

A Forgotten Case of “Scientific Excellence on the Periphery”: The Nationalist Cocaine Science of Alfredo Bignon, 1884–1887

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I have been reading about cocaine, the essential constituent of coca leaves which some Indian tribes chew to enable them to resist privations and hardships. . . . Perhaps others are working on it; perhaps nothing will come of it. . . .

—Sigmund Freud, Letter of 21 Apr. 1884¹

INTRODUCTION

In recent years, Latin American history has been awash in an exciting wave of scholarship on the history of science and medicine. Historians are exploring Latin American reactions to foreign medical, sanitary and scientific missions; the creation of national research institutions; the impact of epidemics on conceptions of urban space, politics and social control; the role of indigenous and folk cures in modern public health campaigns; and the relation of transnational eugenics movements to national anxieties about race, among other fertile topics.² Pioneering medical historian Marcos Cueto dubs this focus

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¹ Ernest Jones, *The Life and Work of Sigmund Freud* (New York: Anchor Books, 1963), 51.

² Marcos Cueto, *Excelencia científica en la periferia: Activiades científicas e investigación biomédica en el Perú. 1890–1950* (Lima: CONCYTEC, 1989). For a few exemplars: Nancy Leys Stepan, *The Hour of Eugenics”: Race, Gender and Nation in Latin America* (Ithaca: Cornell University Press, 1991); M. Cueto, ed., *Saberes andinos: Ciencia y tecnología en Bolivia, Ecuador y Perú* (Lima: Instituto de Estudios Peruanos, 1995); Steven Palmer, *From Popular*

“scientific excellence on the periphery”—the idea that surprising avenues of research and innovation occurred in societies generally deemed “underdeveloped,” especially in modern scientific activities and outlooks.

One unsung case of excellence is the remarkable story of Alfredo Bignon. Between 1884 and 1887, Bignon, a French immigrant pharmacist in Lima, conducted a wide-ranging and original series of experiments and notes on coca and cocaine, disseminated in Peruvian as well as international journals. These were precisely the years that young Dr. Sigmund Freud, a world apart in Vienna, was publishing his still-famous “cocaine papers.” Whereas Freud is well celebrated (or sometimes vilified) as the father of psychoanalysis, which his early fascination with cocaine likely influenced, his contemporary Alfredo Bignon is entirely forgotten.³ I suggest here that Bignon’s oblivion may have to do with the course of cocaine’s subsequent history. Bignon’s Peruvian cocaine papers, including a recognized new technology for local refining of coca-leaf into cocaine, emerged in a climate of rising nineteenth-century “scientific nationalism” around Andean coca and cocaine. This legitimating interest in the drug peaked with the success of the turn-of-the-century Peruvian cocaine export industry (what Finance Minister Alejandro Garland in 1906 called “this essentially Peruvian industry”), which Bignon’s research helped to spur. But by the mid-twentieth century, cocaine’s transformation into a

Medicine to Medical Populism: Doctors, Healers and Public Power in Costa Rica (Durham: Duke University Press, 2003); Julyan Peard, *Race, Place and Medicine: The Idea of the Tropics in Nineteenth-Century Brazilian Medicine* (Durham: Duke University Press, 1999); Anne-Emanuelle Birn, *Marriage of Convenience: The Rockefeller Foundation, International Health and Revolutionary Mexico* (Rochester: University of Rochester Press, 2005); Diego Armus, ed., *Disease in the History of Modern Latin America: From Malaria to AIDS* (Durham: Duke University Press, 2003).

³ Bignon merits two brief mentions (pp. 114, 117) in Joseph Gagliano’s survey *Coca Prohibition in Peru: The Historical Debates* (Tucson: University of Arizona Press, 1994), but none in Cueto’s superb (but post-1890) analysis of Peruvian science, *Excelencia científica*. Two hagiographic essays represent a flash of (pro-industrial?) pharmaceutical nationalism during World War II: Aurea Tejada Barba, “Un talento olvidado: Alfredo Bignon,” *Actas y Trabajos: Primero Congreso Farmacéutico Peruano* (May 1943), 609–15, and Luis Vallejos Santoni, “Estudios científicos sobre la coca peruana desde H. Unánue hasta A. Bignon,” (ibid.), 578–83. Alejandro Garland, *El Perú en 1906* (Lima: Imp. La Industria, 1907), 29. A Calle Bignon reputedly existed in Lima.

An extensive bibliography exists on Freud and cocaine, with three highly divergent views. In addition to Bernfield’s 1953 revelatory article (repr. in Byck), a collection compiled by Dr. Robert Byck, *Cocaine Papers by Sigmund Freud* (New York: Stonehill Publishing, 1974), reacts to the emerging cocaine culture of the 1970s and resuscitates Freud as a father of modern “psycho-pharmacology.” Ernest Jones’ quasi-official biography, *The Life and Work of Sigmund Freud*, ch. 6, “The Cocaine Episode [1884–1887],” dismisses the “episode” as a minor digression in Freud’s larger career. E. M. Thorton’s *The Freudian Fallacy: Freud and Cocaine* (London: Palladin, rev. ed. 1986; original 1983 version was titled simply *Freud and Cocaine*), was written after Fliess’ letters appeared. It shows Freud’s enduring interest in the drug, sees cocaine as a big personal issue in his life, and, in a polemical vein, reads the 1890s theory of psychoanalysis as a product of Freud’s drug-induced sexualized or messianic thinking. For a fanciful reading of Freud’s relation to Peru, see Curtis Marez, *Drug Wars: The Political Economy of Drug Wars* (Minneapolis: University of Minnesota Press, 2004), ch. 6.

disreputable illicit drug made Peru's earlier cocaine science unworthy of national pride. Bignon's achievements, I argue most specifically, were undermined by the transnational tensions between French and Germanic medical and commercial forces in the early definition of cocaine as a modern commodity.

This essay first draws out some of the broadest contexts for Bignon's work in awakening nineteenth-century global and Peruvian fascinations with native coca-leaf, and after 1860 its alkaloid, cocaine. Second, it explores Bignon's research program among the medical, pharmaceutical, governing, and commercial circles of Lima, and some of the transnational influences at play here. I end with the impact of Bignon's cocaine science, his incentive to a Peruvian "crude cocaine" industry, and later, long after the drug's fall from grace, a possible tie to "*pasta básica de cocaína*": peasant-made jungle cocaine paste for illicit export.

IMAGINING COCA: BACKGROUND AND CONTEXT

Since the world "Psychoactive Revolution" of the sixteenth and seventeenth centuries (historian David Courtwright's provocative conception), knowledge about new drugs has typically been filtered through medical curiosity and systems. Such, for example, was the story of novel American stimulants like tobacco and chocolate, which were quickly classified and absorbed after the Conquest into the European humoral *materia medica* before becoming widely used and globally-traded commodities.⁴ Medicine is both a possible medium and a barrier in this transnational discovery or transmission of drugs, though such flows are rarely studied as crisscrossing currents, through Europe to other parts of the globe.

Coca, "the divine plant" of the Incas, did not win the prestige of chocolate and tobacco in the aftermath of the Conquest, for reasons still dimly understood. Instead, coca was either demonized or ignored by the Spaniards. Monardes' canonical treatise on New World medicinal plants (1580) had but one sentence on coca as medicine (versus twenty-four pages extolling the benefits of that health plant tobacco). Historians speculate that Spaniards found the oral-ingested coca habit (its so-called "chewing") repugnant, and quickly condemned it as an anti-Christian practice due to its deep association with Andean spirituality. After trenchant debates, authorities came to tolerate coca for profitable imperial ventures such as sales to the Indian miners laboring

⁴ David C. Courtwright, *Forces of Habit: Drugs and the Making of the Modern World* (Cambridge: Harvard University Press, 2002); Wolfgang Schivelbusch, *Tastes of Paradise: A Social History of Spices, Stimulants, and Intoxicants* (New York: Vintage Books, 1992); Jordan Goodman, *Tobacco in History: The Cultures of Dependence* (London: Routledge U.K., 1993); Michael Coe and Sophie Coe, *The True History of Chocolate* (New York: Thames and Hudson, 1996); Rudi Matthee, "Exotic Substances: The Introduction and Global Spread of Tobacco, Coffee, Tea, and Distilled Liquor, 16th–18th Centuries," ch. 2 in Roy Porter and M. Teich, eds., *Drugs and Narcotics in History* (Cambridge, U.K.: Cambridge University Press, 1995).

the *mita* at Potosí.⁵ Three centuries of Spanish rule in the Andes left coca racially debased in the eyes of Creole elites, though some medicinal use emerged in Lima. In Europe, the energizing properties of coca became widely regarded as a myth, in part because dried coca leaf rarely maintained its powers after a long voyage to Europe.

For a complex of reasons, European imaginings of coca began to shift after 1800, during Peru's break from Spain and the fitful rise of Peruvian nationalism. Medical circles in urbanizing countries (notably Austria-Germany, France, Britain, Italy, and the United States) began seeking new commercial stimulants and cures for an industrial age. European botanists and travelers (such as Richard Spruce and, famously, Dr. Paolo Mantegazza in the 1850s) now ventured freely to Peru and wrote about coca's wondrous effects. The first alkaloids (of opium) were identified in 1805, intensifying a scientific search for other active principles. In the late 1850s, fresh supplies of coca leaf were specifically gathered for scientific research by the Austrian *Novara* naval mission, and used in German isolations (1858–1860) of one of its key alkaloids: cocaine. Albert Niemann's discovery of cocaine added instantly to coca's scientific validity, its stimulating properties now verifiable, and scores of experiments, writings, and speculations mushroomed about this miraculous "new" herb.⁶ As part of the same movement, coca-leaf and its infusions became hugely popular consumer items in the West, starting in the 1860s with the French commercial enterprise of *Vin Mariani* (a coca-laced Bordeaux wine tonic), the precursor and inspiration of American *Coca-Cola* (1886). Angelo Mariani's legendary health advertising campaign liberally wrapped itself in the symbols and mythology of Andean "Mama Coca." French, British, and North American enthusiasm for coca was strongly related to herbal (*materia medica*) and pragmatic or "eclectic" medical traditions, often in contrast to the consolidating Germanic science of pharmacology.

But the true boom of scientific, medical and commercial interest in cocaine, still a very rare experimental commodity, came after the 1884 recognition of cocaine's anesthetic powers by Austrian Carl Köller, a close associate of Freud's. With this discovery, cocaine swiftly revolutionized the practice of western surgery, since it was the first truly effective local anesthetic. For the next decade, research on cocaine, and to a lesser extent, coca, accelerated into a frenzy, and key pharmaceutical firms such as E. Merck of Darmstadt

⁵ See Gagliano, *Coca Prohibition*, ch. 3, for debates. Goodman, *Tobacco in History* has a studied comparison of tobacco with coca (pp. 49–51). Not all of Goodman's arguments are convincing, since mastication was no stranger than smoking for Europeans and chocolate and tobacco also came loaded with American cosmological significance.

⁶ A fine source on developments (title aside) is Joseph Kennedy, *Coca Exotica: The Illustrated Story of Cocaine* (New York: Cornwall Books, 1985), chs. 6–8. See W. Golden Mortimer, M.D., *History of Coca: "The Divine Plant" of the Incas* (New York: J. H. Vail & Co., 1901; repr. FitzHugh Ludlow Memorial Library, San Francisco, 1974).

or Detroit's Parke-Davis & Company sought vastly larger supplies of coca-leaf from the Andes. Hundreds of therapeutic and research notes circulated in medical, dentistry, pharmacy, and chemistry journals about cocaine preparations and applications, much of it actually responsible science. These were swiftly exchanged across a remarkable international circuit that included such scientific luminaries as Britain's William Martindale and Robert Christison and Americans Edward Squibb, William S. Halsted, and William Hammond.⁷ Cocaine has been described as the first "modern drug," for having evolved so entirely out of laboratory science, and for a brief period (before its clinical limits and dangers were realized in the 1890s) it was seen as a modern panacea, tried for everything from labor pains to cholera, hysteria, toothaches, and melancholy. Freud, for example in his landmark literature review, "Über Coca" (July 1884), surveys these extant classes of coca and cocaine therapy: as a general stimulant (physical, mental, and sexual), for all manner of stomach and digestive ailments, for "cachexia" (wasting diseases such as anemia, syphilis, and typhus), asthma, local anesthesia, and famously to his regret, for treatment of alcohol and morphine habits.

But coca-leaf, cocaine's raw material, was bulky and highly perishable from alkaloid-rotting molds, and grown in remote tropical areas of Peru on the far side of the vertiginous Andes (and, with even less availability, from neighboring Bolivia). By 1885 soaring interest and unreliable supply led to a severe scarcity and price squeeze on the new miracle drug. In response, many schemes were laid. Britain, France, and the Netherlands launched scientific coca dissemination projects at their imperial botanic gardens; the U.S. Navy's Surgeon General and Andean consuls were charged with resolving the North American coca shortage, seen largely as a trade and leaf-packing problem. Parke-Davis sent its pioneer ethnobotanist Henry Hurd Rusby on a legendary coca mission to Bolivia to find new medical uses as well as practical solutions to the mid-1880s supply crunch. These were the broadest contexts for Freud's momentous cocaine essays and speculations of 1884–1887, based mainly on his survey of obscure secondary sources found with the U.S. Surgeon General's Index. In fact, Freud nearly abandoned his project, shocked by the steep price of Merck cocaine, until American rival Parke-Davis stepped in to lend him free samples for the publicity. And far away, these same

⁷ See P. Gootenberg, ed., *Cocaine: Global Histories* (London: Routledge U.K., 1999) for nineteenth-century networks. Joseph F. Spillane, *Cocaine: From Medical Marvel to Modern Menace in the United States, 1884–1920* (Baltimore: Johns Hopkins University Press, 2000), in chapters 2–4 presents a discerning analysis of the era's cocaine medicine (cf. Steven B. Karch, M.D., *A Brief History of Cocaine*, Boca Raton: CRC Press, 1998). On the era's mass coca culture, see Mark Pendergrast, *For God, Country and Coca-Cola: The Unauthorized History of the World's Most Popular Soft Drink* (New York: Scribner, 1993), ch. 2. Byck, *Cocaine Papers*, ch. 15, "Über Coca."

scientific and commercial conjunctures also set the stage for forgotten pharmacist Alfredo Bignon's experimentation in Lima.

Bignon was not alone in Peru; he was part of a new national movement emerging around coca and cocaine. I do not want to suggest here that the Peruvian nineteenth-century discovery of coca "in their own backyard" was a mere reflection of the cocaine mania sweeping the European and American world. The enhanced image of coca abroad after 1850 no doubt helped raise its legitimacy at home, but Peruvians came up with their own and often complex responses to the drug. Scientific (and closely related, commercial) interest in coca was part of a wider awakening of Peruvian scientific nationalism, which often was spearheaded by educated immigrants such as prominently Italian geographer/naturalist Antonio Raimondi or the Polish engineer Eduardo Habich, all deeply immersed in trans-Atlantic intellectual currents. With Paris being a pole of cultural and scientific fascination with coca, it is no accident that francophone Peruvians like Bignon would figure in local discoveries about coca, as would, as we will see, local Germans. Their fluid interstitial roles no doubt complicate unidirectional models of scientific flows (from "core to periphery") as well as essentialized ideals of national identity.

To speak generally, there were three prospective routes for the nationalist recuperation of coca's possibilities in Peru. The first was coca as a potentially lucrative national commodity, or to use Arnold Bauer's suggestive term, coca as a "modernizing good." In fact, this type of dreaming and writing about national coca became a virtual obsession after 1860, and was especially evident in revived schemes for Amazonian development (as seen in the writings of Carlos Lissón, Peru's leading sociologist, or Luis Esteves, the *civilista* economic historian, or in the colonizing propaganda of Raimondi's or Sánchez Albornoz's *Sociedad del Porvenir de Amazonas*). Coca, like earlier guano, was a natural monopoly for Peru, just waiting to be "constructed" as a lucrative exportable commodity. Coca plantations could awaken the sleeping tropical riches of the still savage eastern *ceja de montaña* lands of Peru. Following the devastation to Peru's coastal export economy during the War of the Pacific (1879–1881), such pleas became desperate.⁸

⁸ Arnold J. Bauer, *Goods, Power, History: Latin America's Material Culture* (New York: Cambridge University Press, 2001), ch. 5. For the era's technological nationalism, see Paul Gootenberg, *Imagining Development: Economic Ideas in Peru's 'Fictitious Prosperity' of Guano, 1840–1880* (Berkeley: University of California Press, 1993), 103–11. Lissón left this striking commodity discourse in 1886: "Today they demand it [coca] in Europe in large quantities, which no doubt will continue to expand when adopted for their workers and soldiers. It is and has to be a rich and vibrant article of our national exportation, which can advantageously replace even sugar. . . . in the midst of our penury, science has opened a new source of public wealth, giving value to one of our natural resources. To coca, like our mines, we should dedicate ourselves above all else to alleviate our misery . . . since we will be the suppliers to all humanity in this area. Coca will amass capital when cultivated on a large scale and provide us economic renown and respectability" (trans. from Carlos Lissón, *Breves apuntes sobre la sociología del Perú en 1886*

A second possible route for coca was cultural. In theory, Peruvian elites could have embraced coca leaf's centrality as a popular or indigenous marker of Peru, and of its long historic roots as a nation. However, in Peru that avenue was blocked in the nineteenth century, due to the deep cultural divide between ruling urban elites and the coca-using *sierran* Indian majority, which was increasingly construed as a racial hierarchy. Indeed, when nationalist-style *indigenismo* arrived vibrantly in the early twentieth century, most of its proponents were strongly anti-coca—they regarded it as a degenerating vice or poisoning of Peru's *raza indígena*. Paradoxically, Andeanist coca nationalism of a “neo-Incan” kind was more likely found overseas, among French coca wine connoisseurs or as expressed in the classic pro-coca tome of New York physician W. Golden Mortimer, *History of Coca: “The Divine Plant” of the Incas* (1901), a copy of which was sent to the *Biblioteca Nacional* in Lima.⁹

A third avenue was medical-scientific nationalism, which was particularly suited for coca. By the 1850s, literate urban Peruvians gleaned that European science was confirming the scientific value of one of Peru's “untapped” national resources, overcoming ancient prejudices. Lima's medical elites, many ardent liberals, internationalists and public intellectuals, had access to the latest in overseas research through their active mid-century medical societies, correspondence, and journals. Modern metropolitan science could legitimate and nationalize Peru's gift to the world. Typical of the times was the notion that “modern chemistry” would transform the lowly Indian coca plant into that most exciting and useful of commodities: medicinal cocaine. This can be read as a metaphor for elitist Peruvian nationalism generally, the transformation of an inert, telluric and buried raw material of history into a superior and hybrid modern good.¹⁰

[Lima: Imp. Gil, 1887], 20, 63, 67). See also Mariano Sánchez Albornoz, *Breves apuntes sobre las regiones Amazónicas* (Lima: Imp. del Progreso, 1885), 36–37, and José G. Clavero, *El tesoro del Perú* (Lima: Imp. De Torre Aguirre, 1896), 46–47.

⁹ Mortimer, “*Divine Plant*” (1901); Angelo Mariani, *Coca Erythroxyton (Vin Mariani): Its Uses in the Treatment of Disease* (Paris and New York: Mariani & Co., 1886, 4th ed.); Luis Esteves, *Breves apuntes para la historia económica del Perú en 1883* (Lima: Imp. Huallaga, 1883), 73–75. See Gagliano, *Coca Debates*, ch. 6, on anti-coca indigenistas. For the 1920s–1930s medical exemplar of Dr. Carlos E. Paz Soldán, see Paul Gootenberg, “Reluctance or Resistance?: Constructing Cocaine (Prohibitions) in Peru,” in Gootenberg, ed., *Cocaine*, 56–62.

¹⁰ For the conundrum of this split nationalism, Mark Thurner, “Peruvian Genealogies of History and Nation,” in M. Thurner and A. Guerrero, eds., *After Spanish Rule: Postcolonial Predicaments in the Americas* (Durham: Duke University Press, 2003), ch. 6. For comparable analysis of transnational modernity, see Deborah Poole, *Vision, Race, and Modernity: A Visual Economy of the Andean Image World* (Princeton: Princeton University Press, 1997); also, Leoncio López-Ocon Cabrera, “El nacionalismo y los orígenes de la Sociedad Geográfica de Lima,” in Cueto, *Saberes andinos*, 109–25. JoAnn Kawell first alerted me to a “nationalist” element in Peruvian cocaine science.

Bignon was also part of a national coca movement dating to the independence era. Tellingly, when Peruvians spoke of coca in the 1880s they often invoked this national scientific genealogy (sometimes even back to Garcilaso) rather than refer to European discovery. The first in this line is well-known: Dr. José Hipólito Unánue, the towering scientific and political savant of Peru's enlightenment "Sociedad de Amantes del País," who went on to become a leading republican patriot. Unánue's 1794 "Disertación sobre la coca" surveyed the leaf's distribution and medicinal uses across Peru, extolling its centrality to the viceregal economy and promoting it as a future export to Europe. His hypothesis that Indian use of lime in coca preparations was the secret to its vitality was not only correct, but influenced a line of other investigators including von Humboldt.¹¹ Unánue's "Disertación" continued to attract readers in Peru, resurfacing, for example, in 1837 in the scientific monthly of Cuzco, a region of heavy coca-use. In October 1858, riding a wave of coca news from abroad, an editorial, "La coca peruana," appears in the "Pharmacology" section of *La Gaceta Médica de Lima*, Peru's principle on-and-off medical journal. Referring to the Continental search for an active coca alkaloid, and its first crude distillation techniques, the editor (likely French-trained José Casimiro Ulloa, a towering figure of mid-century medicine and politics) declares as matter of fact, "It is well-known in our country the stimulant and tonic properties held by coca leaf (*erythroxylon coca*), even used widely by the *raza indígena* as a daily food." "It is desirable that chemical processes be applied to this indigenous plant, so that its applications will become more advantageous and generalized in medical practice, that which today is still confined to the narrow realm of Andean empiricism."¹²

Less known than Unánue or Ulloa is the remarkable career of Tomás Moreno y Maíz, a former Peruvian chief military surgeon, who relocated to Paris by the 1860s. Moreno y Maíz was an associate of Bignon, likely from a shared period in the highland mining town of Cerro de Pasco, where they both learned first-hand about coca. In 1862, two years after cocaine's isolation and amid the flood of interest around coca, Moreno y Maíz undertook a series of experiments with Parisian rats to determine if cocaine could in fact substitute for food and water, as suggested by Indian lore about coca's power as a hunger suppressant. The rats died, probably because he did not employ more nutritious fluid coca infusions. This result, paradoxically, detracted from growing French coca-mania. His first 1862 piece for Peruvian readers, "On Coca" (anticipating the title of Freud's inaugural cocaine paper), begins by noting, "Peru offers a wide and

¹¹ Gagliano, *Coca Debates*, 82–83; Kennedy, *Coca Exotica*, 53; Cueto, *Excelencia científica*, 39–42; H. Unánue, "Disertación sobre coca. . .," *Museo Erudito* (Cuzco), 3, 1–7 (15 Apr.–15 June 1837). During the 1940s, anti-coca scientists (e.g., Marroquín) returned to the lime thesis, this time to prove Indians imbibed dangerous dosages of cocaine.

¹² "La Coca Peruana," *La Gaceta Médica de Lima* 3, 51 (31 Oct. 1858), 60; A. Raimondi, "Elementos de botánica aplicada a la medicina y a la industria," 264 (15 Jan. 1868), 125.

fertile field for studies . . . above all, the marvel of Coca, put to so many uses by our Indians. This plant recently becoming so known in Europe, will be another source of wealth for Peru.” A response was penned by Italian migrant Juan Copello, one of Lima’s pioneering medical professors, a blood researcher, and later with Luis Petriconi a now-famed nationalist writer on Peru’s economic crisis of the 1870s. In “Clamor Coca,” Copello calls for coca’s emulation with other locally known medicinal plants. Discussion of coca went hand in hand with campaigns for a reformed nationalist nineteenth-century Pharmacopoeia. Later, Moreno y Maíz was also credited with independent verification, upon frogs, of cocaine’s anesthetic capacity (like Freud himself, allegedly prior to Köller in 1884). Peruvian colleagues throughout the 1880s proudly cited him for that discovery. Freud himself twice cites Moreno y Maíz in “Über Coca” (he mangles the accents of his name), along with other researchers in France, for having “provid[ed] certain new facts about cocaine” in 1868, and for disproving the so-called coca “source of savings” energy conservation hypothesis.

Moreno y Maíz’s works not only appeared in French—the lingua franca of nineteenth-century Peruvian medicine—but also, with a lag, in Lima’s medical gazettes. He became well known in Lima due entirely to his work with cocaine. In 1876, “About Erythroxyton Coca of Peru and about Cocaine,” the “excellent thesis of our compatriot,” completed in Paris in 1868, was translated in its entirety from French by Dr. Enrique Elmore for serial publication in the *Gaceta Médica*. It also appeared in *El Nacional*, Lima’s reformist newspaper, no doubt to publicize coca’s developmental promise for Peru. The thesis is a thirty-page compendium of existing historical, botanical, economic, and pharmaceutical knowledge about the two drugs. It ends with descriptions and analysis of his dozen animal experiments (with hyper-stimulated rats and frogs), mainly about the nerve action of cocaine. Like the young Freud, who also mingled in Paris with pioneering neurologists, that *avant-garde* French science, Moreno y Maíz saw nerve and genital excitation to be closely linked. Yet in the Preface to his 1868 thesis Moreno y Maíz credits his initial fascination with coca not to Parisian medical-men but to his firsthand observations how it sustained the highland Indian through daily travails. A much-expanded French version came out as a pamphlet in Paris—all ninety-one pages. Moreno y Maíz put stress on the stimulus to research (not just to body and mind) provided by coca, particularly after the 1860 isolation of cocaine as its active ingredient.¹³

¹³ For Freud (and also Unánue) citations see Byck, *Cocaine Papers*, 55, 69; Kennedy, *Coca Exotica*, 61–62, “Revista Médica de París—T. Moreno y Maíz,” *Gaceta Médica de Lima* 6, 129 (31 Jan. 1862); esp. “De la Coca” 6, 141 (31 July 1862); Dr. Tomás Moreno y Maíz, “Sobre el ‘Erythroxyton Coca’ del Perú, y sobre la ‘Cocaína’” *Investigaciones químico-fisiológicas, La Gaceta Médica* (2d ser.) 2, 8–18 (26 Feb. 1876) (Thesis, orig. 1868, Paris, E. Elmore, trans.), 58–142; T. Moreno y Maíz, *Recherches Chimiques et Physiologiques sur L’erythroxyton Coca du Pérou et la Cocaine* (Paris: L. Leclerc Ed., 1868); Juan Capello, “Clamor coca” 7, 2 (31 Aug. 1862).

The same gazettes reproduce a slew of surveys of coca from the French pharmacy and chemical press, as well as essays on still-fashionable hashish and opium. French medical influences were gaining ground in Peru with Cayetano Heredia's revolutionary mid-century reorganization of the national medical curriculum, which included the practice of sending students to Paris for final training and bringing eminent foreign scientists to Peru. The latter included "1848" refugees such as the wide-ranging naturalist Raimondi, Peru's foremost republican scientific light. However, to Peruvians it must have been ironic to read this multitude of coca specialists in Europe resorting to remote, ancient, dramatized, and filtered hearsay about the Andean leaf. That some *limeños* of "high respectability" (the words of traveler J. J. von Tschudi from the 1840s) privately partook of coca may have given them some practical insight and affection for the leaf. And the tide of opinions flowed both ways: for example, Lima's prolific guano-age publicist and statistician, and premier Francophile, Manuel A. Fuentes, who had a lifelong interest in coca, published a 1866 "Memoire" or paean to coca in Paris. Besides enumerating in French coca's possible cures, Fuentes exclaims, "This plant could possibly become today a branch of exportation as advantageous to Peru as cacao, quinine and guano."¹⁴

Even more strikingly, in March 1866 one sees the first fruit of earlier pleas for local research and recognition: the publication in *La Gaceta Médica de Lima* of the Lima university medical thesis of Dr. José Antonio de Ríos, "La Coca Peruana." The thesis follows a standard compendium style, from its "Historical Summary" of Incan coca to its modern "Botanic Study." Ríos, in his own words, was driven "since starting medical studies by a vehement desire to know the national products that can be used to fight diseases, the benefits one sees in the Indians, and because its therapeutic action is insufficiently understood . . . [coca] is destined to contribute huge services." Significantly, Ríos, a celebrated student of chemistry, was to serve two decades later with José Casimiro Ulloa in the country's "Coca Commission" of 1888–1889, which promoted Bignon's

If Bignon has been slighted by history, Moreno y Maíz more so; though he was reputedly a leading military surgeon he is barely mentioned in Juan Lastres' authoritative survey, *Historia de la medicina peruana* (Lima: UNMSM, 1951), vol. 3, "La medicina en la República."

¹⁴ M. A. Fuentes, *Memoire sur le coca du Pérou*. . . (Paris: Ad. Laine et Havard, 1866), 7. See Cueto, *Excelencia científica*, 45–46, on French influences. Fuentes, a key intellectual influence in Lima, knew and apparently loved coca, which shows up playfully in the title of his later sardonic *Hojas de coca: Colección de artículos*. . . (Lima: Imp. de Estado, 1877): "Aquí entra una explicación: La coca merece todos los elogios que han predigado, desde el tiempo de los Incas (nuestros antecesores) y mucho más que yo le produque el día o noche que este en vena. . ." (t. 1, p. 31). J. J. von Tschudi, *Travels in Peru, During the Years 1838–42*. . . (London: D. Bogue, 1846), 450. On Raimondi, see Giovanni Bonfiglio, *Antonio Raimondi: el mensaje vigente* (Lima: Banco de Crédito del Perú, 2004). On Copello, Fuentes, and *El Nacional*, see Gootenberg, *Imagining Development*, 64–70, 163–81.

cocaine researches. Dr. Miguel Colunga, one of two physicians on Rios' 1866 thesis committee, also shows up two decades later on the same commission. In January 1868, Antonio Raimondi, who wrote frequently on economic botany, contributes an essay, "Elementos de botánica aplicada a la medicina y a la industria," which evaluates the era's great coca debate: the nature of the leaf's "excitant properties." Referring obliquely to cocaine, Raimondi uniquely distinguishes it from the earlier recognized stimulant, caffeine, of coffee and tea. Other studies appear in the Peruvian medical press, for example the richly detailed 1875 "Estudio sobre la coca" of *limeño* physician Eduardo Nuñez del Prado, which focuses on the economic and medicinal uses of Bolivia's coca of the Yungas. Along the way, Nuñez endorses Unánue's early insight about coca's eclectic nutritional value.¹⁵

In short, Lima was bombarded with local coca studies, information, and controversies after mid-century, much of it with a French accent. Nationalist ideals of scientific analysis and exploitation of Andean medicinal plants and indigenous lore dominated the vibrant discussion. *Limeño* elites were in the process of uplifting coca into a national good, in both senses of the word, often via the mediation of more "scientific" modern cocaine. In December 1875 a new "Sociedad de Medicina" was inaugurated in Lima around the same *Gazeta Médica*, and among its founders was pharmacist Alfredo Bignon, whose name (with his father Luis) had appeared in druggist ads as early as 1866.

BIGNON'S COCAINE PAPERS, 1885–1887

The bedrock of cocaine interest in nineteenth-century Peru, more central than sociologists and Amazonian promoters, was found among Lima's nascent clique of medical scientists. Between 1885 and 1887, pharmacy chemist Alfredo Bignon, with a handful of *limeño* associates and emulators, conducted ten published investigations on cocaine and coca-leaf, establishing an entire branch of Peruvian cocaine science with broadly nationalist and commercial overtones. Bignon's discoveries came in a burst of scientific energy that swiftly rose and fell, as a precocious episode of Cueto's "scientific excellence on the periphery"—the modernist circles and institutions of research that evolved in *civilista* Peru after 1890.¹⁶

Born in Paris in 1843, where he returned after 1900, Bignon was raised and trained in Peru in the "Sección Farmacéutica" of Lima's Faculty of Medicine,

¹⁵ José A. de los Rios, "La Coca Peruana," (Thesis, Licenciatura y Doctor en la Facultad de Medicina," orig. Mar. 1866), *Gaceta Médica de Lima* 12, 256 (15 Sept. 1867), 26–28; extended bio-obituary in *La Crónica Médica* 17, 278 (31 July 1900); A. Raimondi, "Elementos de botánica aplicada. . ." 13, 264 (15 Jan. 1868), 125. Farmacología, Eduardo Nuñez del Prado, "Estudio sobre la coca," *Gaceta Médica de Lima*, 1, 29–35 (all 30 Oct.–11 Dec. 1875). One might read Nuñez's 1875 essay as early commercial spying on the only rival coca-growing culture.

¹⁶ Cueto, *Excelencia científica* (1989); for older survey, Carlos A. Bambarén, "La medicina en el primer centenario de la República," *La Crónica Médica* (1921), 189–221.

and became one of the country's most prized pharmacists. Both his brother and his father, Luis Bignon (possibly a refugee of Europe's 1848), were druggists, and by the late 1850s Luis was a teacher of pharmacy in Lima, though he later resettled for business in Chile. Alfredo's solo career began in the late 1860s with a "*botica*" in Cerro de Pasco, a highland center of miner "chewers," near the coca supply shed of Huánuco. There he is said to have continued chemistry studies on his own. Bignon returned to the capital in 1872 after his father's death to run the thriving "Droguería y Botica Francesa Alfredo Bignon" on Calle Plateros, situated around the corner from Peru's political epicenter, Lima's *Plaza de Armas*. After the Pacific War, Bignon served as a professor of pharmacy and chemistry, and became active in Lima's new Academy of Medicine. Childless (perhaps explaining his scientific productivity), Bignon toyed in other businesses as well, such as a local ham factory. Apart from cocaine, he honed an eclectic range of other scientific interests including metallurgy and engagement with social issues like alcoholism. As an educated European, Bignon was well known in the small world of Lima—"a friend of Raimondi, Ulloa, Castilla, Villar and other celebrities of the time."¹⁷ Like other cosmopolitans, Bignon moved back and forth from Lima for travel and study in Europe, including a course in industrial chemistry in Germany. Bignon's papers and comments were published and quoted abroad, and leading American, British, and French chemists and coca enthusiasts cited his distillation methods and cocaine expertise. Bignon, in short, was part of the lively transnational network of cocaine researchers that swiftly circled the globe during the 1880s. But he was also a dedicated promoter of Peruvian research: besides his own working example, he endowed a "Bignon Chemistry Thesis Prize" in the Faculty of Medicine. Despite his French roots, Bignon was, in the words of his sole chronicler, "a citizen of Peruvian science."

Bignon's "cocaine papers" erupt during the associational revival and elite politics that followed the devastating Pacific War. Peruvian medicine recovered quickly from its wounds and began to institutionalize itself in more "scientific" fashion, including wider emphasis on national and applied research. Educationally exclusive medical societies were a significant site for elite "civilizing" and nationalizing discourses in Peru, often of a hygienic, social, or positivist bent. The white men debating the scientific merits of coca in medical salons were some of Peru's most distinguished doctors and educators. Their esoteric research and discussions were not even the kind of news that filtered to Lima's wider reading public. By 1885, the original *Gaceta Médica*, which

¹⁷ For biographical details, not wholly accurate, see Tejada Barba, "Talento olvidado." Less useful is Vallejos Santoni, "Estudios científicos sobre coca," from *Actas* of Primer Congreso Farmacéutico Peruano (May 1943). Quote from Lastre, *Historia de la medicina*, vol. 3, 175–76. I located two rather uninformative Bignon wills in Lima (Archivo Nacional del Perú, Testimonios [M. Iparraquirre], A. Bignon, 8 June 1889 [112.v], 25 June 1895 [126.v]).

had folded in 1868, was revived by two renovated medical societies in the capital, engaged in a friendly rivalry that involved many of the same physicians, professors, and professionals. One was the *Academia Libre de Medicina de Lima*, led by scientific-political luminary José Casimiro Ulloa, which evolved into Peru's new French-styled *Academia Nacional de Medicina*. They put out their own short-lived *Boletín* of proceedings, research, and debates as well as the bimonthly journal *El Monitor Médico* (1885–1896). The other group, *La Sociedad Médica Unión Fernandini* was more pharmacy- or syndicalist-oriented, and launched *La Crónica Médica*, edited by Leonides Avendaño, which became Peru's long-running medical forum. Both journals came out of San Marcos University's Faculty of Medical Sciences and disseminated a mix of breaking foreign and national medical developments. From this milieu, specific bodies on cocaine were convened as well: in early 1885, a *Comisión de Cocaína* of the *Academia de Medicina* was called to evaluate cocaine-making techniques and therapies (as with all new pharmacy formulas in Lima), and promote their use in national medicine and industry.¹⁸ The commission recruited doctors D. L. Villar (President), Miguel F. Colunga, R. L. Flórez, Pedro Remy, and the ubiquitous José Casimiro Ulloa. In 1888, a distinctive government-university commission was appointed, this time with commercial sights on Peruvian coca-leaf: *La Comisión de Coca*, staffed by Ulloa, Miguel Colunga (Peru's botanist successor of Raimondi, and university dean), and José A. de Ríos, then vice-dean of the medical faculty and author of that youthful coca thesis of the 1860s. These commissions were a mode of validating national science. Bignon's work, besides its publication in article form, appeared as proceedings of the Academy throughout 1885–1887, and his public readings of his papers conjure up for us a specialist audience and lively debate.

Between late 1884 and early 1887, Bignon undertook nearly a dozen major published papers, studies, and elaborated experiments on cocaine—with laboratory equipment, on animals, or in Freud's own early psychopharmacological fashion, self-administrated—surrounded by a small group of admiring scientific colleagues. We can only imagine these discoveries, after hours, in the back room of the pharmacy on Plateros; one author suggests Bignon had been toying with cocaine for some years prior to 1884. Bignon's main achievement was a novel and economical kerosene-precipitation

¹⁸ These “free” academies were in part a reaction to President Iglesia's wartime intervention in San Marcos University. For commissions, “Comisión nombrada para estudiar el procedimiento del Sr. A. Bignon. . .” *El Monitor Médico*, I, 2 (15 June 1885) (versions in *Anales Universitarios del Perú*, and *Boletín de la Academia Libre de Medicina*, session 18 Mar. 1885); and “Informe sobre la coca,” *La Crónica Médica*, 6, 6, 1889—orig. 31 Oct. 1888). As associations, see Martín Monsalve, “Civilized Society and the Public Sphere in Multiethnic Societies: Struggles over Citizenship in Lima, Peru (1850–1880),” Ph.D. thesis in History, Stony Brook University, 2005; Monsalve's ch. 7, stresses racial and disciplinary discourses of medical societies.



Figure 1 The Faculty of Medicine (Lima, late nineteenth century). Marie R. Wright, *The Old and the New Peru* (Philadelphia: George Barrie & Sons, 1908), 237.

method for producing cocaine from fresh coca, as opposed to Niemann's original 1860 alkaloidal cocaine hydrochloride using dried coca. This was a so-called "crude cocaine" (known as "*cocaína bruta*" in Spanish), a cocaine sulfate that he worked strenuously to test, compare, and apply therapeutically. A modernist like his mentor Moreno y Maíz, Bignon clearly valorized the properties of cocaine over coca, which he deemed unscientific, inert or inexact for clinical use. Yet, as a scientist, he was also unusually attuned to the notion that cocaine's therapeutic properties might vary with the salt of cocaine used or even the type of coca bush from which it derived.

Bignon's intensive cocaine phase (1884–1887) began with publication in January of 1885 of his new method for cocaine extraction. The era is marked internationally by a flurry of development and dissemination of more efficient cocaine-refining techniques: Niemann's textbook-style 1860 alkaloid isolation, Lossen's chemical analysis, the sophisticated 1890s German patented "ecognine" extraction method for dried leaf, and those of Einhorn, Meyer, Hesse, Phieffer, Liebermann, Castaing, and others, as well as numerous assaying methods. In contrast to enhanced laboratory manufacture, Bignon's aim was cocaine's "easy and economical preparation in the same places as coca cultivation," a direct response to the cocaine shortages blocking wider cocaine usage globally in the mid-1880s. Bignon immediately requested that his extraction technique be examined and approved by the specially appointed Lima "Cocaine Commission," which reported in March of 1885. The Commission's ten-page "Informe," signed by Ulloa, is a deep reflection on the Peruvian scientific lineage of coca and cocaine, from Unánue through Moreno y Maíz,

SESION DEL 13 DE MARZO.

INFORME

DE LA COMISION NOMBRADA PARA ESTUDIAR EL PROCEDIMIENTO
DEL SR. A. BIGNON, PARA EXTRAER LA COCAINA.

Comision: - Doctores D. L. Villar (Presidente)—M. F. Colunga—R. L. Flórez—P. F. Remy—J. C. Ulloa (Secretario Relator.)

La coca, indígena del Perú, por sus raras y extraordinarias propiedades exaltadas hasta lo maravilloso, llamó desde la conquista la atencion de todos los nuevos pobladores del imperio conquistado, así como el de todos los viajeros y sábios que desde entónces han venido á explorar nuestras-regiones.

Su verdadero estudio científico no fué hecho, sin embargo, hasta que nuestro inmortal fundador de la medicina nacional, el Dr. D. Hipólito Unánue, publicó su célebre disertacion sobre el *aspecto, cultivo y virtudes de la coca*, que ha sido y es hasta hoy el fundamento de todas las investigaciones que se han hecho sobre esta singular planta, cuyos efectos parecian asemejarse á los del té y del café.

Apesar de esto, la coca no figuraba en la Terapéutica, hasta que, estudiada su composicion química y descubierto por Niemann en 1850 uno de sus alcaloides, la *Cocaina*, se comenzó á estudiar su accion fisiológica y terapéutica por Mantegazza en 1857, Gosse en 1862, nuestro finado com-

Figure 2 "Informe" of Commission to Evaluate Bignon's Cocaine Extraction Method (Lima). *Boletín de la Academia Libre de Medicina de Lima* I, 20 Mar. 1885, 77.

whom they crown for discovering cocaine's anesthetic powers as well as precursor methods for isolating cocaine based on Indian calcite use. Among the three commonly used techniques for making cocaine, the committee vaunted Bignon's for its sheer simplicity and its reductions of wasteful heating and pulverization. Its use of kerosene and soda ash as precipitants,

after prolonged maceration of coca in lime, was a real breakthrough. Kerosene was abundant in Peru from the reachable new Zorritos oil field of the north, and bicarbonate of soda was made in Lima. The staggered use of solvents took some eighty-seven hours (three to four days) to produce viable cocaine. Bignon's product was a 60 percent cocaine sulfide, not as pure or soluble as the medicinal end product processed with hydrochloric acids (i.e., cocaine hydrochloride, or cocaine HCl). Yet, with coca native and petroleum on line, the report stressed that in Peru "one could establish a large-scale national industry, which could produce an invaluable article of export."¹⁹ Coca "indigenous to Peru with its rare and extraordinary properties exalted unto the fantastic" by countless foreign conquerors and travelers, was now, thanks to Bignon, becoming a tangible reality.

In July 1885, Bignon published "La cocaína y sus sales," a six-page comparative study of new varieties of cocaine, which suggested that standardized hydrochloride of cocaine, besides its production challenges, was not necessarily the best clinical anesthetic. Most of the testing Bignon performed on his own tongue, or so it seems. In May 1886, Bignon presented his latest experiment to the Academy, "Acción fisiológica de la cocaína," a twenty-page research report derived from varying dosages and drug formulas administered to *limeño* dogs, most of whom died in delirious fits of nerve poisoning. From here, Bignon began to draw larger theories of cocaine's action on the nervous system, based on nineteenth-century notions of nerve conduction, and he refers to building on the experiments of Moreno y Maíz two decades before. Aware of cocaine's clinical dangers, Bignon judges the drug's "toxicity" to be an indirect effect of its action—cocaine itself was not a poison. A parallel experiment appeared in the *Monitor Médico*, which used human urine samples to trace cocaine absorption and effects via urea analysis. Again, Bignon acknowledges the innovations of his colleague Moreno y Maíz. In late 1886, Bignon pens a therapeutic note, "Propiedades de la coca y de la cocaína," a strong statement, as he saw it, of the medicinal superiority of cocaine over Indian coca-leaf. Bignon, in contrast to earlier national coca enthusiasts, considered the leaf alone to be neither a tonic nor nutrient; indeed, Bignon deemed coca folkloric as medicine. In December of 1886, he presented the Academy with his latest and most elaborate paper to date: "Posología de la cocaína" (posology being the science of quantifying drug dosage). It aspired to a more rigorous comparison of the therapeutic qualities of cocaine salts and solutions, used with hypodermic needles, pills, and various tinctures. Bignon concludes that

¹⁹ "Informe de la comisión nombrada para estudiar el procedimiento del Sr. Bignon para extraer la cocaína," *Boletín de la Academia Libre de Medicina de Lima* (session 13 Mar. 1885), 77–86 (rare copies from U.S. National Library of Medicine); also notes, 12 Jan. 1885. *Crónica Médica* 2, 18 (June 1885), introduction "La cocaína," by chemist Andrés Muñoz; and *Monitor Médico* 1, 2 (15 June 1885), "Informe de la comisión"; A. Bignon, "Nuevo método para la extracción de algunos de los alcaloides," *Monitor Médico* 1, 4 (Oct. 1885), 191–93.

his own impure cocaine sulfate contained “more energy for a lesser cost,” suggesting neurological stimulant concerns beyond surgical anesthesia.²⁰

Perhaps, like Freud, Bignon was a user himself, for his scientific output soon reached a frenetic pace. In September of 1886 he published a series of three new notes and experiments on the drug, weighing in scientifically on the innumerable “botanical” coca controversies of the era. The first, surprising given Bignon’s apparent aversion to natural coca, is a largely botanical work, “Sobre una nueva coca del norte del Perú,” which examines what was generally known as the Trujillo strand of erythroxyton coca. Bignon finds it contains a higher ratio of un-cristalizable (ecgonine) alkaloids. This is true, but mainly for that growing zone’s arid climate, and this is one reason northern Peruvian leaf has been preferred for coca essences rather than for cocaine making. The second work “Sobre el valor comparativo de las cocaínas,” in collaboration with doctors Ríos, Castillo, and Flórez, systematically tries to compare cocaine action from alkaloids derived from Peru’s three regional coca-leaves—the northern, central (Huánuco), and southern varieties. Here the interest shifts into commerce again, and indeed, these are commercial varieties, and not as once widely believed true sub-species of the plant. This is the kind of research that could only have been performed by local scientists knowledgeable about coca culture and providence. A critical concern here were the odors left by residual coca alkaloids, a problem in syrups, additives, and salves but not injectable cocaine. Perhaps this was a factor in the long-standing commercial taste among western consumers for Trujillo leaf, including drinkers of *Coca-Cola*. (Other *limeño* pharmacists, such as Manuel Velásquez, were perfecting commercial coca elixir formulas during the same era.) Some years hence, the American coca crusader Mortimer cited Bignon’s distinctions here to argue in favor of coca therapies, ironically the opposite of Bignon’s actual stance. This work was soon joined by another intricate dog autopsy paper, “Estudio experimental del antagonismo de la estriquina y de la cocaína,” a series of seven gruesome experiments to probe the neutralizing action between strychnine and cocaine and its therapeutic implications for conditions such as tetanus, epilepsy, and other so-called “over-excitation” disorders. Like leading European (such as Freud) and American peers, Bignon prescribed here cocaine injections for nervous conditions such as “hysteria,” epilepsy, and “neurasthenia.”²¹

²⁰ Sr. A. Bignon, Comunicación: “Acción fisiológica de la cocaína,” *Monitor Médico* 2, 8 (15 Sept. 1886), 117–20, Trabajos Nacionales—“Acción fisiológica de la cocaína”; and “Cocaína y sus sales,” *Monitor Médico* 11, 8 (Dec. 1886), 231; Terapéutica: “Propiedades de la coca y la cocaína,” *Monitor Médico* 245–46 (Feb. 1886). Comunicación: “Posología de la cocaína,” *Boletín de la Academia Libre*, 1 Apr. 1886, 306–11. Most with versions in *Boletín de la Academia Libre* (some with discrepant dates), that is, “Acción fisiológica. . .” (session 4 May 1886), 319–39; the twenty-page version, followed by “Comunicación: Sobre la acción fisiológica. . .” (15 June 1886).

²¹ Unlike Freud, who waxed about cocaine’s pleasurable and energizing effects, and who may have become dependent on it, Bignon never discusses subjective details. A. Bignon, Trabajos

EL MONITOR MÉDICO.

TRABAJOS NACIONALES.

ACCIÓN FISIOLÓGICA DE LA COCAINA
POR EL SEÑOR BIGNÓN. (1)

Los experimentos hechos en perros y que han sido el tema de mi última comunicación, probaban la posibilidad de observar detenidamente, sin peligro para el hombre, la acción fisiológica de la Cocaína.

A este efecto, el 12 de Mayo, hallándome en perfecto estado de salud, tomé cada hora desde las 7 de la mañana hasta las 5 de la tarde, 0,05 centigramos de Cocaína, en una oblea. A las doce, con motivo del almuerzo, no tomé dosis ninguna.

Además, convencido de que un estudio prolijo de la orina, me permitiría descubrir el proceso fisiológico, me resolví a orinar de hora en hora, analizando la orina de cada micción.

Absorbí 0,50 centigramos de alcaloide, en 11 horas, á razon de 0,05 centigramos por hora. Esta cantidad corresponde al máximo de la cantidad ingerida por los indios más veteranos en el arte de la *chaccha*; aunque los indios coqueros, cuando el vicio ha llegado á su mayor intensidad, absorben hasta un gramo diario y quizás más.

En el cuadro que acompaño, se hallarán los resultados de mi experimentación, resultados que voy á interpretar.

Es evidente la aceleración del pulso y el aumento notable de la cantidad de urea excretada en un espacio de tiempo dado. No se puede afirmar que este aumento sea de la úrea únicamente, pues empleé para determinar la cantidad de úrea, el procedimiento clásico del hipobromito, y es bien evidente que la cantidad de azeo recojida, representa, además de la úrea, otros productos azoados de eliminación, como creatinina, allantoina, sarcosina, etc. Debo advertir también, que no he corregido el error debido á la presencia de la sal marina.

Todos estos errores no amenguan en nada el interés del experimento cuyo único fin es de saber si hay, de un modo general, aumento de las excreciones, cuando se ingiere cocaína.

En el cuadro es fácil notar que esta aceleración de los procesos vitales no es pasajera, pues que se prolonga durante 6 á 8 horas después de la ingestión del medicamento, así es que habiendo tomado la última dosis á las 5 de la tarde, mi pulso era todavía anormal (80 pulsaciones en vez de 66 á 68), á la media noche.

No se ha notado elevación de temperatura sensible pues á las 5 de la tarde en el momento de mayor intensidad la temperatura axilar fué de 37° 3, siendo la normal 36° 8 á 37°.

Los efectos fisiológicos generales han sido poco pronunciados: algo de cefalalgia, una ligera excitación cerebral que me permitió trabajar hasta las doce de la noche con una actividad mayor, y sin sentir los efectos del sueño.

El sueño desde las doce de la noche á las siete de la mañana, ha sido profundo, sin agitación, ni ensueños ni pesadillas. Por último, noté un poco de fatiga ó cansancio en las articulaciones.

No tuve ninguna sensación de hambre ó sed, pero tampoco anorexia.

El almuerzo fué copioso y no experimenté la menor alteración en los sentidos del gusto ú olfato; en fin, no tuve el menor desórden digestivo estomacal ú intestinal.

La dilatación de la pupila fué bien marcada, pero no fué tampoco exagerada.

No hubo ningún fenómeno de vertigo ó halucinación. A las 6 de la tarde, fui examinado por el doctor Castillo (J. C.), quien notó una ligera aceleración en los movimientos del corazón, 20 respiraciones en vez de 15 ó 16 que son las normales y 102 pulsaciones; no observé ningún desórden cerebral, tuve el cuidado

(1) Comunicación presentada á la Academia Libre de Medicina, en la sesión del 15 de Junio de 1886.

In January 1888, Bignon published another suggestive “communication” to the Academy “Sobre utilidad de la cocaína en el cólera”—a sterling example of applied or social medicine, as cholera epidemics still posed an active threat in coastal Peru. It derived from a critique of articles by Dr. Lucindo del Castillo published in *La Nación* of Buenos Aires. Bignon rejects the therapeutic claims of this Argentine investigator, which were based on coca tinctures alone; however, he saw possible benefits linked to the “corporal” anesthetic action of pure cocaine. This controversy provides us a window into a remarkable scattering of original research about coca and cocaine across the Americas, though none as intense as Lima’s. Examples pop up in contemporary Chile, Argentina, and Mexico, in part since coca was a long accepted item of the regional pharmacopoeia.²² One also enters here into raging international medical controversies about cocaine’s internal indications; Bignon was hardly alone in prescribing cocaine for symptoms of cholera. But Bignon ends here sharply assailing the “moral anesthesia produced on the spirit of doctors” (a pun clearly intended), referring to stubborn physician preferences for coca-leaf over the measurable remedies of cocaine. This polemical tone is resonant of Freud’s famous swansong to cocaine, “Craving for and Fear of Cocaine” (July 1887), which also suggests that rising criticism of medicinal cocaine, and his own work on it, was irrational or psychological at core.²³ In April 1887, Bignon’s final note on cocaine is issued, a succinct analysis of

Nacionales, “Estudio experimental del antagonismo de la estrocinina y de la cocaína,” *Monitor Médico* 11, 14 (15 Dec. 1886) (orig. Sept. session). On coca extracts, ads, patents of Velázquez (a leading Lima pharmacy teacher), *Academia Libre de Medicina* 24 (Feb. 1887), “Preparaciones: Andina—Licor de los Andes.” On coca circuits, see Paul Gootenberg, “Secret Ingredients: The Politics of Coca in U.S.-Peruvian Relations, 1915–65,” *Journal of Latin American Studies* 36, 2 (May 2004). Marijke Giswilt-Hofstra and Roy Porter, eds., *Cultures of Neurasthenia: From Beard to the First World War* (Amsterdam: Rodopi, 2001).

²² Manuel M. Espinosa, *Ensayo experimental sobre el Erythroxylym Koca* (Doctoral thesis, Buenos Aires: Pablo Conti, 1875), a rare ninety-page work found in New York Academy of Medicine. Buenos Aires had migrant coca users. Chilean *Revista Médica de Chile* (vol. XV, 1886–1887) also has original studies: for example, Gabriel Covarrubias, *Memorias*, “Estudio sobre el muriato de cocaína,” discusses Bignon’s work (pp. 60–119). For Mexico, Vicente Gómez y Couto, *La Coca: Estudio fisiológico y terapéutico* (Mexico: Imp. de Comercio, 1876) is another published medical thesis reflecting coca’s role in the Latin American pharmacopoeia.

Bignon’s forgotten analogue of “excellence on the periphery” may have been Enrique Pizzi, an Italian pharmacist teaching in La Paz, Bolivia, rumored to have made cocaine in situ in 1857 (at behest of von Tschudi) shortly before both Gaedecke’s contested try (1858) and Niemann’s successful isolation (1860). Wöhler’s test of Pizzi’s preparation falsified it. Cited as fact in some Bolivian texts, we know nothing about Pizzi: “Cocaine in 1857,” *The Chemist and Druggist* (London), 27 (Mar. 1886), 226; Mortimer, *History of Coca*, 294; Kennedy, *Coca Exotica*, 55.

²³ A. Bignon, Comunicación, “Sobre la utilidad de la cocaína en cólera,” *Boletín de la Academia Libre de Medicina*, Jan. 1887, 128–32; “Soluciones de cocaína” (session 6 Apr. 1887), 198–99 (published Feb. 1888). Sigmund Freud, “Craving for and Fear of Cocaine” (July 1887) in Byck, *Cocaine Papers*, ch. 15. (Ch. 9, “Contribution to the Knowledge of the Effect of Cocaine,” Jan. 1885, is Freud’s scientific effort.)

“Soluciones de cocaína,” about varied clinical uses for Vaseline-cocaine mixtures. But Bignon continued to publish widely on other medical and scientific topics, including translations of overseas advances in alkaloid chemistry.

Bignon’s intellectual production on cocaine was so prodigious—more than a dozen major articles, communiqués, and notes over three years—that the Academy started posting simple summaries for lay readers. What began with a simple patriotic commercial motive—to find a made-for-Peru cocaine-making formula—ended in a wider scientific quest in chemistry, botany, physiology, neurology, and therapy. Granted, medical professionals, even workaday pharmacists, were not yet terribly specialized anywhere in the late nineteenth century (indeed, outside of Germany, doctoral programs in sciences would just get started in the 1890s), allowing the space for still-maverick contributions. Bignon actually addressed this idea of practical science in a general 1886 essay about therapeutic versus chemical analyses of medicines. Bignon was not only twice as prolific as Freud—who actually published but five cursory cocaine papers between 1884 and 1887—but more “scientific” in the modern objectivist sense, given that only one of Freud’s surveys involved any type of measurement or external observation. Freud famously saw coca as a “magical” drug, and his overriding concern was its phenomenology and the implications of cocaine’s induced feelings of “well-being,” often tested on himself. Nor was Bignon isolated in Lima. In the *Crónica Médica*, for example, other original works on cocaine also appear, as do a stream of overseas clinical reports on cocaine, its utility in surgery, heart problems, etcetera, and even as a cure for “insanity.” A prominent example issued from the journal’s later editor, Dr. Almenara Butler, in his April 1885 report, “La cocaína en las quemadas,” which presented his own clinical work aiding young burn patients with cocaine-laced petroleum jelly bases, and ended with a passionate plea for affordable national medicines. Dr. Nuñez del Prado, who wrote earlier about coca, was credited with original research about cocaine as an antidote to mercury poisoning, a common side effect of the era’s treatments for venereal disease. Bignon’s co-authored papers are notable as well, since they demonstrate a network of working colleagues and the respect his research garnered in Lima. The Academy’s “Cocaine Commission” became all virtual experts on cocaine, some with coca obsessions dating back decades. San Marcos Medical School records also reveal scattered Peruvian medical research on coca and cocaine, for example, Eduardo Showing’s now lost 1884 thesis on “La medicina tónica y sus aplicaciones terapéuticas” (Dr. Showing, not coincidentally, was from one of coca-rich Huánuco’s top families); a medical thesis by Rodolfo Mercado on “Aplicaciones higiénicas y terapéuticas de la coca” (1894); and a 1902 thesis by Víctor Diez Canseco, “La raquicocainización en cirugía.”²⁴ Cocaine research, however, was petering out after 1887.

²⁴ Sr. Bignon, “Pureza terapéutica de los medicamentos,” *Boletín de la Academia Libre de Medicina* (session 1, Apr. 1886), 311–13; “Informe sobre la coca,” *Crónica Médica* 6, 6 (1889).

In conclusion here, a strong current of “scientific nationalism” ran throughout this mid-1880s episode. In this sense, Bignon’s work can be read as a precursor to the more public and better-known scientific “coca debates” that resurfaced in Peru during the 1920s–1950s, involving San Marcos medical luminaries such as the anti-coca crusader Carlos Gutiérrez-Noriega, and Dr. Carlos Monge, the founder of Peru’s more coca-positive school of highland “Andean Biology.” In the 1880s, the keyword was coca and cocaine as eminently “Peruvian” subjects for modern research, “Trabajos Nacionales” in the idiom of Lima’s cosmopolitan medical journals. A July 1885 editorial of the *Monitor Médico* “La Cocaína,” penned by J. C. Ulloa himself, boldly asserts, “As the plant itself originates from Peru, where it is principally grown, its study rightfully belongs to the *sabios peruanos*, who have at their reach the observation of the effects caused by use of coca leaf, and have been best able to study them.” Study of coca combined the “obligations of patriotism and science.” Peruvian researchers “with their studies of coca and cocaine have opened to science new and broad horizons, and a duty of our fraternal patriotism was to reclaim this glory for its own sake and for the *patria*.”²⁵ Their actual proximity to coca, and first-hand experience of its use by Andean people, gave these would-be Peruvian scientists a privileged place in its study compared to far-off European or North American counterparts. They were, so to speak, von Humboldts *in situ*, lifting the veil still left by Spanish colonialism over Peru’s natural wonders. It was, predictably, a paradoxical nationalism, practiced by coastal cultural bi-nationals, the most cosmopolitan (and no doubt whitest) members of Peru’s elite, and invoking a paradoxical dialect between the local and traditional (coca) and the universal and scientifically modern (cocaine). Another theme of their work is what we euphemistically

San Marcos University, Escuela de Medicina Library (Av. Grau), thesis catalogue (Mercado’s thesis is interesting in light of 1888 Coca Commission, below). For a remarkable later French example, see Dr. N. S. Lambruschini, *La cocaïne et ses dangers* (Paris: Lib. Picart, 1936). This is a Parisian medical thesis by a Huánuco native and ex-student of Peru’s fervent anti-coca psychologist Hermilio Valdizán (a gift of the nonagenarian author, 1997).

In the twentieth century, local scientific activity around cocaine and coca resurfaces, especially during Peru’s modern Indian coca-chewing debate of the 1920–1950s. It evolved as a struggle: the San Marcos pharmacology school of Dr. Carlos Gutiérrez-Noriega essentially regarded coca as a degenerating poisoning or addiction of highland natives, and their position evoked more nuanced national scientific responses from the “Andean biology” school of Dr. Carlos Monge. The latter had an impact on the visiting late-1940s United Nations “Commission of Enquiry on the Coca-Leaf.” See Gagliano, *Coca Prohibition*, ch. 7; or Cueto, *Excelencia científica*, ch. 5. More recently, Peruvian doctors have studied local cocaine addiction (*basuca*), with wide repercussions, especially Raúl Jeri in the 1970s, who actually began his career in the 1940s anti-coca movement.

²⁵ Sección Editorial, “La cocaína,” *Crónica Médica* 2, 18 (15 June 1885), 61–66; A. Butler, “La cocaína en las quemaduras,” *Crónica Médica* 2, 16 (Apr. 1885); the origins of female-gendered cocaine is a mystery (as in later Pichicata, or “white lady”), though in Spanish both nouns are feminine (*la cocaína, la chinchona*).

call today “the industrialization of coca,” the production of cocaine as a national social calling, bringing wider access to modern medical treatments across Peru. Even the burn patient study preached: “Peru is very sensitive, as the original cradle of coca which now has the good fortune of preparing cocaine itself, to the steep costs of such substances. . . . With the primary materials in our hands, it is most desirable to establish cocaine processing on a large scale, thus keeping the needed coca on our soil and stopping its enormous flight by those who wish to intensify coca exports to Europe. . . . As with quinine and now cocaine, *hija de la República*, medicine ought to reach our sick at comfortable prices.” Cocaine was now a respectable daughter of the Republic, thanks largely to Peru’s adopted son Alfredo Bignon.

BEYOND BIGNON: COCAINE LEGACIES

Bignon’s outpouring of research in 1884–1887 raises questions about its short-lived nature. For like Freud’s brief cocaine “episode,” Bignon soon abandoned the study of cocaine. Did Bignon fail to benefit in name or other prospects? The answer, I believe, has much to do the episode’s relation with the future enterprise of cocaine, and in a larger commercial sense, with competing transnational scientific and economic networks at play, both French and German (North American interests aside). An autodidactic and applied pioneer of cocaine technology, Bignon had an auspicious start in 1885. Like Freud, who embraced the glamour of cocaine research to jump-start his medical career (and marriage), Bignon was drawn by commerce as much as national science. In June 1885, smack in the middle of his frenetic cocaine research, Bignon took off for Europe, where he petitioned and won a coveted ten-year official privilege—it is said with the help of his still active friend Moreno y Maíz—to import cocaine into France, one of the drug’s foreign markets. One wonders if Bignon and Freud unknowingly crossed paths in Paris, since this was also the year of Freud’s inspirational sojourn at Jean-Martin Charcot’s neurological clinic at Salpêtrière hospital, which punctuated his own writings on cocaine.²⁶ In Paris, Bignon’s Peruvian cocaine samples were acclaimed by eminent French surgeons and professors such as Dujardin Baumetz, and Bardet, chief of the laboratory in the Hospital Cochin. Indeed, Bignon’s production method received international publicity, was endorsed by pharmaceutical cocaine experts such as Martindale in Britain, and criticized by

²⁶ “La cocaína de Bignon,” *Monitor Médico* 1, 5 (Aug. 1885), 100; also Tejada Barba, *Talento olvidado*, 613 (date of 1883 mistaken). For a reading of Freud’s cocaine work as careerist, rather than a serious scientific venture, see Jones, *Life of Freud*, ch. 6. This view is contested by Byck. On the Parisian Freud, see Thorton, *Freudian Fallacy*, chs. 3–6. “Crossing paths,” perhaps in the sense fictionalized by Nicolas Meyer in *The Seven-Per-Cent Solution* (New York: Ballantine Books, 1975), the popular novel (and a film) that explores the shared cocaine obsessions and investigative strategies of “Sherlock Holmes” and Freud (the titular percentage is how much cocaine Holmes uses by syringe).

Dutch academic specialists. Mortimer in the United States referred to him more times than Freud (as “Dr. Bignon, Professor of Chemistry at the University of Lima, Peru”). Bignon’s work was republished in German, French, and English translations in top trade journals such as *The American Druggist*, including even notes never published in Lima, such as one on cocaine in dentistry found in the *New York Medical Journal* in May 1886.²⁷

Part of the explanation for Bignon’s withdrawal is that he soon faced competition from the most powerful forces in the emerging field of cocaine: Germans. This came both in the form of the dominant German pharmaceutical and scientific block (E. Merck, C. H. Boehringer, Gehr, Riedel, Knoll) and from activities of their direct links or representatives to the Andes—*limeño* German immigrant pharmacists and merchants. Merck of Darmstadt was before the 1880s cocaine’s sole supplier, and it became their most profitable drug line in the next decade. They sent an agent to Lima in 1885–1886 to resolve the supply bottleneck, most likely Arnaldo Kitz, a key figure in the subsequent development of the industry in Peru. Boehringer-Mannheim, as now documented, sent their Ph.D. student chemist Louis Schaeffer to Lima on a less successful mission (he would later end up in New Jersey concocting custom-made coca syrups for an expansive *Coca-Cola*).²⁸ Bignon’s possibilities were more limited: France had only a pair of modest cocaine makers, Houdé and Midy, but most importantly, the medical and consumer culture still decidedly preferred herbalist coca-leaf extracts over cocaine science, epitomized by the original and ever-popular *Vin Mariani*. Although French-style medicine dominated Bignon’s Peruvian milieu, German research-based scientific models were starting to supplant it worldwide; cocaine’s early and dramatic success as a “modern” drug exemplified that cultural-scientific conflict.

²⁷ A sample of references to or articles by Bignon: Mortimer, *History of Coca* (1901), 304, 311, 433; “Preparation of Cocaine,” *The American Druggist* (St. Louis), Jan. 1886, 11 (which questions Bignon’s “87-hour” soaking), repr. from *Revista Farmacéutica*, Buenos Aires; “Cocaine Factory in Lima,” 1888, 105; “Note on Cocaine,” Dec. 1886 (on Bignon’s alleged patents, from the German). A. Bignon, “Cocaine as a Dental Anaesthetic,” *New York Medical Journal* 594, 1886; orig. 1 May 1886, *Nouveaux Remedes*; “Note on the Properties of Coca and Cocaine,” *The Pharmaceutical Journal and Transactions* 16 (1885), 265–66; “Cocaine as a Antidote to Strychnine,” *New York Medical Journal* 198, Aug. 1887, from German version; William Martindale, a leading British pharmacist, elaborates on Bignon’s methods in *Coca, Cocaine and Its Salts* (London: H. K. Lewis, 1886), 53; E. M. Pozzi-Escot, “Recherches sur l’industrie de la cocaïne au Pérou,” *Bulletin des sciences pharmacologie*, 615–16, 1913 (French chemist, like Bignon ends up teaching in Lima). Emma Reens, “La Coca de Java: Monographie historique botanique, chimique et pharmacologique,” Ph.D. thesis, University of Paris, 1919, now published as “Java Coca,” in Steven B. Karch, M.D., comp., *A History of Cocaine: The Mystery of Coca Java and the Kew Plant* (London: Royal Society of Medicine Press, 2003), ch. 5; see pp. 75–76, on backward “Bignon technique” (editor’s comment, pp. 50–51, based on my own Bignon research).

²⁸ On German agents, see H. Richard Friman, “Germany and the Transformation of Cocaine, 1880–1920,” in Gootenberg, *Cocaine*, 86–87; Spillane, *Cocaine*, 50–54. T. Holtzer kindly provided me with 1903 data from the Boehringer-Mannheim Archives.

Bignon belonged, as it were, to the wrong “commodity chain,” in the global race to commodify Andean cocaine.²⁹

Bignon woke up to this fact in September of 1885, when, with no warning, German-Peruvian pharmacists Meyer and Hafemann, located on Calle Espaderos 190, presented their own cocaine samples to the Lima Academy of Medicine. The partners won praise for their “service in putting medicines in the reach of the sick, with uses justified in so many illnesses.” A long explanation followed to the editors of *El Monitor Médico* to clear up the controversy about their new “factory of cocaine.” True, they admitted, their method looked “almost identical” to that of Bignon, but this they claimed was a remarkable case of simultaneous discovery. Theirs was inspired by study of kerosene filtration of cinchona bark (Peruvian quinine) and was novel in doing away with leaf pulverization altogether. As Meyer and Hafemann confessed, “When the miraculous properties of cocaine were revealed and this alkaloid won greater importance day by day with its varied medical applications, we proposed for this reason to bring it here, convinced of getting better results using fresh leaf without suffering its overseas voyage.”³⁰ In the same issue, prominent ads begin to appear for their “Cocaína Pura y sus Sales,” prepared in a modern “chemical laboratory,” listing no less than six separate salts for sale. Velázquez’s “Antigua Bótica Inglesa-Italiana,” one of Lima’s major drugstores, also started selling cocaine. The commercial lure of cocaine, if not its precise formula, was contagious in Lima.

So, in December 1885, less than a year after Bignon’s moment of glory, the four-man Lima “Comisión de Cocaína” put out another lengthy “Informe,” this time on “La cocaína y sus sales preparados por Meyer and Hafemann.” Meyer and Hafemann submitted samples of all six types of cocaine produced (“pure” “Cristalized,” Chlorohidrate, Sulfate, Salicylate, Bromohidrate). The Commission assayed their chemical purities and therapeutic strengths, and itself monitored thirty-seven surgical operations (“without the least discomfort”) on

²⁹ Cocaine as “commodity chains” (with flows of science), in P. Gootenberg, “Cocaine in Chains: The Rise and Demise of a Global Commodity, 1860–1950,” in Z. Frank, C. Marichal, and S. Topik, eds., *From Silver to Cocaine: Latin American Commodity Chains and the Building of the World Economy, 1500–2000* (Durham: Duke University Press, 2006), 321–51. I prefer viewing in “commodity” terms because of the specific linkage to cocaine. An alternative spatial conception is Mary Louise Pratt’s transnational “contact zone,” analyzed as scientific nationalism by Claudio Lomnitz, in “Nationalism’s Dirty Linen: ‘Contact Zones’ and the Topography of National Identity,” in his *Deep Mexico, Silent Mexico: An Anthropology of Nationalism* (Minneapolis: University of Minnesota Press, 2001), ch. 6. On French and German medical currents, see John Parascandola, *The Development of American Pharmacology* (Baltimore: Johns Hopkins University Press, 1992); or generally W. F. Bynum, *Science and the Practice of Medicine in the Nineteenth Century* (New York: Cambridge University Press, 1994). Also relevant are Lynn Payer, *Medicine and Culture: Varieties of Treatments in the United States, England, West Germany, and France* (New York: Penguin Books, 1989); and Arthur A. Daemmrich, *Pharmacopolitics: Drug Regulation in the United States and Germany* (Chapel Hill: University of North Carolina Press, 2004).

³⁰ “Correspondencia,” 14 Oct. 1885, to *Monitor Médico* 1, 10, 193–94. Advertisements permeate Lima medical journals from 1885–1890.

COCAINA PURA CRISTALIZADA BLANCA
MURIATO DE COCAINA
 puro, cristalizado, completamente neutro y soluble en agua y en alcohol.

SULFATO DE COCAINA
 puro, cristalizado, completamente neutro y soluble en agua y en alcohol.

TANATO DE COCAINA.

SALICILATO DE COCAINA
 puro, cristalizado, completamente neutro y soluble en agua y en alcohol.

BROMHIDRATO DE COCAINA
 puro, cristalizado, completamente neutro y soluble en agua y en alcohol.

COCAINA PURA Y SUS SALES.
 A LAS CUALS SE LE GARANTIZA LA PUREZA Y LA EFICACIA. GARANTIZADAS POR MEYER & HAFEMANN, Españoles 138 y 150.
 Preparadas en su laboratorio químico por MEYER & HAFEMANN.

Figure 4 Advertisement for Lima-made Cocaine, Meyer y Hafemann brand. *El Monitor Médico* (Lima) 1, 11 (15 Nov 1885).

corneas and other delicate organs, and surveyed indications for treatment of hemorrhoids, second degree burns, and gingivitis. They compared the newest national cocaine to “Merk” crystals, certifying Meyer and Hafemann’s brand had “with little doubt” double its anesthetic “action.” Bignon had little recourse here, since Lima formula committees only evaluated medicines without awarding monopolies or patents, and Meyer and Hoffmann were already deep in the business. Vitally, they enjoyed direct relationships to German importers, and by 1889 clear-cut contractual exports, with Merck himself.³¹ Meyer, along with German merchant houses like Prüss, Schroeder, and Dammert, continued on as a leading crude cocaine exporter through the 1890s. Prüss was to set up one of Peru’s biggest new cocaine complexes in Callao. For the German pharmacists of Lima, cocaine was not a scientific hobby. Bignon proved the French *dilettante*.

³¹ “Informe: La cocaína y sus sales preparadas por Meyer y Hafemann,” session 7 Dec. 1885, *Boletín de Academia Libre de Medicina*, 265–68; also session 30 July. “Cocaína y sus sales,” *Monitor Médico* 1, 7 (15 Sept. 1885), 193–94. Clavero, *Tesoro del Perú*, 47 (Prüss). Overseas journals noted initial crude cocaine exports in 1885 (see note 36).

One can only speculate about Bignon's disillusion by the *dénouement* of his formula. Nothing came of his initial French exporting scheme. Unlike his competitors, his pharmacy barely advertised or pushed its cocaine. Instead, Bignon turned to his other scientific pursuits, from alkaloid chemistry, cowpox vaccines, and disinfectants (mercury iodine), to the latest advances in European weather observation. Still sharing his research abroad, in September 1886 Bignon wrote of an urge for a more active circle of colleagues: "Resolving all of these questions [on internal usage of cocaine] is not within the reach of a single individual, and furthermore, many of them pertain to scientific regions that are well off-limits to me."³² A sign of Bignon's withdrawal from cocaine science was his conspicuous absence from a newly formed Peruvian "Coca Commission" of 1888–1889, which barely mentions his work.

There was also a form of scientific edging out by import competition. By the late 1880s, Lima medical journals are inundated with notes from overseas clinicians and chemists on cocaine, researchers engaged in team laboratories, as the most science-driven phase of the North Atlantic industrial revolution took off. Squibb and Merck's distinctive cocaine-making formulas became standardized in the United States and Europe, and Peruvian "crude" (Bignon's own barely surpassed 50 percent purity) was reduced to an economical input or chemistry curiosity.³³ Pharmaceutical ads flooded Lima journals for American (Parke-Davis), German (Merck), and French (Midy) medical-grade cocaine, which soon won market prestige in Lima over local pharmacy brands. In an ironic reversal, the catchy ads of the 1890s were for Frenchified imports like "Pastillas Houdé," "Elixer Houdé," and "Cocaína Midy," rather than new national productions. Bignon's own business legacy exemplified this trend: he too imported drugs, and decades after his passing, a re-baptized "Laboratorios Antigua Bótica Francesa" evolved into one of Peru's biggest pharmaceutical importers.

Moreover, cocaine, some reports suggested, was already losing its luster as the "miracle" drug of the 1880s; it was a drug with potentially dangerous side effects and some disturbing social consequences (the "habit" of the newly-identified cocaine "fiend"). Thus, by the 1890s Peruvian medical researchers turned to more pressing, often social issues: epidemics, vaccine testing, urban sanitation, and other national problems. In contrast to the Franco-Peruvian

³² Bignon, "Acción fisiológica de la cocaína," *Monitor Médico* 2, 8 (Sept. 1886), 120; "Informe sobre la coca," *Crónica Médica* 6, 6 (1889), 28–31.

³³ E. R. Squibb, "Hydrochlorate of Cocaine, or Muriate of Cocaine," *Pharmaceutical Journal and Transactions* 15 (Mar. 1885), 774–76; "The Preparation of Cocaine," *New York Chemical and Drug Reporter*, 26 Nov. 1894, 21. See later Peruvian medical journals (esp. *La Crónica Médica*, late 1880s–1890s advertisements) for foreign drugs; for Bignon's ex-business see "Peru": *Yearbook of Foreign Trade, Exporters—Importers, Merchants* (Lima: Compañía Peruana de Negocios Internacionales S.A.), listing 53. Parascandola, *American Pharmacology*; Bynum, *Science and Medicine*, ch. 4.

Bignon, Freud belonged to the dominant Germanic scientific ecumene, which may explain the visibility of even his much-maligned cocaine research phase. Even at home in Peru, Bignon would later be discounted as pre-scientific by the 1920s generation of researchers—Hermilio Valdizán, Carlos Enrique Paz Soldán, Gutiérrez-Noriega—who in their anti-coca zeal could and did not regard fine distinctions between coca and cocaine, or types of cocaine, as serious pharmacology.³⁴

Two last implications to consider in closing: Bignon's legacy for the take-off of Peru's legal national cocaine industry (which peaked around 1900), and later still, the chemical trail that led to the illicit cocaine boom (post-1950) of recent Andean history. In 1888, in another long and intriguing story, Peru assembled a second "Coca Commission" in a government campaign to promote Peruvian coca leaf, as well as Bignon's crude cocaine, as world exports. Staffed by Ulloa, Colunga, and de los Ríos—Peruvian medical luminaries and familiar local coca experts—the Commission issued its recommendations in mid-1888, the height of the world cocaine spike. This Commission, too, was awash in coca nationalism, lauding the Peruvians who had refurbished coca's image as a "diabolical plant," extolling its vast economic potential in consumption as a health ("hygienic") product for the working masses (rather than Bignon's allopathic cocaine). Coca, for example, was good for a byproduct of sugar's industrial revolution: rotting gums and teeth. With a slight push, coca "could replace tea and coffee itself, for whom science had shed its tremendous advantages"—not so far-fetched, considering what happened with pharmacist John Pemberton's secret formula for his health drink *Coca-Cola*, concocted shortly before in Atlanta, Georgia. Within their intriguing eight-point program were a proactive Peruvian marketing campaign for encouraging coca use in industrialized countries, and incentives for coca planters to set up exporting "factories of crude

³⁴ Marcos Cueto July 2005 personal communication. This is logical since the 1920s generation (i.e., Gutiérrez-Noriega and peers) was driven by the notion that Indian coca use was a form of "cocaine-addiction" or "toximania," thus erasing all chemical, biological, or social distinctions between coca-leaf and alkaloidal cocaine. See Carlos Gutiérrez-Noriega and Vicente Zapata Cruz, *Estudios sobre la coca y la cocaína en el Perú* (Lima: Ministerio de Educación, 1947), which, incidentally, despite its title, fails to cite Bignon. I have found only one modern anti-coca essay that cites Bignon. "Ignored" is indeed the apt term: I have scoured classic sources on Peruvian medical history (Valdizán y Maldonado, etcetera) without finding reference to Bignon. The exception is Lastre's canonical *Historia de la medicina*, which contains a half-page, respectful biography (vol. 3, 175–76), on Bignon's "puesto destacado" in Peruvian pharmacy. In a discussion of José de los Ríos, Lastre refers to Bignon as republican Peru's most "brilliant chemist" (270). Dr. Angel Maldonado's nineteenth-century survey, "La farmacia en el Perú" (I Congreso de Farmacia Peruana—*La Reforma Médica*, 1943) omits Bignon altogether. Closer to his own time, Bignon was recognized: a published 1918 San Marcos chemistry thesis by later professor Manuel Vinelli, *Contribución al estudio de la coca* (Lima: Imp. San Pedro, 1918) lauds "the labor of Bignon, so fertile in the fields of chemistry and pharmacy, his vast scientific training, his enthusiasm for national science. . . [as well as] his vital discoveries recognized in Europe. . ." (26).

cocaine” at jungle estates. “The Bignon process for cocaine extraction shows how this operation is easily done in the very sites of production of coca and in unlimited quantities.”³⁵ In a related report, Peru’s Minister of Commerce wholeheartedly embraced the national goal “to convert coca into a valuable export.”

Peru’s legal cocaine boom was already underway, based on adapting the Lima pharmacy technology of Bignon to jungle settings. Maybe it did not need much promotion. The first shipment of concentrated non-perishable “crude cocaine,” probably from Meyer and Hafemann, arrived in Hamburg in May 1886. By 1888, German promoter Arnaldo Kitz, likely on behest of Merck, took Bignon’s formula of maceration-double precipitation to the legendary “lost” Austrian (Tirolean) colony in remote Amazonian Pozuzo. In still another link of the Germanic commodity chain, Austrian Karl Scherzer, commercial officer of the *Novara* mission that fetched the coca for Wöhler and Niemann’s experimental *cocain*, was also an early 1860s promoter of Pozuzo (he envisaged cocaine’s production “on the spot” near fresh supplies of the leaf). By the early 1890s, Kitz developed a thriving business there based on a three-step processing of coca from nearby farms with carbonate of soda, sulfuric acid, and kerosene in a workshop built from wooden barrels, piping and presses, delivering 70 kilograms a month of yellowish bricks to Lima.³⁶ By 1890, Peru sold more than 1,000 kilos of this crude cocaine abroad each year. German firms like Merck quickly stopped their bulky imports of coca and began taking in Peruvian cocaine sulfides, which now reached 90 percent purity, as an industrial input, which in a clear international division of labor they refined into profitable medicines in the world’s most advanced bio-chemical laboratories. By the mid-1890s, Kitz & Co. moved operations to Huánuco above the coca-rich Huallaga valley and close to chemical inputs from Cerro de Pasco mine companies. This area was to become the hub of the Peruvian cocaine industry for the next half-century. By 1905, the height of the trade, Peru had some twenty-four working cocaine workshops, linked to hundreds of coca plantations, exporting

³⁵ “Informe sobre la coca,” *Crónica Médica* 6, 6 (1889), 28–31 (report dated 31 Oct. 1888); Asuntos Generales: “Informe sobre la coca,” *Anales Universitarios* vols. 15–16 (24 July 1888), 256–57, forwarded in Dec. 1888 to Minister of Education for dissemination.

³⁶ “Cocaine in Peru,” *The Chemist and Druggist*, 29 May 1886 (also 17 Oct. 1904); “Crude Cocaine,” *Journal of the Society of the Chemical Industry* 30 Sept. 1889; Augusto E. Tamayo, *Informe sobre las colonias de Oxapampa y Pozuzo y los Ríos Palczuzo y Pichis* (Lima: Imp. Liberal Unión, 1904), 111–13 (with blueprint of Kitz’s factory). Spillane, *Cocaine*, ch. 3. For Peru’s boom, see P. Gootenberg, “Making a National Commodity: Peruvian ‘Crude Cocaine’ (1885–1910),” MS, New York, 2006. Link in Natalia Sobrevilla, “La creación de la colonia de Pozuzo,” in Giovanni Bonfiglio, ed., *La presencia europea en el Perú* (Lima: Fondo Editorial del Congreso, 2001), 117, and chs. 2–3, a good source on cultivated foreigners in Peru. Karl D. C. Scherzer, *Narrative of the Circumvention of the Globe by the Austrian Frigate Novara* (London: Saunders, Oatley and Co., 1861), vol. 3, 409.

some ten tons of cocaine, 7,000 kilos to Germany alone. Cocaine and coca became for a time Peru's fifth most remunerative export.

Thus, Germans rather than Peruvians or French dominated the science and global marketing of this new cocaine commodity chain, though Peruvians deftly adopted local structures to meet its needs. Bignon's national cocaine science, translated into global enterprise by savvy Germans, had a discernable impact on cocaine's future. This was because it was an "appropriate technology," to use today's lingo, easy to use with simple, cheap, and mobile inputs. The new industry spawned had international repercussions: it solved the crippling world cocaine bottleneck of the 1880s and superseded problems of costly and unreliable shipment of dried leaf coca. Each kilo of crude cocaine sent over the Andes replaced 160 to 180 times its weight in raw coca-leaf, a radical reduction in cost. Prices plummeted in the late 1880s—from \$1 a grain in 1884 to some 2 cents—making cocaine a widely used, and soon abused, global medicinal commodity. Coca sales carried on, but by 1905 almost entirely for the peculiar circuit forming around North American coca beverages, notable *Coca-Cola*. The British and others quickly abandoned coca colonization projects (a fact noted by their star imperial botanist Sir Clements Markham) because they recognized, like Merck and Squibb, that Peruvian crude cocaine would easily dominate the field. For the next half-century, visitors to Huánuco would speak of the "Bignon" (or Kitz-Bignon) process of making exportable cocaine.³⁷

But if one probes further to speculate where the trail of evidence ends, the repercussions of Bignon's lost cocaine science may still be traceable today. To make a long story short, by 1915 Peru's legitimate cocaine industry fell into a deep economic and political crisis, buffeted by western reactions against cocaine's medical perils and recreational lures, and the overproduction abetted by Bignon's technique. There was also the dramatic rise of a commercial rival half a world away: a vastly efficient Dutch-integrated coca-cocaine complex, based in colonial Java, exploiting the latest chemical ecgonine-extraction methods. World cocaine markets collapsed and Peru's regional industry of Huánuco languished for decades until shut down by government fiat in 1949. One facet of this crisis was that Peruvians, despite their know-how, never upgraded the apt artisanal technology of the 1890s into a modern pharmaceutical export. This even though technological critiques, voiced by Franco-Peruvian state engineer Pedro Paulet, were common as early as 1903, and vociferously repeated by others in 1911, 1913, and so on into the

³⁷ For references to Bignon-Kitz, see E. M. Pozzi-Escot, "Recherches sur l'industrie de la cocaïne au Pérou," *Bull pharmacologie* 20 (1913), 608–17 (Bignon on p. 615); "La Fabricación de cocaína en Huánuco" (Luzio, n. 37, p. 45; Binda, p. 377); Emile R. Pilli, "The Coca Industry of Peru" (MS., N. J. Merck, 1943, in DEA Library), 40 ("Crude Cocaine Manufacture," 39–47).



Figure 5 A “Crude Cocaine” Factory (Amazonia of Peru, ca. 1900). Marie R. Wright, *The Old and the New Peru* (Philadelphia: George Barrie & Sons, 1908), 446.

1940s.³⁸ The state of Peru’s surviving jungle workshops was invariably described as “rudimentary.” Meanwhile, as the prestige of cocaine sank worldwide, Bignon’s aging science, and the idea of a modernizing national cocaine, lost its gleam. Instead of Peruvian “protochronism” (exaggerated nationalist claims of invention), Bignon’s cocaine faded into oblivion.

Understandably, the post-war trail to illicit cocaine gets muddier still. It is now known that after 1949 a handful of former cocaine-makers in Peru (including Huánuco’s commercial magnate Andrés Avelino Soberón) and various cocaine “cookers” turned to processing illicit cocaine. It was a process and local tradition that was easy to transfer, even to illiterate peasants. Between 1947 and 1965 a larger hemispheric network emerges in response to

³⁸ “Mr. Clements R. Markham, FRS, Coca Cultivation,” *Chemist and Druggist* 17 Mar. 1894, esp. “An Uncommercial Coca-Lecture” (387–88). On lags, see Pedro Paulet, “Industrias: La cocaína,” *Boletín del Ministerio de Fomento* 1903, 25–42, written as French consul, with a range of cocaine methods including Pfeiffer’s elaboration of Bignon and ecognine extraction; Alfredo Rabines, “The Production of Cocaine in Peru,” *Peru To-day* [a journal pub. in Lima] 1911: 31–33; Federico Luzio, “Tecnología: La fabricación de cocaína en Huánuco,” *Agronomía* 3, 15 (1943), 44–54; Dante Binda A., “La Cocaína: Problema industrial del Perú,” *Actas y trabajos del segundo congreso peruano del química* Oct. 1943, I, 375–79. On “Protochronisms,” see Katherine Verdery, *National Identity under Socialism: Identity and Cultural Politics in Ceausescu’s Romania* (Berkeley: University of California Press, 1991), 167–68.

encroaching global bans on cocaine. It linked, for the first time, Andean coca peasants to “chemists” (as they were instantly dubbed), to long-distance smugglers of the drug from Peru and Bolivia through Chile, Cuba, or Mexico, and on to novel users in Havana and the United States. This time the commodity chain was not French or German, but Pan-American, driven not by science or modernizing commerce but by illicit profiteering and by political imperatives of the cold war. By the early 1960s, agents of the U.S. Federal Bureau of Narcotics, forerunner of the DEA, begin reporting on “recipes” for “coca paste,” cocaine sulfates, or “crude cocaine,” which were turned into purer *pasta básica de cocaína*, or “cocaine base,” in misnamed tropical “laboratories.” Chemical soaking had been cut to seventy-two hours, down some fifteen from Bignon’s less harried circumstances.³⁹ For obvious reasons, early *narcos* relied on timeworn jungle formulas, and in this realm Peru’s technological simplicity or backwardness had its advantages. Refining of the highly marketable paste was finished in labs in Havana and then later Colombia, replicating the older international division of labor, in this, the start of the huge global boom in illicit cocaine of the 1970s and beyond. Were these illusive and enterprising new chemists, with their ad-hoc plastic-lined maceration pits and converted oil drums filled with cement lime, soda ash, kerosene, and other household supplies, distant progeny of Alfredo Bignon’s national cocaine science of the 1880s? Quite possibly so.

³⁹ I am speculating here, for as the DEA soon learned, there are many ways to make cocaine. But this link (and chemical equivalence) of cocaine sulfates to coca paste and more oxidized cocaine base (pbc) is confirmed by Finnish graduate student Jyri J. Soininen (personal communication, July 2006) who on my query interviewed relevant chemists, including ex-DEA specialist Casale, cited below.

For the rise of illicit trades, see Paul Gootenberg, “Birth of the Narcs: The First Illicit Cocaine Flows in the Americas, 1947–64,” MS., New York, 2004. For the U.S.-Andean chain in long perspective, P. Gootenberg, “Between Coca and Cocaine: A Century or More of U.S.-Peruvian Drug Paradoxes, 1860–1980,” *Hispanic American Historical Review* 83, 1 (Feb. 2003), 119–50. For a few of many recipes, see U.S. National Archives, Record Group 170 (FBN/DEA, Foreign Countries), Durkin to Giordano, Cocaine: “Process for Manufacture of Cocaine Paste” (of “Information furnished by detained traffickers”), Mar. 1966; John T. Maher, “Erythroxyloin Coca: A Lecture,” DEA National Training Institute, Sept. 1976 (DEA Library); J. F. Casale and R.F.X. Klein, “Illicit Production of Cocaine,” *Forensic Science Review* 5, 2 (Dec. 1993), 95–107.

Anthropologists also work on this problem: Edmundo Morales, *Cocaine: White Gold Rush in Peru* (Tucson: University of Arizona Press, 1989), ch. 4, for techniques; p. 75 suggests peasants learned from “some Germans” three generations prior to 1980s (during the Kitz era?). Juan Cajas, *El truquito y la maroma, cocaína, traquetos y pistolocos en Nueva York: Una antropología de la incertidumbre y lo prohibido* (Mexico: CONACULTA-INAH, 2004), 60, where contemporary dealer informants link sulfates to making cocaine. Richard Kernaghan, a Columbia University ethnographer, finds Huallaga peasants, in a twist of historical amnesia, claim “Colombians” taught them techniques (personal communication, May 2005).

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