Railways of Christmas Island, Indian Ocean* (Melbourne: Light Railway Research Society of Australia Inc., 2008), 14–15.

[16] Quoted in Jan Adams and Marg Neale, *Christmas Island – The Early Years, 1888–1958* (Canberra: Bruce Neale, 1993), 36.

[17] Fran Yeoh, "The early coolie houses on Christmas Island," *Christmas Island Archives*, accessed 15 December 2023, https://christmasislandarchives.com/coolie-houses/.

[18] Jehan, *Shays, Crabs and Phosphate*, 15.

[19] Jehan, *Shays, Crabs and Phosphate*, 15.

[20] W. W. Sweetland, *Report of Commission of Inquiry into the viability of the Christmas Island Phosphate Industry*, Parliamentary Paper No.36/1980 (Canberra: Australian Government Publishing Service, 1980), 3. See also Les Waters, *The Union of Christmas Island Workers* (Sydney: Allen & Unwin, 1983).

[21] "From Coral Isles to Farm: Tale of 'Super'," *The News, Adelaide*, 16 September 1936.

[22] Brian Larkin, "The Politics and Poetics of Infrastructure," *Annual Review of Anthropology* 42 (2013), 329.

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ON LAYERING: SURVIVING ANGAUR

Mar 13, 2024 by Jasper Ludewig, recipient of SAH's H. Allen Brooks Travelling Fellowship

Getting to Angaur involved chartering one of the hundreds of small boats scattered around the Republic of Palau. After approaching the main operators in Koror—the commercial and tourism center of the archipelago—I eventually found a captain open to the prospect of a day trip to the remote island (figure 1). (He shall remain nameless in this report for reasons that will become obvious below). Leaving Koror on the morning of our voyage, which had been rescheduled several times due to high winds and large swell, we made a brief detour to collect a young resident of Angaur returning home with fuel and fresh vegetables. As he boarded, he explained that he was excited to finally be getting back to his family after the recent bad weather had kept him away longer than expected. Conversation fell away as we left the harbor and the captain brought the two engines into life, the boat lurching forwards before rising to skim across the surface of the water. We quickly settled into the two-hour passage to Angaur (figure 2).

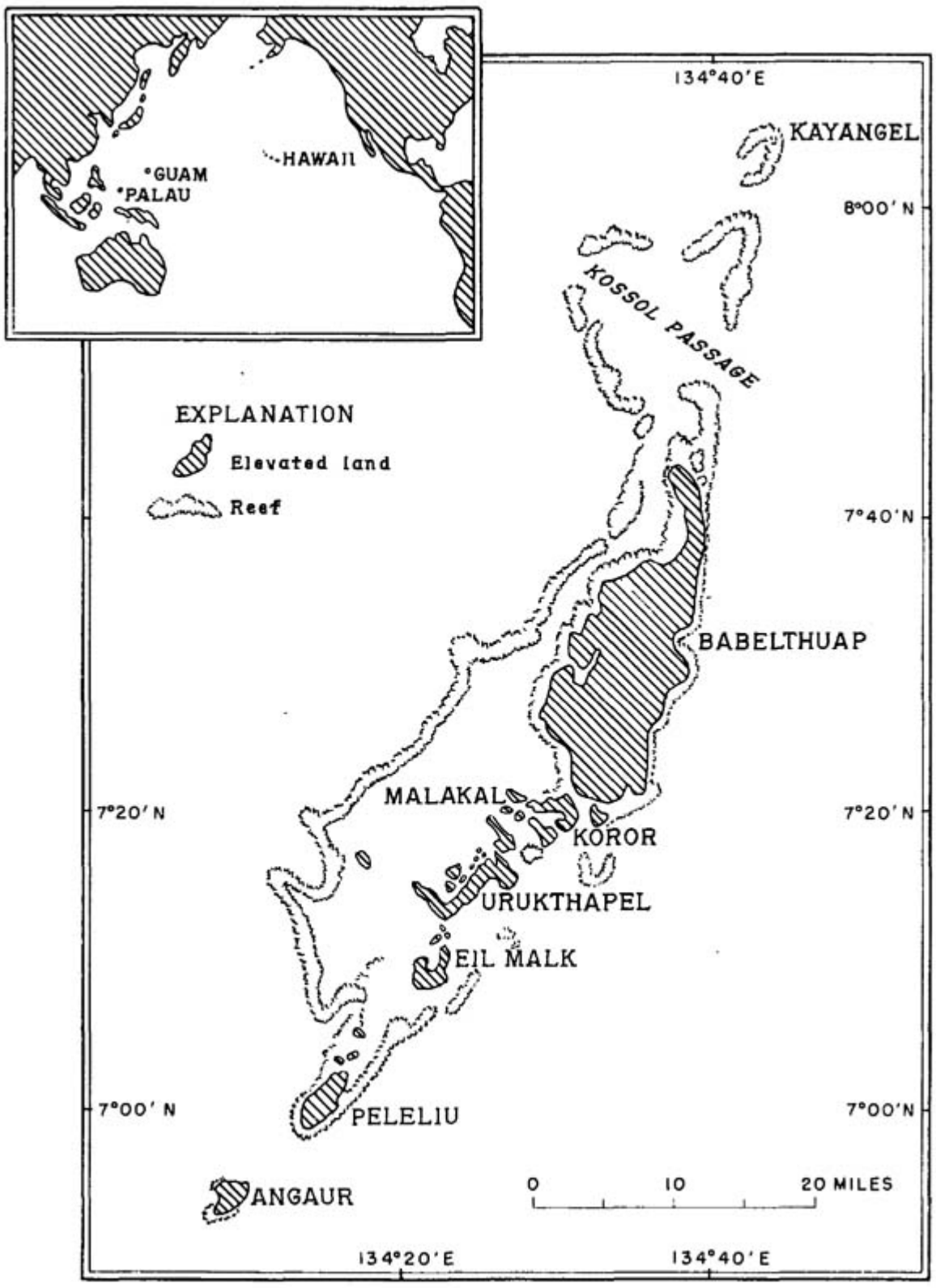

Fig. 1 – Map of the Palau archipelago with inset indicating its position in the Pacific Ocean. Source: Ted Arnow, *Effects of Phosphate Mining on the Ground Water of Angaur, Palau Islands Trust Territory of the Pacific Islands*, Geological Survey Water-Supply Paper 1608-A (Washington, D.C.: United States Government Printing Office, 1961), 4.

Fig. 2 – When spirits were still high: on the way to Angaur from Koror by boat.

Fig. 3 – Several hundred Rock Islands rise from the large lagoon that stretches between Babeldaob and Peleliu. Their slight overhangs give the impression that they are floating above the surface of the water.

Our route took us south, via the Rock Islands—large polyps of limestone that appear to float above the turquoise lagoon, covered in verdant green (figure 3)—before heading through German Channel, blasted out of the coral reef in the early twentieth century, when Palau was a German colony, to facilitate a quicker connection between Angaur and Koror (figure 4). Leaving the channel, we hit open water for the first time and proceeded south along the western coastline of Peleliu. Large rollers passed beneath us, bobbing our small boat up and down before jagging steeply upwards and exploding onto the island's low reef. Each explosion produced a salty mist that slowly drifted back out to sea, engulfing us and turning the morning sky into a sheet of white light. The dark contours of Angaur's northern cliffs gradually began to emerge from the glare, disappearing and reappearing again as we undulated across the ocean (figure 5). The captain had announced his intention to troll through the deeper water between Peleliu and Angaur and his deckhand was soon summoned to deploy a spread of flamboyant lures in the hopes of enticing a passing wahoo or yellowfin tuna.

Fig. 4 – A marker indicates the entry to German Channel on the way to Angaur from Koror.

Fig. 5 – Angaur seen between sets of waves from the northern channel that separates it from Peleliu.

The swell was enormous. As we poked our nose around the southern tip of Peleliu the waves rose to three, perhaps four times what they had been on the protected western side of the island: vast mounds of bulky, angry water ripping across the bow; accelerating, rising and collapsing in sharp claps at random intervals; a confused and violent surface above an abyss the depths of which I preferred not to fathom. The lures were eventually brought in as we reached the northern tip of Angaur, our only catch being a sad strip of seaweed dislodged from the nearby cliffs by the powerful swell. I seemed to be the only one unsurprised by our failure to extract a fish from the churn, but it was agreed that there would be another opportunity on the way home, hopefully with less swell and a better wind direction. Thus, spirits remained high on the resilient little boat, as did my heartrate, which, according to my smartwatch, was racing at 100 BPM as we entered the harbor at Angaur; a situation not helped by the group of locals assembled on the rocks, their phone cameras out, filming the uncommon spectacle of a tourist boat in the heavy seas (figure 6).

Fig. 6 – The boat harbor at Angaur upon our arrival. Note all the locals' boats: no one was out fishing in the dangerous conditions on this day.

Fig. 7 – "Welcome to Angaur: Home of Latmikaik, Motherland," reads the sign at the boat harbor.

Palau was formed within a complete, closed universe after the sky god, Ucheliangl, made land rise from the turbulent stretch of water we had just crossed between Angaur and Peleliu. Latmikaik, a giant pregnant clam, then gave birth to half-fish, half-human children whom she instructed to pile rocks from the seabed to the sky before toppling them over to create Palau's many rock islands. On their northward journey from Angaur, Latmikaik's children discovered fire and were taught carpentry and measurement by the underwater gods. One such child, Chuab, was tasked by Ucheliangl with bestowing social order upon the archipelago. She passed this task on to her own children who again proceeded from Angaur in the south, creating chiefly councils on their way to Babeldaob, the northernmost island of Palau. Our trip had thus effectively transported us backwards in cosmological time: to the site where the cosmic migration from the

world under the sea first made landfall and from which the social structure for a future Palauan polity was established (figure 7). [1] Western science estimates that this polity began to arrive—initially from Indonesia and then the Philippines—approximately 3,000 years ago. Large earth structures on Babeldaob, some close to 2,500 years old, attest to the intensity of the first colonists' occupation, hosting agricultural, infrastructural, domestic and ceremonial functions, and defining the political space of Palau for over a millennium. [2]

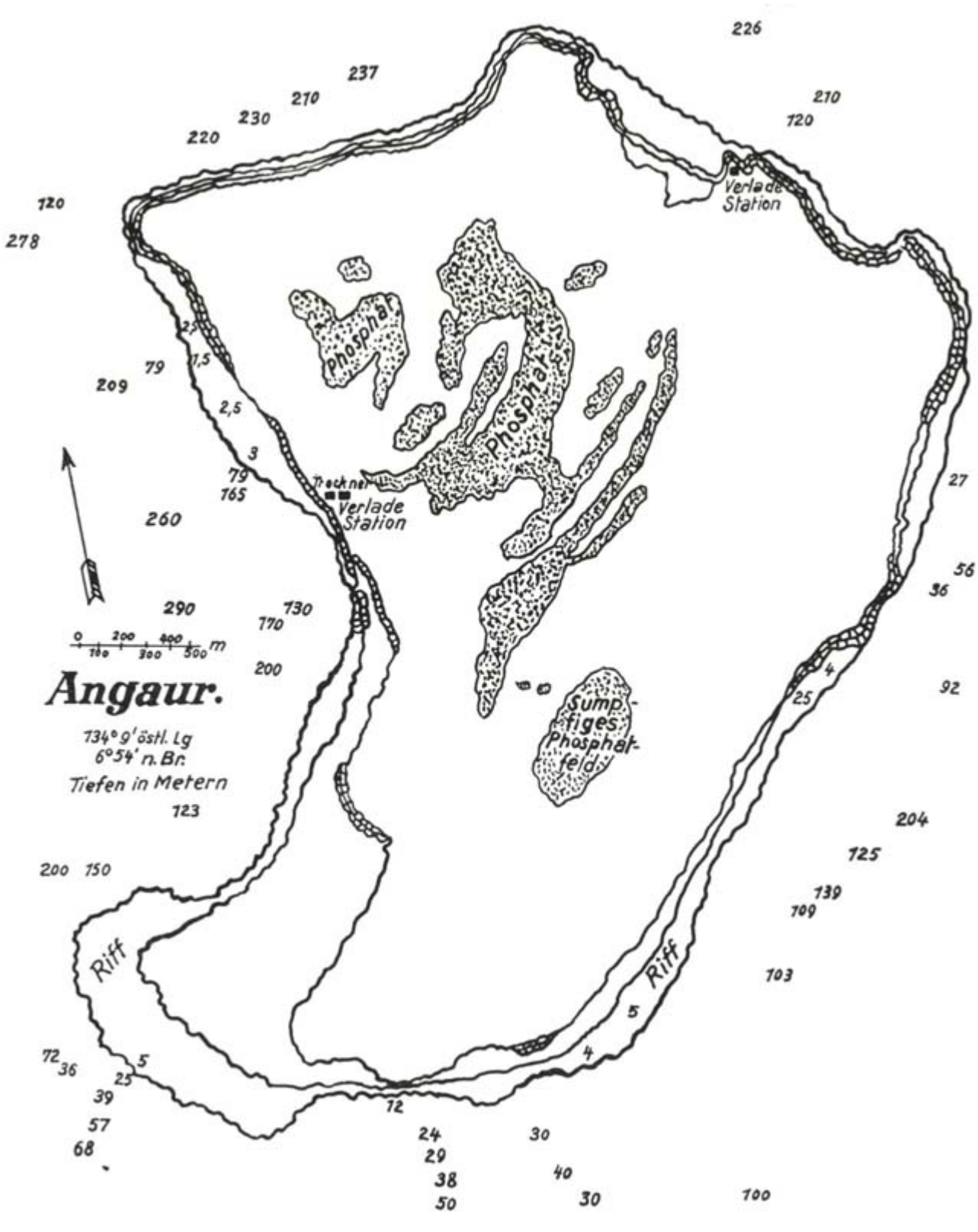

Fig. 8 – Map of Angaur showing the different phosphate deposits on the island (hatched). The German South Sea Phosphate Company's drying and loading facilities are located on the west coast and an additional loading station is situated on the northern cliffs. Source: Carl Elschner, *Corallogene Phosphat-Inseln Austral-Oceaniens und ihre Produkte* (Lübeck: Max Schmidt, 1913).

No such structures were developed on the low-lying, isolated island of Angaur, which stretches to only four kilometers in length and approximately the same in width, sloping down from its raised edges in the north towards the once swampy land at its center. It was here that District Commissioner Arno Senfft first discovered phosphate in 1905, six years after Palau had been sold to Germany by Spain as part of the Caroline Islands following the Spanish-American War. The deposits Senfft unearthed boasted two distinct types of phosphate: a reddish-brown and grainy variant located close to the surface, between the island's limestone pinnacles; and a white phosphate found in continuous blankets beneath the swamps (figure 8). [3] As on Christmas Island and Nauru, Angaur's phosphates were the product of a fusion between limestone, soil and seabird excrement, formed over millennia and to an extremely high grade.

In the year after Senfft's discovery, the Bremen-based Norddeutscher Lloyd shipping company arranged for an inspection of the island by Wilhelm Schönian—the same mining engineer who had overseen the development of the Pacific Phosphate Company's early facilities on Nauru. As discussed in my third report, this followed the entreaties of Albert Hahl, governor of German New Guinea, who viewed mining as a lucrative way to encourage private development throughout his vast protectorate. The Angaur deposits were estimated at around 2.5 million tons of eighty-six percent phosphate of lime, speaking favorably for a mining venture. The Deutsche Südseephosphat Aktiengesellschaft (German South Sea Phosphate Company Limited, DSPAG) was subsequently formed in 1908 with Schönian as its technical director. [4] A contract soon followed that at once transferred the ownership of Angaur from eight "island chiefs" to the treasury of German New Guinea, while also granting the DSPAG exclusive mining and settlement rights over eighty percent of the island. This confined the local population to a 150-hectare reserve in the southeastern corner of the island in return for a one-off payment of £60. [5]

The testimony of Chief Uherbelau, whose reign commenced in 1908 when he inherited the position from his mother, recounts a different version of events leading to the original phosphate mining lease. In a letter from the 1940s to the US administration in Palau, Uherbelau describes how the Germans, having realized the value of the phosphate deposits on Angaur, refused to negotiate with his mother, claiming they were unable to conduct business with a woman. Instead, they escorted a group of local men to Koror where, at gunpoint, they were coerced into signing the agreement. Presumably, these men were the "island chiefs" whose signatures are recorded on the original contract. When Uherbelau's mother later proposed that her community should receive royalties from the mining, the DSPAG refused to recognize her title as chief altogether. Once Uherbelau was appointed in her place, she was summarily sent over five hundred kilometers away to the center of the German administration in Yap in the Western Caroline Islands. [6] Thus supposedly unencumbered, the DSPAG commenced its operations on the island in February of 1909, bringing twenty-three European employees, fifty-five contracted Chinese craftsmen and ninety-eight indentured laborers from Yap. This involved dividing the island into thirds and moving the local population from numerous villages—Ngerbelau, Ngebeanged and Rois—to the reserve established in the Ngermasech region in the southwest (figure 9). [7]

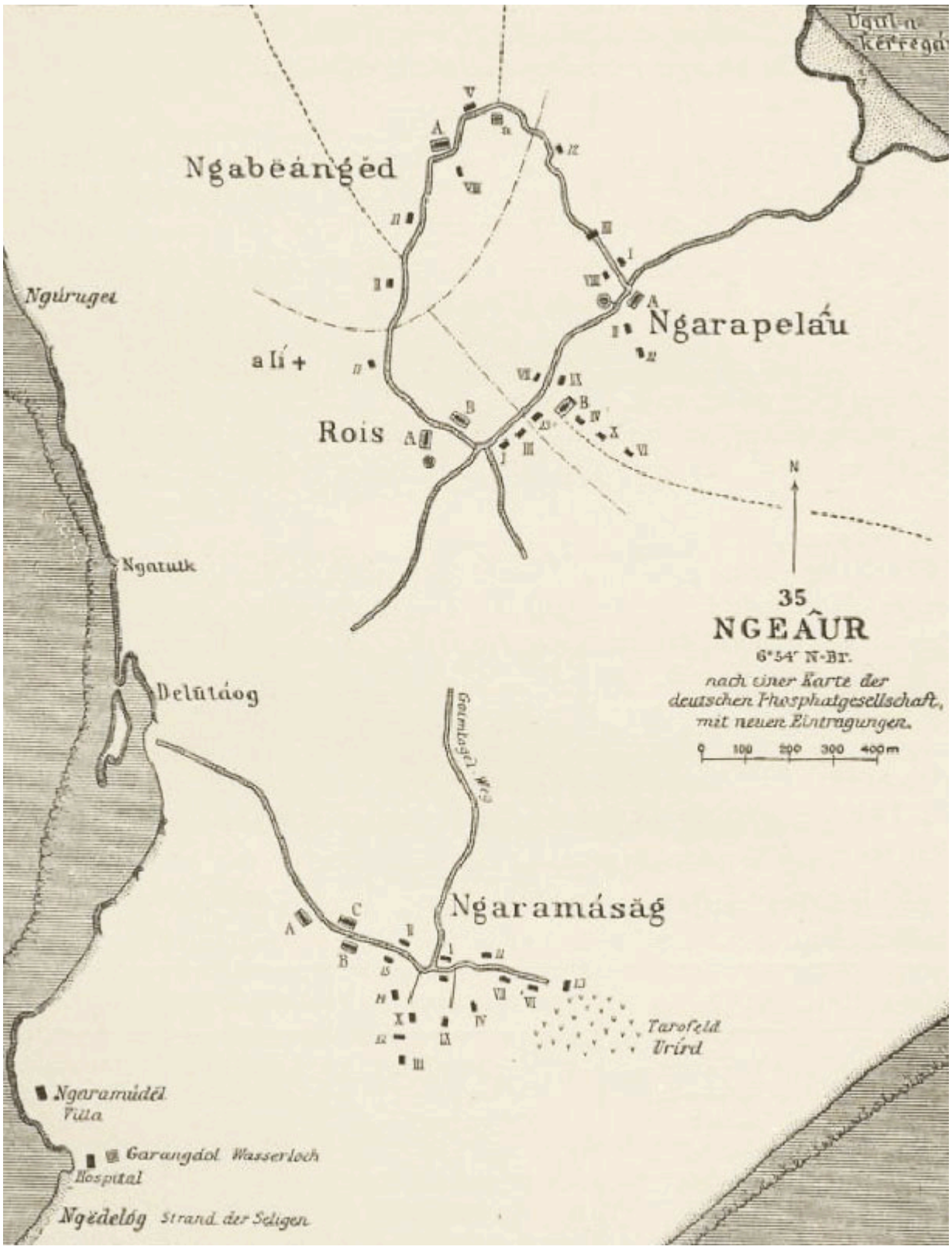

Fig. 9 – Map from c.1915 depicting the traditional villages of Angaur. The reserve created in the Ngermasech (Ngaramasag) region is shown in the south, beneath which are the buildings of the DSPAG. Source: Augustin Krämer, *Palau*, vol. 3 (Hamburg: L. Friederichsen & Co., 1919), 286.

Fig. 10 – Prefabricated housing for the European employees of the German South Sea Phosphate Company on Angaur, supplied by the Hamburg-Altona-based company F. H. Schmidt, c.1909. Source: Deutsches Bundesarchiv, Sammlung Heinrich Hagedorn, Bild 223-158.

A further 126 men were indentured from the Central Caroline Islands over the course of 1909, tasked with erecting the prefabricated facilities manufactured by F. H. Schmidt in Hamburg-Altona, and to commence the mining operations. [8] They worked nine hours per day, six days a week and received a monthly wage equivalent to around $4 USD. [9] The initial shipments of equipment and materials from Bremen and Hamburg amounted to a full arsenal of locomotives, wagons, rails and sleepers, water treatment facilities, as well as the electrical and transmission devices required to establish a radio connection with Yap. In addition, F. H. Schmidt provided a suite of prefabricated timber buildings including a director's house, houses for the managers of the phosphate works, government officials, overseers, workers' dormitories, transportable warehouses, a hospital, a separate mess hall for DSPAG officials and workers, a kitchen, office building, laboratory and goods stores (figure 10). [10] A casino was also erected for the entertainment of the officers in the evenings, containing a bowling alley, billiard table and piano. Therefore, within a year of securing a mining lease over Angaur, the DSPAG had established a large company settlement and a functional phosphate mine on the most remote island in the Palau archipelago.

The next four years saw a substantial shift in the proportions of the different groups on Angaur: European staff dropped by half to only ten; Chinese workers doubled to one hundred; and Caroline Islanders increased fourfold to five hundred. [11] As David Hanlon notes, the abuse of the laborers brought to the island by the DSPAG included:

> *low wages, frequent payment in the form of near worthless coupons rather than currency, forced purchases with these devalued coupons of overpriced goods in the mining company's store, physical punishment and extended working hours. By 1911, the situation had deteriorated so badly that German colonial officials elsewhere in the Carolines were refusing to assist in the recruitment of islander labor for Angaur.* [12]

Instead, one hundred prisoners were brought to the island as convicts under police guard in 1911 following the suppression of a rebellion against German rule in Pohnpei. The DSPAG's exploitation of cheap labor minimized operational costs, enabling it to invest in major capital works upgrades on the island as early as 1910. [13] As a result, annual exports from Angaur climbed by four hundred percent: from approximately 9,000 tons of in 1909, to more than 36,000 tons in 1910, before continuing to rise to 89,000 tons in 1913. [14] As noted by the geologist John Rodgers, of the many phosphate islands in the Western Pacific, "only Angaur has produced on a scale at all comparable with the outstanding Pacific island deposits: Nauru and [Banaba], northeast of the Solomon Islands, and Makatea, north of Tahiti." [15]

Michael [16], my tour guide on Angaur, was sheepish when I asked him how safe he thought it was for us to have made the crossing from Koror. "I thought you were the coast guard" was all he offered, politely suspending any overt judgement of our captain's decision to make the trip while also implying, unmistakably, that no normal boat or person should have hazarded the ocean that day. My teeth clenched

as I imagined the homeward passage to Koror. I jumped onto the back of Michael's small truck and, as we headed for our first stop on the tour, I focused on bringing my heart back down to its resting rate. Deep breaths and happy places. I soon remembered why I had made the trip to the island and reached for my phone, bringing up the maps and old photographs I had prepared for Michael the night before. Once my enthusiastic show-and-tell had drawn to a close he shot me a look of concern: "Yes, all this was once here, but it's gone now." "You mean there's nothing for me to see?" my voice climbing to a falsetto. "That's right…" I immediately recommenced my breathing exercises, warding off the intrusive thought that I had made the long journey—Sydney, Brisbane, Port Moresby, Koror, Angaur—in vain. Sensing disappointment, or perhaps thinking I was about to faint, Michael quickly added: "But let's go and have a look anyway."

Fig. 11 – The ring road on Angaur closely follows the coast, passing through fields of tall limestone outcrops, small beaches, pine forest and exposed cliffs.

The truck bounced along a road that had been cut into the scrub, wending its way between weathered outcrops of limestone as it followed the coast (figure 11). Macaque monkeys scurried across our path, disappearing into the knotted canopy above. I had expected them, having read they were the descendants of an original pair of macaques introduced to Angaur by German mining engineers to monitor air quality in the early mines. [17] The monkeys were, in this sense, the first evidence I encountered of the former phosphate industry's presence on the island. We next passed Diai in the northwest, a blowhole rumored to have extinguished the firebird Esisbangiau, sent from Peleliu to incinerate Angaur during the warring times. [18] I heard its deep exhalations before I saw its column of seawater rising through the pine trees, cresting waves and a mess of whitecaps visible in the channel beyond. As we approached a non-descript section of road, Michael brought us to a slow halt. I scanned the thick vegetation, seeing nothing of note. "Here we are," he announced as I jumped off the truck, preparing myself for whatever disappointment lay ahead. But then, as we trudged across the boggy ground, the tangle of vines and branches began to tessellate into an orthogonal shape: not vines, but the corroded webbing of a steel truss; not a branch, but a steel beam, collapsed into the liquid trunk of a strangler fig (figure 12). Like the spine of some giant beached whale, I began to discern the form of a once massive linear structure receding into the interior of the island (figure 13). This, I knew, was the phosphate processing plant of which Michael had told me there were no

remnants. I briefly locked eyes with him and his bemused smile let me know that he had played me for a fool. I contemplated an appropriate quip in response; however, relief is a magnanimous emotion and all I could muster was: “This is incredible.”

Fig. 12 – The steel structures of the former phosphate facilities are being consumed by the thick jungle of the island’s interior.

Fig. 13 – Remnants of the former phosphate mill and dryer lead from the inland phosphate pits on Angaur to the loading facilities on the coast.

We spent the next hour clambering over wafer-thin corroded steel members, into brick kilns, beneath rotary dryers and along the length of the extensive ruins. Old phosphate was still stuck to the fins inside the rotating drums of the dryers. Staghorn grew from the chutes and buckets laying around. Damp bricks

resisted their inevitable return to the earth (figures 14 – 16). I tried to piece together and distinguish the different infrastructural layers from the collapsed mess around us. I knew the steel we had seen as we arrived was from the so-called "*Gute Hoffnungshütte*," a hulking 18-meter-wide by 18-meter-high, 100-meter-long, two-story integrated processing facility prefabricated in Germany and erected on Angaur by the DSPAG around 1912 (figure 17). (I later learned that the structure is now referred to by locals as Blailebakl [adz house] in reference to the repurposing of its steel to make adzes and other hand tools). [19] Damp phosphate was conveyed to its upper level by a cable railway before being dropped into large driers heated by furnaces from the level below, fueled using felled timber from the old growth forest on the island. Once dried, the export-ready product was stored in the enclosed structure, alongside workshops, a forge and storage space for the DSPAG's five locomotives, which plied around ten kilometers of tracks on the island leading from the mining sites in the interior to the processing facilities and ultimately to the harbor installations on the coast.

Fig. 14 – The undersides of the rotary dryers used to reduce the moisture content of the phosphate prior to export. White phosphate was still stuck to the insides of the drums, seventy years after mining ceased.

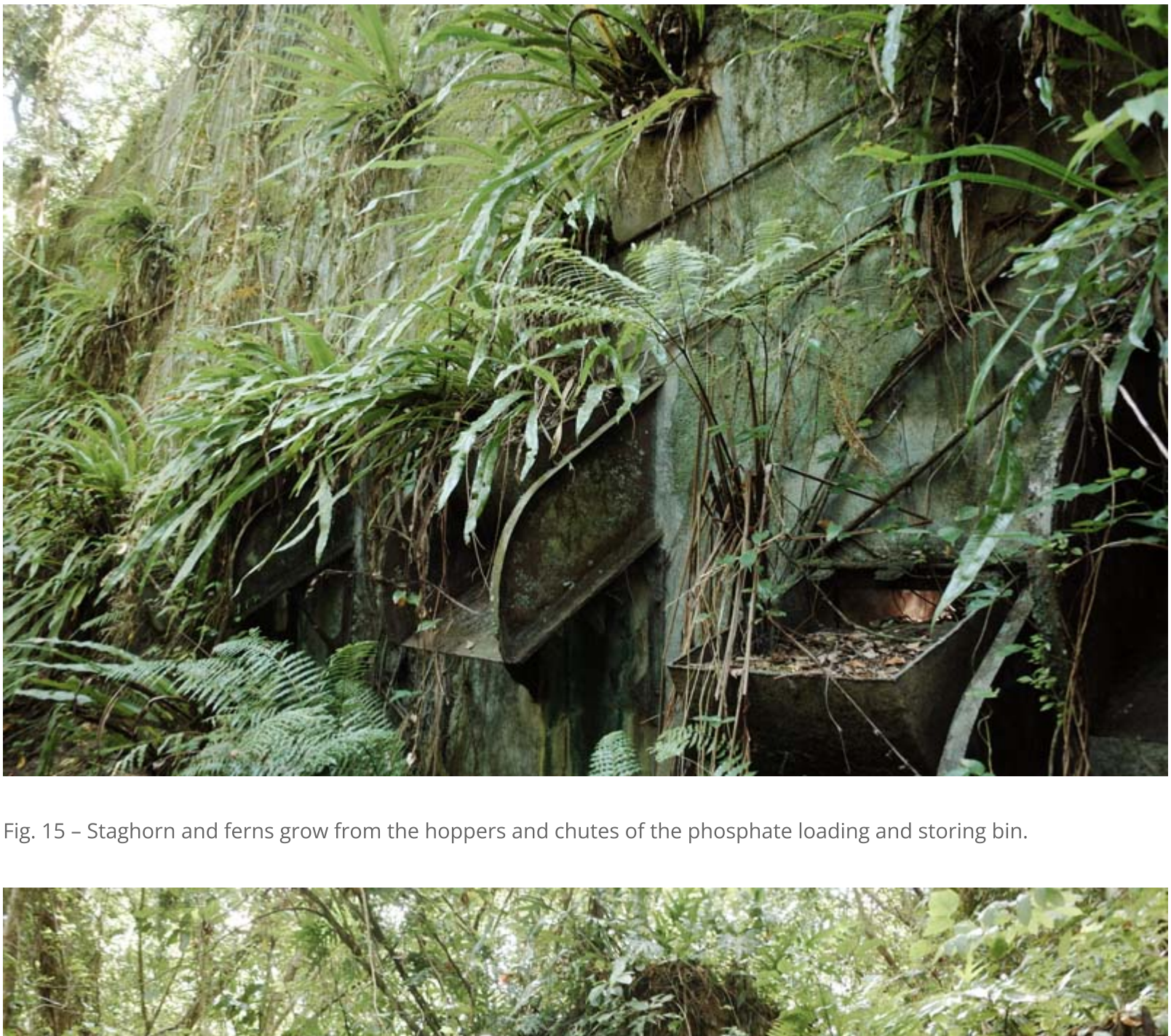

Fig. 15 – Staghorn and ferns grow from the hoppers and chutes of the phosphate loading and storing bin.

Fig. 16 – A brick kiln, built by the DSPAG and used to heat the rotary driers shown in figure 14, threatens collapse. The circular shape to the left of the image is the manifold that was used to attach the drums to the kiln.

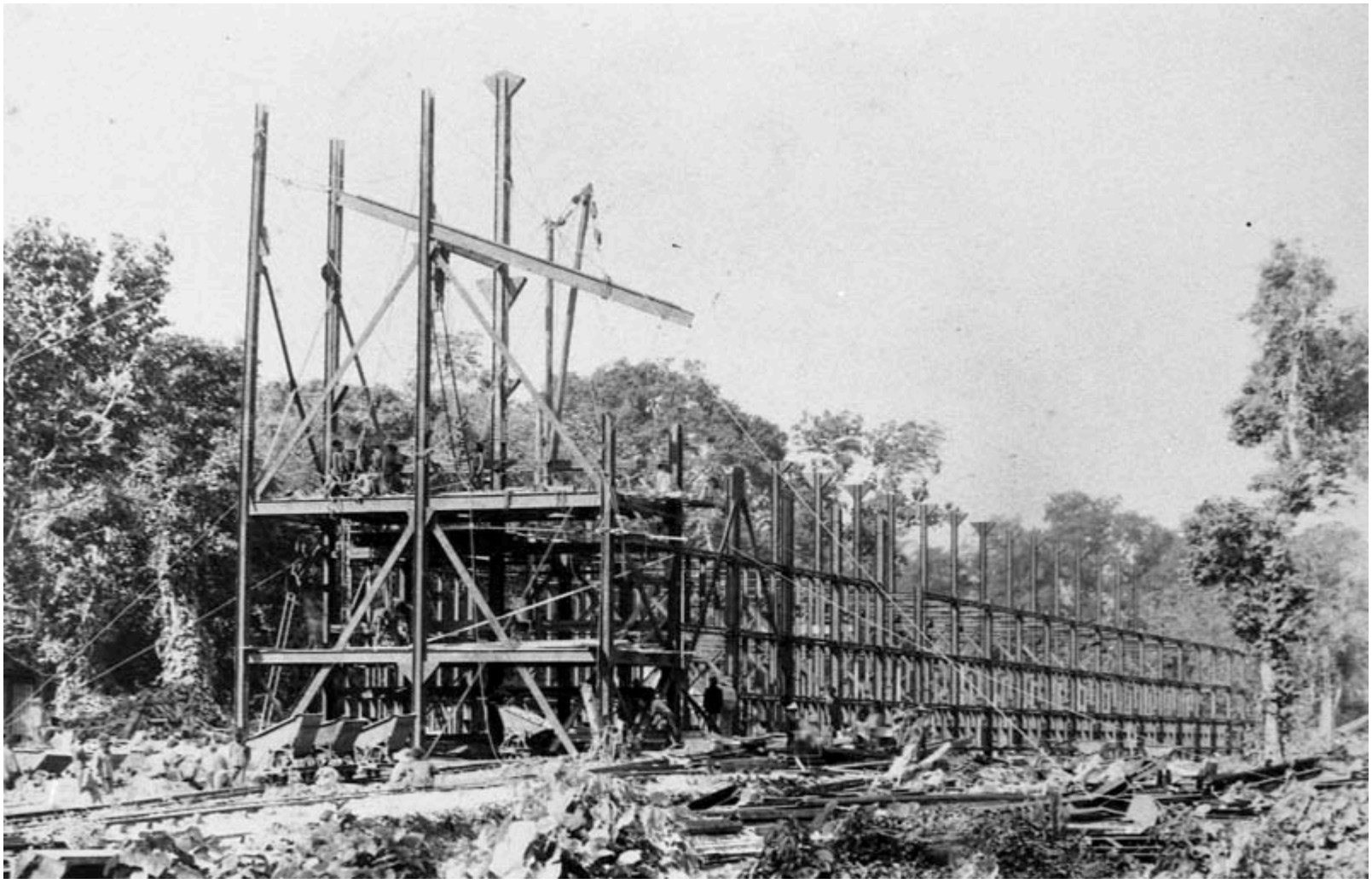

Fig. 17 – The *Gute Hoffnungshütte* under construction in c.1912. Source: Deutsches Bundesarchiv, Sammlung Heinrich Hagedorn, Bild 223-227.

More surprising was the tall concrete structure—likely a later phosphate storage bin—located immediately adjacent to the former Gute Hoffnungshütte (figure 18). We entered via its western façade, the afternoon light streaming in to illuminate a walled garden seemingly draped over the industrial skeleton (figure 19). Ficus roots and other creepers dangled through the open roof, curling themselves around the rectangular columns. Internal buttresses reinforced engaged columns along the walls, perhaps also acting as bulwarks to break up the masses of phosphate once stored in the space (figure 20). I asked Michael if he knew whether the structure was German, Japanese or American—these being the three administrations involved in working the phosphate on the island over the course of the twentieth century. He replied that he was unsure. I later came across photos taken in the days following the US seizure of the island during the Battle of Angaur in 1944 (figure 21). They revealed that the concrete structure pre-dated the American occupation of the island, suggesting it had been constructed during the period in which Palau was administered as part of the South Seas Mandate after Japan purchased the mining rights and equipment from Germany in the aftermath of World War One. The photos also captured an elaborate conveyor system on the coast used to load ships in deeper water beyond Angaur's shallow reef, presumably erected by the South Sea Development Company (*Nan'yo Kohatsu, KK*)—the largest single commercial operation in Micronesia during the inter-war period—which took on the phosphate mining operations on Angaur in the 1920s alongside its other enterprises in sugar, alcohol, resin, cotton, palm, copra and fisheries. [20]

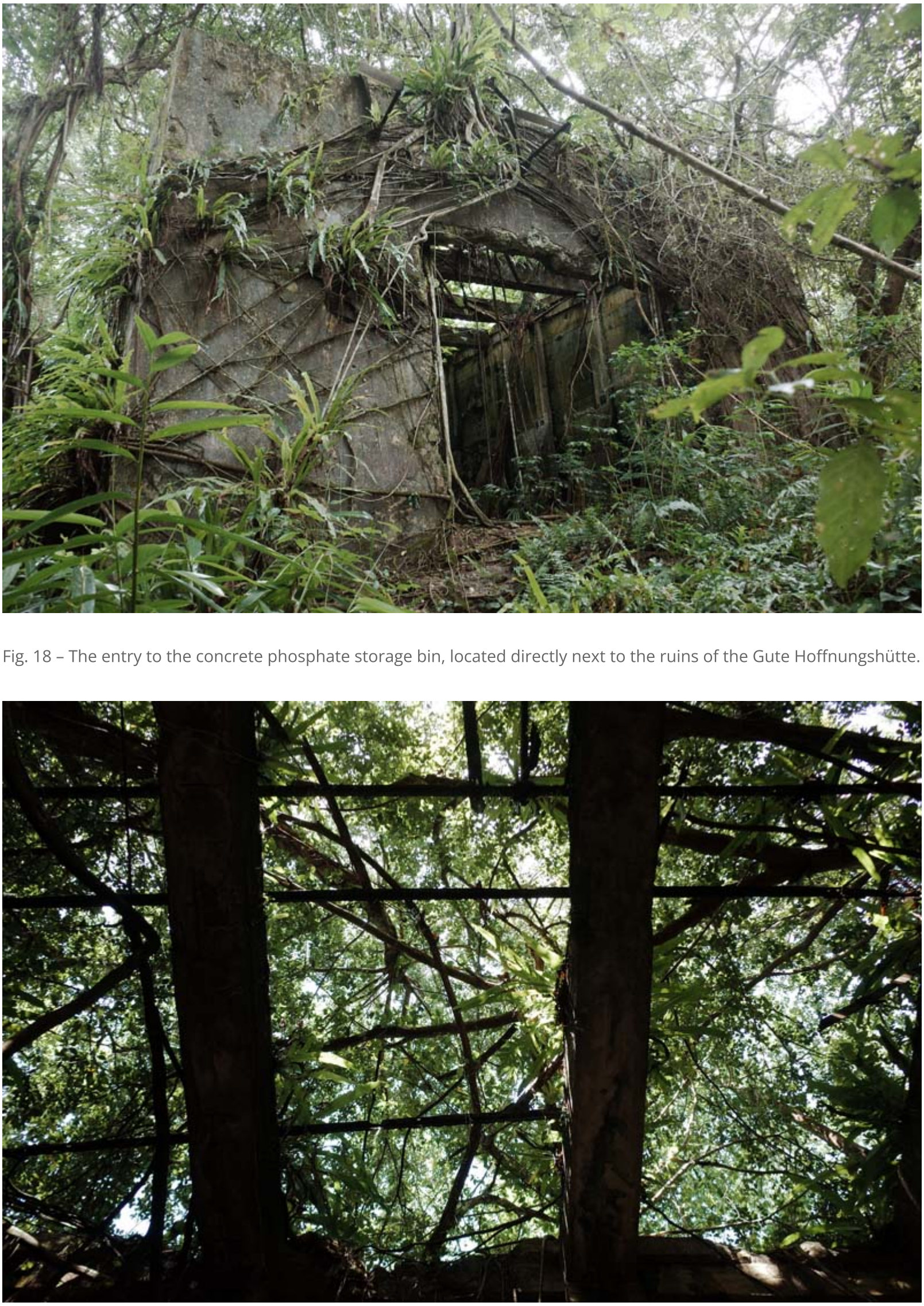

Fig. 18 – The entry to the concrete phosphate storage bin, located directly next to the ruins of the Gute Hoffnungshütte.

Fig. 19 – The view looking up from the within the phosphate storage bin.

Fig. 20 – Trunks and roots now obscure the rhythm of the concrete structure.

Fig. 21 – Photos taken following the Battle of Angaur in 1944 showing the partially destroyed Gute Hoffnungshütte and concrete storage bin behind (top) and the remnants of the cantilever and conveyor system used for loading ships in deeper water beyond the fringe reef (bottom). Source: US National Archives, Caroline Islands, 1944, 204970791.

Leaving the main processing facilities, we passed the remains of a second loading arm, built into the northeastern cliffs of the island by the DSPAG and designed for use when conditions were unfavorable at the boat harbor on the western side (figure 22). We continued in a clockwise direction, passing limestone caves in which locals had sheltered during the American bombardment of the Japanese positions on the island. Twisted lengths of narrow-gauge track emerged from the soil before submerging again, corroded carts lying in disrepair next to crushed limestone and unidentifiable scrap metal. The road rose gently as we continued towards the center of the island before reaching a large fig tree. Michael brought the truck to a stop and I climbed down, following him towards a high ledge overlooking a string of ponds beneath us, barely visible through the scrub (figure 23). It took me a moment to register what I was looking at, and then, to reconcile what lay before me with the archival images I had seen of Angaur in the past. Where we now stood indicated the former ground level, prior to the commencement of mining, from which the surface of the island had been lowered by at least thirty meters to the water level of the ponds below. This was the largest mining pit on Angaur, known as Doresha, which was worked under all three imperial administrations over the last century. Previously, the village of Eche had occupied the area but was destroyed after its inhabitants were relocated to the reserve in Ngermasech. [21]

Fig. 22 – Remnants of the former loading facilities on the northeastern coastline of Angaur, built by the DSPAG around 1910 to enable loading under all weather conditions.

Fig. 23 – The former mining pits in the center of Angaur have formed a series of brackish ponds. The entire surface level of the island has been dropped by approximately thirty meters in this area as a result of phosphate mining.

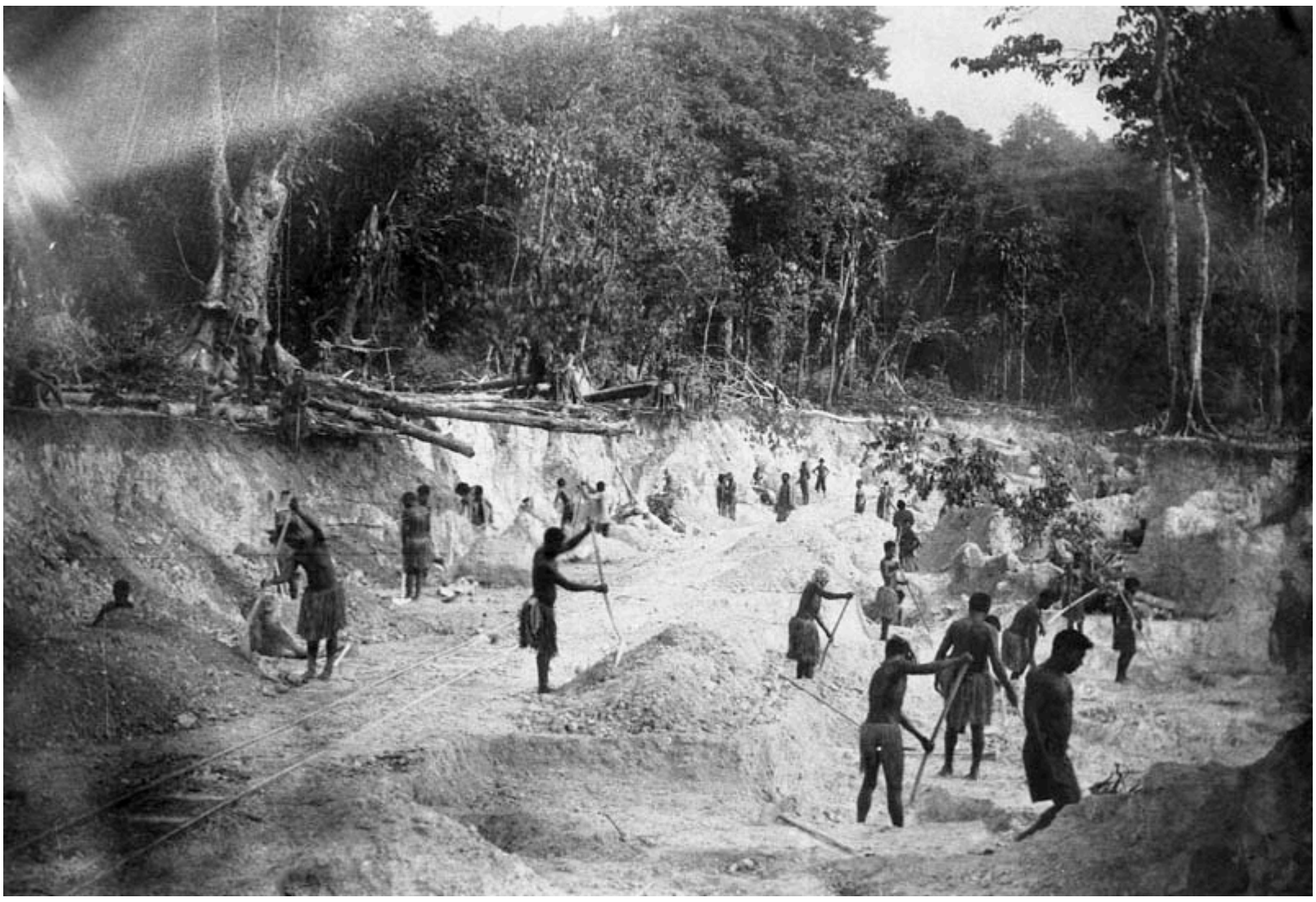

Fig. 24 – Indentured Caroline Islander laborers mining phosphate on Angaur using hand tools, c.1909. A tramway runs through the pit, connecting the mine to the processing facilities on the coast. Source: Deutsches Bundesarchiv, Sammlung Heinrich Hagedorn, Bild 223-153.

Fig. 25 – Aerial view of Angaur from the west. Apart from the airstrip, located at the top of the image, the white areas indicate phosphate mining sites. The major mines on the island are visible to the left of the image. A string of strip mines runs along the length of the runway. Source: US National Archives, Caroline Islands, 1944, 204969950.

Initially, during the period of the DPSAG, shallow pit mining was undertaken by hand using pickaxes and shovels, used to peel back the topsoil of the forest to reveal the reddish-brown phosphate it concealed (figure 24). Ultimately, however, manual methods gave way to floating mechanical dredges—first employed by the Japanese during the inter-war period—that drained the existing swamps to access the blankets of white phosphate beneath. The mechanical excavations eventually extended below sea level and, by the 1950s, Angaur's freshwater supply and agricultural land were contaminated by salt water that had entered from below, through the island's fissured rock. [22] I imagined the vast volumes of missing matter—long since dispersed across fields in Germany, Japan, Australia and New Zealand as superphosphate—trying to reinsert it all at once into the landform before me using my mind's eye. The scale of extraction was somehow inconceivable yet still more immediate than the historical record with which I was familiar: tabulations of annual phosphate exports in company reports; photographs of laborers working in the pits, beleaguered by heat and dust; an aerial view from World War Two, the various mining sites clearly visible after American bombs had razed the island's vegetation to the ground (figure 25). As I had been at Tocal, Dookie and across the Wimmera, in Liverpool, Reading, London, Hamburg and Bremen, and on Nauru and Christmas Island, once again I was absorbed by the vastness of the geography of superphosphate and the diverse forms of violence upon which its production relied.

Fig. 26 – The surveillance station currently being constructed adjacent to the landing strip on Angaur as part of the US Air Domain Awareness Program.

Fig. 27 – The passenger terminal at Angaur International Airport.

Seeing the surface of the ponds ripple in the wind, Michael suggested that we return to the boat before the weather deteriorated further. We rounded the western tip of the island, passing the Japanese-built airstrip and the American surveillance station currently under construction as part of the Air Domain Awareness program (figure 26). The wind was blowing hard now and the sea looked monstrous beyond the inner reef. The road ran southwest through former phosphate pits before pivoting north, past the airport terminal and an abandoned US Coast Guard station, towards the boat harbor (figure 27). The captain was waiting for us, taking a nap under a tree as the deckhand prepared the boat for our passage back to Koror. I informed him of the conditions on the exposed side of the island and asked if he knew what the weather prediction was

for the afternoon. He replied that, as a rule, he never checked the forecast “because you’ve got to go through it anyway, so what’s the point?” I kept my thoughts on this philosophy to myself and thanked Michael for his hospitality before—somewhat reluctantly—climbing aboard.

It took us no less than twenty excruciating minutes to make it out of the harbor. The swell had picked up dramatically since our arrival, leaving very few opportunities for the captain to pass through the breakers without risking becoming swamped. I clung to the antique lifejacket I had been given, its frayed edges and loose fit testing my confidence in its utility. As we waited, I untied one of the inflatable fenders attached to the stern of the boat in case I was going to require additional buoyancy. The captain chose a narrow window between sets of waves and ploughed through the rising surf, launching us off the face of a final wave into the safety of deeper water. His unbridled celebrations at having made it through unscathed didn’t exactly fill me with confidence, but I buried that line of thought and tried to stay in the present moment. “I told you that thing was pointless,” he boomed, nodding at my bright orange lifejacket. “Nicely done,” I replied, terror and relief mixing with antipathy behind an ambivalent smile.

Things only got worse. For reasons that still escape me, the captain chose to navigate around the southern tip of Angaur before leading us north into an aggressive head sea on the western side of the island, directly into the bellowing wind. Had we stayed on the eastern side and headed north immediately, our course would have kept us in the lee of Angaur until we reached the calmer water offshore. Instead, the boat, its entire cabin wobbling as each wave shuddered through the hull, was slapped and rolled around for the next hour. Our progress was so constrained by the conditions that I began to question whether we had enough daylight left to make it back before dark. As we reached the water off the northern cliffs of Angaur —more or less where we had brought in the lures on the way over—the sea state deteriorated into something I never wish to experience again. Two swells moving in opposite directions—one groundswell, one wind-driven—coincided with one another to form steep wedges of water that shot up at random before crumbling into powerful whitecaps. The tallest of these wedges towered above us at around eight meters—the length of the boat—requiring the captain to slowly idle up the face of each wave before accelerating at the top to avoid being pushed backwards and capsizing. This meant that we launched off every wave vertically, falling eight meters from its lip into its trough, the two outboard engines momentarily disappearing underwater upon landing. Each time, I would turn to check the engines were still running when they resurfaced, the view of the swell crashing into Angaur’s cliffs visible in the background. At one stage, my watch lit up: my heartrate was so high and our progress so slow that it thought I was out swimming and wanted to know whether it should be recording my exercise. We proceeded in this fashion for what felt like forever, Peleliu refusing to draw closer as we bucked and battled the swell. The deckhand had withdrawn into himself entirely and was staring towards Peleliu in silence, disassociating from his surroundings as water washed over the gunwales, sloshing around the bilge. Thirty minutes after passing the cliffs, having made no visible progress, I asked the captain whether we were going to be ok or if we needed to call for assistance. “Oh, do you want to drive the boat?” was his reply, retrieving a flare gun from his bag as he spoke. “You need to learn to respect the ocean,” he added a few minutes later, unprovoked, the ice box strapped to the bow becoming dislodged as another wave rolled the boat onto its side. “Mayday! Mayday!” he screamed, pretending to hold a radio. He looked at me and laughed. I fixed my gaze on Peleliu and, for a third time that day, focused on my breathing.

Suffice to say, we made it back intact and I’m writing this report in my hotel room in Koror. We arrived in the rain after dark, the captain’s family lining the dock at the marina, concerned for his safety. Unlike him, they *had* checked the forecast and knew the risks he had taken. I was invited to dinner at a raucous bar and grill and we discussed other near-death experiences he had survived over the years. I felt vindicated, the topic of conversation an implicit concession that he had shared my concerns during the crossing after all. I

don’t remember much else from that evening other than the sensation of wave after wave of relief passing through my body, the last of which struck as I finally lay down to sleep in the early hours of the morning. The next day, I battled two hangovers simultaneously: the first, induced by the celebration of our survival; the second, the emotional comedown from the precarious passage. I walked around Koror in a fog, the overcast sky and oppressive humidity not helping with my recovery. Still, it felt good to be alive and there was much I was yet to see. I visited the surreal Capitol of Palau in Ngerulmud, an early-2000s apparition of the United States Capitol, adorned with cosmological motifs from the period of Palau’s creation (figure 28). I tracked down the administrative buildings of the *Nanyocho* (South Seas Bureau) from the period of Japanese rule over the Marshall Islands, Caroline Islands and Northern Mariana Islands (figure 29). And I visited the Belau National Museum, its archives housed in the former meteorological observatory of the South Seas Bureau.

Fig. 28 – The Capitol of Palau in Ngerulmud district, designed by Joseph Farrell. A strange sight on a small tropical island.

Fig. 29 – The former Koror headquarters of Japan's inter-war South Seas Bureau government.

Fig. 30 – The original caption reads: "7th Air Force Engineers using steel girders taken from Japanese mill, in construction of control tower on Angaur Island, Caroline Islands, 6 November 1944." Source: US National Archives, Caroline Islands, 1944, 204970295.

I also spent a day reviewing the photos I had taken on Angaur in an attempt to distinguish the different historical periods of the structures and sites I had visited with Michael. This is when I came across the tranche of photographs from World War Two referred to above. I became interested in one photograph in particular: an unusual control tower, built to manage air traffic on Angaur once it had fallen under US control (figure 30). The caption indicated that it had been constructed by Air Force engineers using steel repurposed from the phosphate mill on the island. It struck me that this tower somehow embodied the material continuity of imperialism in Palau: steel originally manufactured in Hamburg to construct the Gute Hoffnungshütte on Angaur during the period of German colonial rule, extended by the Nan'yo Kohatsu when Palau fell within the South Seas Mandate, and incorporated into one of the earliest structures of the American occupation of Palau, under which phosphate mining would continue until the mid-1950s. But where continuity implies linearity—an unbroken sequence of events—it fails to capture the political ruptures and breaches that characterize Palau's modern history across Spanish then German then Japanese then American rule. In this sense, the tower perhaps more accurately embodied the pervasive logic of extractivism, registering the administrative layering of imperialism and the staccato bureaucratization of political authority on Angaur, but also the continuity of the wider hegemonic order of global capitalism in which phosphate extraction was always rooted—from what Karl Marx referred to in the nineteenth century as a metabolic rift, to its deepening under industrial conditions through the processes Marion W. Dixon terms "chemification." [23] By the time mining was discontinued on Angaur under the US administration in 1955, close to 3.75 million tons of phosphate ore had been exported from the island—representing around one percent of global annual phosphate production—used to manufacture in excess of 7 million tons of superphosphate fertilizer at ports around the world. [24]

Fig. 31 – Map of the global phosphate trade in 1937. The green circles indicate net exports of phosphates. The pink circles indicate net imports. Australia and New Zealand were among the world's largest importers of phosphate, almost exclusively from the Indo-Pacific. Source: International Exchange of Phosphates in 1937, Department of State, Division of Map Intelligence and Cartography, 1926, US National Archives, 159081051.

Although it overwhelmingly fueled the industrialization of Japanese agriculture, the phosphate industry on Angaur was also entangled with antipodean settler colonialism. One third of the almost 200 tons of material exported from the island prior to World War One was shipped to Australia and New Zealand [25]—a period during which the former country became the highest consumer of superphosphate of all land-abundant economies, including the US, Russia, and Canada (figure 31). [26] In this way, the pre-war activities of the German-run DSPAG on Angaur complemented similar operations on Nauru and Banaba (Anglo-German), Makatea (French) and Christmas Island (British) in tethering unexploited phosphate reserves to Australia's rapidly expanding wheatbelts. The inter- and intra-imperial character of the Indo-Pacific phosphate industry before the war did not preclude its value for the economic development of the Australian colonies; rather, the various colonial governments' liberal attitudes towards national and imperial interests largely left the question of the flow of phosphate to the vicissitudes of the global market, which Australia worked to its benefit. This changed after the war through the reapportioning of Pacific territories by the League of Nations, which saw a boisterous Australia vie for a sphere of influence in its region—especially in relation to the known phosphate deposits—by deploying a white supremacist logic in which white possession of Australia depended on white possession in the Pacific and vice versa. [27] Later, when the US enabled Japan to work the Angaur deposits to reduce its post-war food deficit, Australian anxieties about non-white incursions into its sphere of influence again came to the fore. [28] The history of phosphate imperialism on Angaur is therefore not only entangled with Indigenous dispossession in Australia but also the particular brand of racial capitalism it practiced as a regional power, both within and beyond its sovereign borders.

Close to four decades of intensive phosphate mining and aerial bombardments left more than half the surface of Angaur unusable for any human purpose. [29] The island's taro patches, upon which social status and political structures were based, had been destroyed, relocated and encroached upon countless times under successive foreign occupations. The Angaurese had been shifted around the island in a similar fashion: to make way for mining and conflict between competing foreign powers, including to Babeldaob, the northernmost island in the Palau archipelago. Consistently denied land rights, inadequately compensated, repeatedly excluded from the economic opportunities presented by the phosphate industry, and continually subjected to arbitrary governmental regimes, the community on Angaur practiced a patient and sustained resistance, ceaselessly advocating for their sovereignty and the protection of their livelihoods. "We, the Angaur people," wrote Chief Uherbelau to the US administration in 1947, "are disturbed about these things, and our heart weeps to think of them. We are most disturbed over the problem of what will become of our people when this little island that belongs to us has all been mined." [30] We now occupy that future. As the US returns to Angaur to ramp-up its surveillance of China, and Australia "reengages with the Pacific" by delivering energy and telecommunications infrastructure throughout the archipelago, it is difficult not to see these projects as yet another layer of imperialism in Palau through which foreign powers are again attempting to consolidate their positions of influence within the wider global order.

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[1] Jay Dobbin and Francis X. Hezel, "The Religion of Palau," in *Summoning the Powers Beyond: Traditional Religions in Micronesia* (Honolulu, HI: University of Hawai'i Press, 2011), 166–67.

[2] Jolie Liston and Melson Miko, "Oral tradition and archaeology: Palau's earth architecture," in Jolie Liston, Geoffrey Clark and Dwight Alexander, eds., *Pacific Island Heritage: Archaeology, Identity & Community* (Canberra: ANU Press, 2011), 185–86.

[3] John Rodgers, “Phosphate Deposits of the Former Japanese Islands in the Pacific: A Reconnaissance Report,” *Economic Geology* 43 (1948), 406.

[4] Jean Fritsch, *The Manufacture of Chemical Manures* (London: Greenwood & Son, 1911).

[5] The signatories listed in the contract are transliterated as follows: Ugerbalau, Ungerbunch, Gagelbai, Riguchel, Midechulsch, Gaithan, Thalowak and Guang. Contract of Acquisition, Imperial District Administrator Fritz and Director Schönian of Angaur, 20 November 1909, University of Hawai'i Library, A21.

[6] Parts of the letter are cited in Cecilia Wahl, *Number One Pacific Island* (Bloomington, IN: Woodcrest, 2000), 118–20.

[7] Olsudong and Blaiyok, “Preliminary Report,” 12.

[8] Augustin Krämer, *Palau*, vol. 1 (Hamburg: L. Friederichsen & Co., 1917), 159.

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[11] Olsudong and Blaiyok, “Preliminary Report,” 13.

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[13] “Gewinn- und Verlust-Rechnung per 31. Dezember 1910,” Geschäfts-Bericht der Deutschen Südseephosphat-Aktiengesellschaft in Bremen für das Geschäftsjahr 1910, Leibniz Informationszentrum Wirtschaft, 45933.

[14] Anneliese Scharpenberg and Hartmut Müller, “Die Deutsche Südseephosphat-Aktiengesellschaft Bremen,” *Bremisches Jahrbuch* 55 (1977), 165–66.

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[16] Not his real name.

[17] Frank E. Poirier and Euclid O. Smith, “The Crab-Eating Macaques (Macaca fascicular is) of Angaur Island, Palau, Micronesia,” *Folia Primatologica* 22 (1974): 258–306.

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[19] Olsudong and Blaiyok, “Preliminary Report,” 21.

[20] Mark R. Peattie, *Nanyo: The Rise and Fall of the Japanese in Micronesia, 1885–1945* (Honolulu, HI: University of Hawai'i Press, 1988), 126–27. See also Yuta Sumi, “The Use of Accounting Information for Factory Closure and Income Creation: The Case of the South Seas Development Company, 1937–1944,” *Accounting History Review* 27, no. 2 (2017): 143–75.

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[22] Chester K. Wentworth, Arnold C. Mason and Dan A. Davis, "Salt-water Encroachment as Induced by Sea-level Excavation on Angaur Island," *Economic Geology* 50 (1955): 669–80.

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[24] Ted Arnow, *Effects of Phosphate Mining on the Ground Water of Angaur, Palau Islands Trust Territory of the Pacific Islands*, Geological Survey Water-Supply Paper 1608-A (Washington, D.C.: United States Government Printing Office, 1961), 14.

[25] Michael Hofmann, *Deutsche Kolonialarchitektur in China und der Südsee* (Petersberg, Hesse: Michael Imhof Verlag, 2016), 178.

[26] Derek Byerlee, "The Super State: The Political Economy of Phosphate Fertilizer Use in South Australia, 1880–1940," *Jahrbuch für Wirtschaftsgeschichte/Economic History Yearbook* 62, no. 1 (2021), 100.

[27] Priya Chacko, "Racial Capitalism and Spheres of Influence: Australian Assertions of White Possession in the Pacific," *Political Geography* 105 (2023), 4.

[28] "Australian Protest over Jap. Phosphate Workings on Angaur," *Queensland Times*, June 27 (1947), 1. See also: Christopher Michael Aldous, "Replenishing the Soil: Food, Fertiliser and Soil Science in Occupied Japan (1945–52)," *Environment and History* 28, no. 2 (2022): 311–37.

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ON IMPROVEMENT: WASTE, WHEAT AND WHITE POSSESSION

Sep 13, 2024 by Jasper Ludewig, recipient of SAH's H. Allen Brooks Travelling Fellowship

The H. Allen Brooks Fellowship afforded me many invaluable things: the time to immerse myself in new ideas; an invitation to experiment with novel (for me) forms of writing; the resources required to explore unfamiliar and otherwise inaccessible places; and an engaged audience with whom to share early work. I leave my tenure as fellow with a greater appreciation of the immediacy of fieldwork and its importance in ground-truthing the historical record. I leave with an expanded understanding of the architectures of Australian empire. And I leave with lived experience of the disaggregated geographies of phosphate imperialism. In no uncertain terms, this fellowship—encompassing archival finds, spectacular land- and waterscapes and near-death experiences—has been transformative for me as a scholar. While my colleagues in other disciplines continue to ponder how travelling to islands in the Indian and Pacific Oceans constitutes research, I am left with questions and projects that will continue to preoccupy me for many years to come.

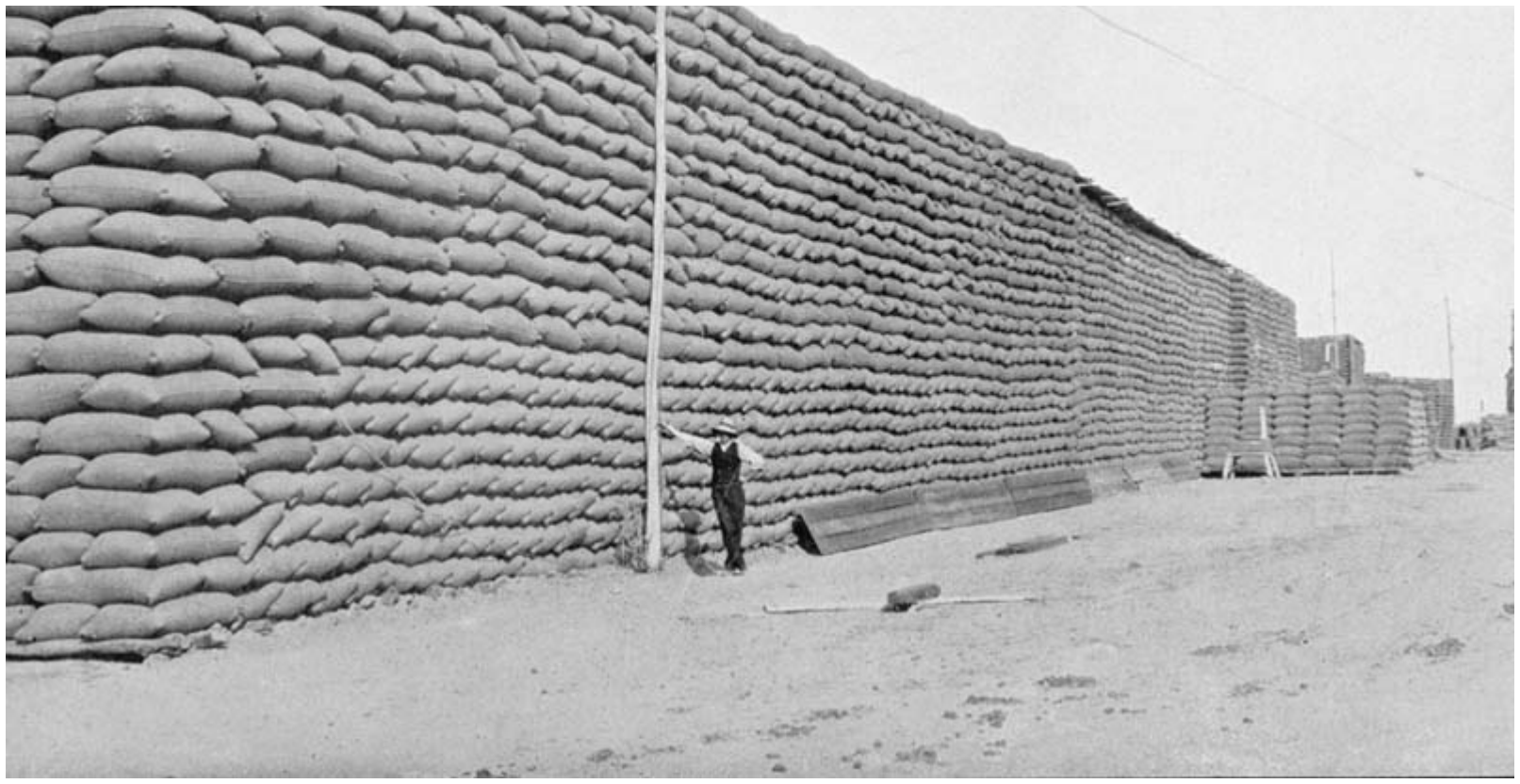

Fig. 1 - Department of External Affairs, 125,000 Bags of Wheat Awaiting Shipment, South Australia, *Under the Southern Cross: Glimpses of Australia*, 1908.

Here, I seek to recapitulate the initial ambition of my fellowship project: to reconstruct the historical infrastructural network of phosphate imperialism in the Indo-Pacific and to read this network against the forms of political order, organizational governance and dispossession with which this network was always entangled. As explored in my previous reports, these objectives ultimately led me from the east coast of Australia to England, Germany, Nauru, Christmas Island and Palau. What emerged is a complex picture of empire in which various, often overlapping forms of public and private power cooperated in the pursuit of mining rights on remote islands to serve the escalating needs of chemical manufacturing throughout the industrialized world. More specifically, my travels followed a kind of triple displacement in which (1) the extraction of phosphorous from the Indo-Pacific (2) consolidated European colonialism in the region as an extension of Australia's ballooning wheat production, which in turn (3) entrenched settler colonial dispossession of Indigenous land throughout the continent's grain growing regions (figure 1). By stitching together field and furrow, experimental agricultural station, port and railway, chemical manufacturing and offshore mining, my travels aimed to capture these displacements at work, approaching them as fundamental processes in the settler colonial enclosure of political territory (figure 2).

Fig. 2 - Overlooking the former workers' housing at Location on Nauru.

Improving the fertility of land both underpinned the ideology of a productive, well-ordered society and was a key rationale in and justification for Indigenous dispossession according to the doctrine of *terra nullius.* As the urban geographer Libby Porter has argued, modern planning law remains grounded in notions of "exclusivity, sovereignty, property and correct land use" in which "improvement, cultivation and civilisation" are both a moral right and a duty within the project of the colony.[1] Experimental agricultural stations, tasked with adapting European techniques of improvement to Australian conditions, were established throughout the colonies in the nineteenth century. My travels took me to one such station in northern Victoria—Dookie Agricultural College—where aspiring farmers were trained in all practical, scientific and administrative aspects of modern agronomy (figure 3). As the experiments conducted at Dookie revealed, nothing came close to the chemical fertilizer superphosphate for stimulating plant growth in Australia's phosphorous-deficient soils. Its uptake at the turn of the twentieth century was dramatic and pervasive: state-subsidized railways connected phosphate works on the coast to burgeoning agricultural districts inland where one shipment of rock phosphate could provide 1000 farms with their annual supply of fertilizer; state banks offered attractive house and land packages, enabling colonists to immediately acquire grain, fertilizer and agricultural equipment before commencing their repayments; mallee country and sclerophyll forest were divided into selections, ringbarked and burnt, raked and grubbed, stripped and ripped, electrically blasted, graded and canalized, before being injected with grain dowsed in chemical fertilizer.

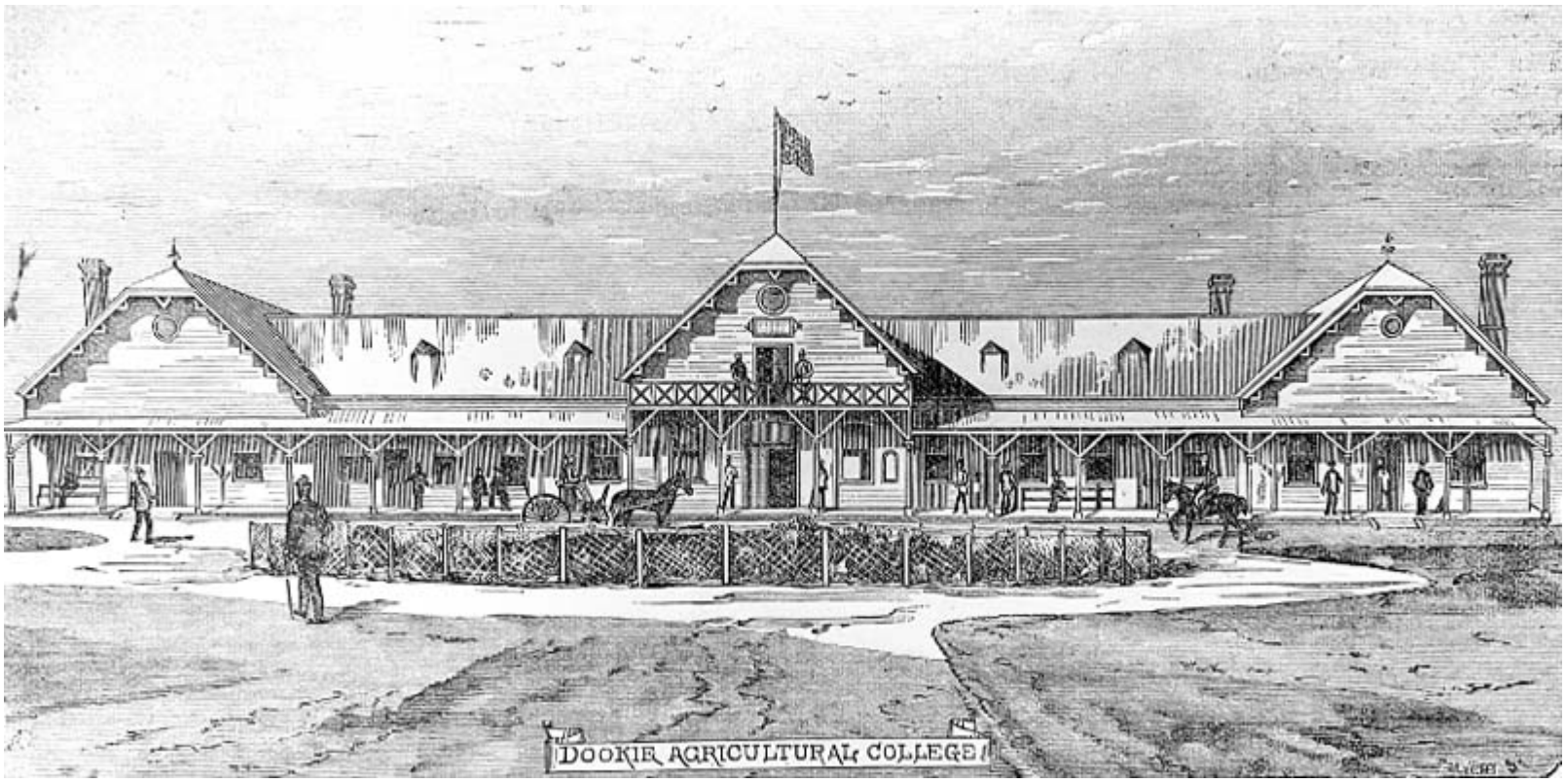

Fig. 3 – Dookie Agricultural College, c.1898.

In just two decades, the 50,000 hectares of land cleared and transformed into wheat fields in Western Australia by 1890 had ballooned to 2.1 million—an area the size of Wales—matched by similar increases in the southern colonies. Driving through these regions today, the rhythmic pattern of the raked earth demarcates the intimate scale at which these largescale environmental transformations were ultimately performed (figure 4). By the early twentieth century, according to agricultural commentators and politicians, Australia had become a so-called “super state”—an avowedly white and virile political community, which had overcome the natural deficiency of Indigenous soils through systematic improvement and coordinated chemical engineering. [2] The wheat industry made Australia in the early twentieth century just as superphosphate made the wheat industry.

Fig. 4 – Wheat field in the Wimmera, Victoria.

Leaving Australia, my travels brought two interdependent trajectories into view: on the one hand, an intensive process of chemically transforming unceded Indigenous land to better support the reliable growth of a variety of imported cereal grasses—wheat—within a settler colonial political economy. And, on the other, an extensive process of securing the requisite raw material—rock phosphate—from a handful of

islands in the Indo-Pacific upon which that growth and subsequently that political economy depended. This is referred to by Brett Clark and John Bellamy Foster as the “environmental overdraft” in which industrialized states imperialistically draw on ecologies and labor elsewhere to fuel “the social metabolic order” of the particular capitalisms to which their state formation is tied. [3]

The technical dimensions of this overdraft varied from island to island and developed significantly over the course of the twentieth century, but always involved shoveling, picking, scraping, drilling, hammering or blasting the rock phosphate from the limestone that formed the geological structure of each island. Today, scarified and disturbed land indicates the former mining sites, torn into tropical forests on each of the islands. On Nauru, the central plateau is uninhabitable, having been dug back to jagged pinnacles that now rise from its reengineered surface (figure 5). On Christmas Island, geometrical patches of rock and earth continue to be exposed deep within the island’s national park (figure 6). On Angaur in Palau, a thirty-meter mining pit, once known as Doresha, has penetrated the island’s water table. Locomotives, narrow-gauge tramways and aerial cableways conveyed the mined rock from these sites to the crushing and drying facilities at the ports where the phosphate was finally loaded directly onto steamers via belt conveyors on pivoting steel cantilevers, arriving at Australia’s fertilizer manufacturers around two weeks later. Here, the rock was crushed further and mixed with sulphuric acid before being bagged and loaded for distribution (figure 7).

Fig. 5 – The landscape phosphate mining has left beside at Topside, Nauru.

Fig. 6 – Mining continues within the Christmas Island National Park.

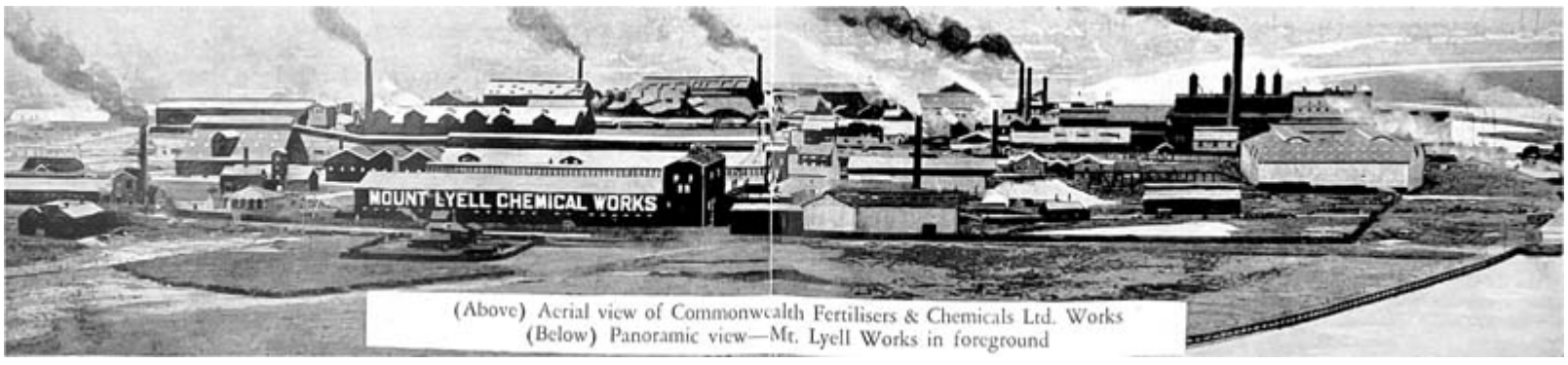

Fig. 7 – Mt Lyell Chemical Works, Yarraville, Melbourne, c.1920.

These processes were coordinated on each island by imperial technocracies in miniature, complete with their own public works departments. Countless structural, hydraulic and mining engineers, architects and naval architects, boilermakers and carpenters, company executives and imperial administrators lived in racially segregated company settlements, administering remote industrial mining ventures for close to a century and managing a vast labor force. Conditions were overwhelmingly horrific, as captured in the extreme discrepancies in mortality rates between the European managers and the Japanese, Chinese, Malay and Pacific Islander laborers indentured to each island. Protests against unsafe, unhealthy and inhumane working conditions were, over time, used as justification for increased surveillance and policing of the workforce. This further reified regional hierarchies between a generalized wage labor force in Australia's urban-industrial centers and primary industries, and the indentured, often incarcerated labor deployed in their service on the phosphate frontier. [4]

As Roger C. Thompson observed in his study of nineteenth-century imperialist attitudes in Australia, the Indo-Pacific ambitions of Australian companies and politicians were instrumental in shaping the final limits of Greater British imperialism in the region, demonstrating the "primacy of peripheral forces for political expansion in the growth of the British Empire." [5] Those involved in the Indo-Pacific rock phosphate industry thus joined a wider cast of actors pursuing what the Victorian Premier Graham Berry, in 1877, had called "a kind of Monroe Doctrine" under which "all the islands in this part of the world should be held by the Anglo Saxon race." [6] The vast copra reserves amassed by Lever's Pacific Plantations throughout the British Solomon Islands (Lever was also a major investor in the Pacific Phosphate Company, which worked Nauru

and Banaba before World War One); the sugar infrastructure constructed in Fiji by the Colonial Sugar Refining Company; Burns, Philp & Co.'s settlement scheme for cotton plantations in the New Hebrides; the web of mission stations developed there by the Presbyterian Church of Victoria; in addition to the myriad Australian trading stations, properties, wharves and settlements—these were the collective physical evidence that accompanied calls for imperial protection and visions for white possession of the Indo-Pacific (figures 8 – 10). As remarked in the Adelaide *Advertiser* following federation in 1901:

> *Now, however, that we have the machinery for bringing the concentrated opinion of Australia to bear upon matters affecting our continental interests, we may expect to find attention once again turned towards the numberless islands that dot the huge watery waste around us, and which—whatever allegiance they may now own—we still regard as [...] preordained, at however remote a date, to be our heritage.* [7]

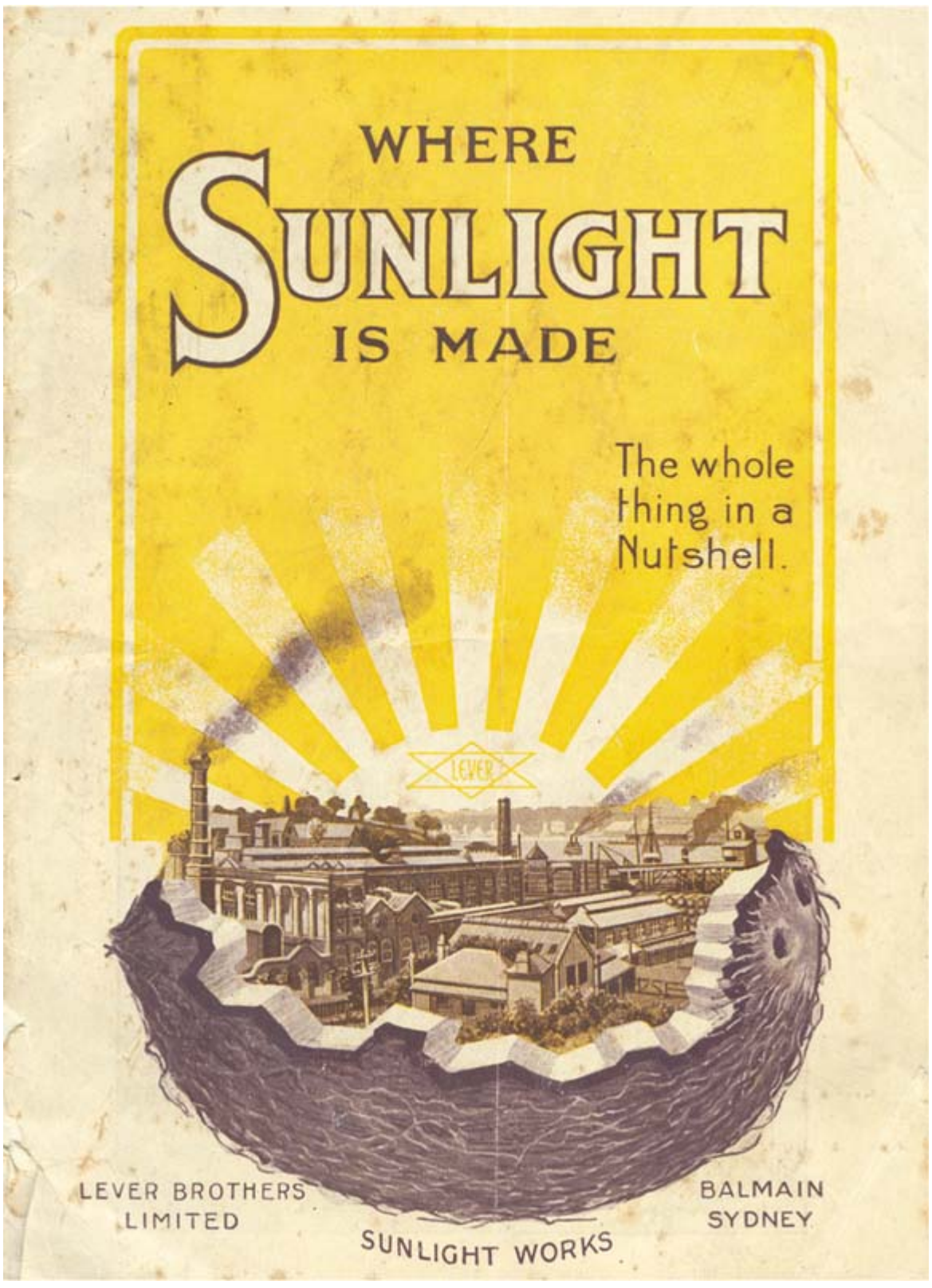

Fig. 8 – Advertisement from c.1920 for Lever Brothers Sunlight soap, manufactured in Balmain, Sydney using copra acquired by Lever's Pacific Plantations in the British Solomon Islands.

Fig. 9 – The Colonial Sugar Refining Company's sugar mill in Labasa, Fiji, 1924. CSR Archive, Australian National University, 171-58.

Fig. 10 – Burns, Philp & Co.'s store in Vila, New Hebrides, 1911. Australian National University Archives, N115-625.

Australia's empire never took the heightened forms of direct colonization, annexation or invasion of territory inferred by the *Advertiser*; rather, it was amassed gradually through the increasing bureaucratization of political authority on islands of value to its economic development. Phosphate is just one vector in this broader history, underpinned by what Priya Chako describes as "layers of dispossession,"

[8] whereby attempts to develop an agricultural economy to secure white possession of stolen Aboriginal land "at home" in the Australian colonies depended upon extraterritorial dispossession throughout the Indo-Pacific, collapsing neat geopolitical distinctions between Australia and its offshore resource frontiers, and between public and private power.

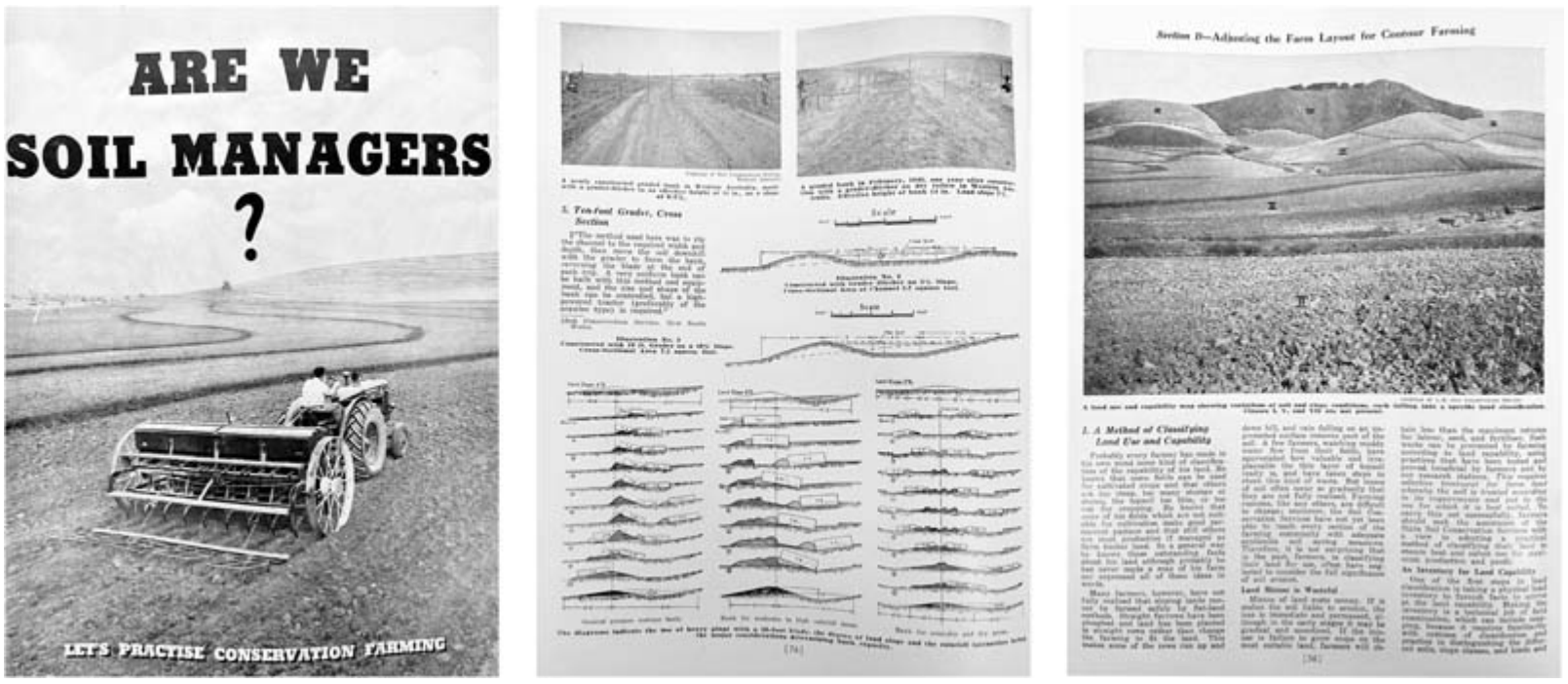

Fig. 11 – Excerpts from *Are We Soil Managers?*, a trade magazine published by the International Harvester Company, c.1955.

One implication is that the spaces of Australian agriculture—those through which I traveled, and which recur throughout the distributed archive of the Indo-Pacific phosphate industry—must also be understood as sites of Australian imperialism. The two cannot, in fact, be separated. By the mid-twentieth century, at the peak of Australia's rock phosphate consumption, improvement was characterized as much by dramatic increases in land clearing, mechanization, genetic modification and the total chemicalization of farming, as the almost total decimation of remote phosphate islands. As it had been since British invasion of the continent in the late eighteenth century, soil remained the medium for envisaging, organizing and sustaining the settler colony. According to one trade magazine (figure 11):

> *We should manage every last particle of our soil as we manage our bank account. …We should treat personally and individually this responsibility as a moral obligation. […] Soil erosion wastes fertility and soil. Wasted soil means less nutritious food. When the land suffers and is wasted, both landowners and city people suffer, eventuating in wasted lives.* [9]

Waste, as improvement's inverse, was not only antithetical to modernity and national progress, but was also a moral problem deeply rooted in colonial understandings of land, property and social reproduction. As the historical geographies of superphosphate ultimately clarify, white supremacy in Australia was contingent on Australian imperialism in its region and vice versa; Australian exploits in the Indo-Pacific were supposedly legitimized by its sovereign independence and historical trajectory as a white ethnostate. These imperial hierarchies continue to structure Australian relations with its regional neighbors today, albeit couched in sanitized notions of a shared past and the so-called "Pacific family," rather than the white man's burden and murmurings of manifest destiny. [10] This fellowship has enabled me to attend more

closely to the spatial and territorial forms of this history as embodied in the carefully designed buildings and infrastructures of the superphosphate industry (figure 12). As I have attempted to argue, these forms cast the placatory tropes of Australia's contemporary geopolitics in a different and more glaring light, whereby questions concerning reparations for Australia's historical overdraft on ecological abundance overseas sit alongside calls to "pay the rent" for the dispossession of traditional owners at home.

Fig. 12 – Remnant phosphate bin on Nauru, built during the period of the British Phosphate Commission.

Whereas it was the process of writing that first brought these various entanglements and displacements into view for me, my travels revealed the extent to which they were already written into the physical landscapes themselves. Travel animates the imagination in ways that conventional forms of scholarship cannot, challenging the convenience of neat historical narratives and complicating the historian's straightforward appraisals of motive and causality. Navigating this complexity has clarified the critical work historiography performs in making the past available to present concerns. Attempting to do so with nuance, rigor and balance has been extremely challenging, catalyzing much self-doubt along the way. Working through these difficulties requires the time and space to sit with new impressions and to understand their implications for what is supposedly settled knowledge. Being afforded both at once is an immense privilege and I am deeply grateful to the Society of Architectural Historians and the late Professor H. Allen Brooks for their generous support.

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[1] Libby Porter, "Dispossession and Terra Nullius: Planning's Formative Terrain," in Sue Jackson, Libby Porter and Louise C. Johnson (eds.), *Planning in Indigenous Australia: From Imperial Foundations to Postcolonial Futures* (London: Routledge, 2018), 61–62.

[2] Derek Byerlee, "The *Super* State: The Political Economy of Phosphate Fertilizer Use in South Australia, 1880–1940," *Jahrbuch für Wirtschaftsgeschichte* 62, no. 1 (2021): 99–128.

[3] Brett Clark and John Bellamy Foster, “Ecological Imperialism and the Global Metabolic Rift: Unequal Exchange and the Guano/Nitrates Trade,” *International Journal of Comparative Sociology* 50, nos. 3-4 (2009): 311-34.

[4] Marion W. Dixon, “Phosphate Rock Frontiers: Nature, Labor, and Imperial States, from 1870 to World War Two,” *Critical Historical Studies* 8, no. 2 (2021): 271–307.

[5] Roger C. Thompson, *Australian Imperialism in the Pacific: The Expansionist Era, 1820–1920* (Melbourne: Melbourne University Press, 1980), 220–24.

[6] Quoted in Marilyn Lake, “Colonial Australia and the Asia-Pacific Region,” in Alison Bashford and Stuart Macintyre (eds.), *The Cambridge History of Australia*, vol. 3, Indigenous and Colonial Australia (Cambridge: Cambridge University Press, 2013), 555.

[7] Quoted in Thompson, *Australian Imperialism in the Pacific*, 158.

[8] Priya Chako, “Racial Capitalism and Spheres of Influence: Australia Assertions of White Possession in the Pacific,” *Political Geography* 105 (2023), doi.org/10.1016/j.polgeo.2023.102923.

[9] Unknown, *Are We Soil Managers?* (Geelong: International Harvester Company of Australia, c.1955), 8.

[10] On the “Pacific family” discourse, see Joanne Wallis, “The Enclosure and Exclusion of Australia’s ‘Pacific Family’,” *Political Geography* 106 (2023), /doi.org/10.1016/j.polgeo.2023.102935.

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