EUROPEAN VISIONS:

Science, the Tropics, and the War on Nature

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In the nineteenth century, many of those who made and influenced French colonial policy conceptualized colonization as an extractive enterprise to be conducted in the manner of a rational and efficient war against nature. This paper explores how France sought to extract various agricultural and human "commodities" or "products" from her colonies in the years before the Great War. The kinds of products the French tried to extract from their colonies changed over the century, but the predominant frame of reference – that of colonization as an extractive enterprise – remained the same whether the metropolis "needed" oranges, ostrich plumes, disciplined labor, or soldiers.

Colonization at Mid-Century

In the 1860s, Jules Duval, author of several books and articles on colonization and emigration, defined the essence of colonization as the "exploration, peopling and agricultural clearing of the globe". In this natural outward growth of the human family, battles against men were but minor episodes. Navigation, agriculture and commerce constituted the genuine tools of the colonizer, and the real struggle pitted colonists "against a wild and untamed nature... the fierce enemy" not yet softened "to the rules of regular production" (1).

While a whole gamut of motives, from prestige to commerce, figured into the acquisition of colonies, agriculture was the common path of development encouraged by Paris. Most colonial scientific effort was directed at creating a social and physical environment where agriculture, particularly export agriculture, would prosper. The best "products", of course, were those things termed "exotic", things which France lacked or could not produce in abundance.

Algeria was the show-case colony of the era, and there French agronomists tried for some forty years to introduce exotic tropical crops and animals to force the colony to produce spices, sugar cane, and other crops which would not compete with the products of French domestic agriculture. General Clauzel, leader of the French expeditionary force in 1830, imagined that by the 1850s Algeria would supply France with

sugar, and "the same and equally beautiful products which it once drew from its possessions in the West Indies" (2). Auguste Hardy, director of the Jardin d'essais at Algiers and of some two dozen other experimental gardens in Algeria, was the most influential resident scientist in the colony during the 1840s, 50s and 60s. Charged with the task of fashioning a tropical future for Algerian agriculture, Hardy's work anticipated Duval's conception of a war against nature and enjoined natives and colonists alike "to fight against and defeat this invisible enemy more formidable than man – climate" (3).

A major enemy in the war on nature was the dry African air which desiccated young plants. Hardy redressed this problem by calling for irrigation systems and planting one-third of the colony's surface with clumps of trees which would capture and hold humidity. A related if inventive plan counseled clump-planting in concentric circles eucalyptus trees, bamboo, fruit trees and spice plants. The war on the Algerian environment produced other inspired schemes as well, the most famous one being the construction of a canal from the Gulf of Gabbes. The idea was to create an ocean on the northern Sahara and transform Algeria into a humid tropical garden.

The changes in and challenges to the extractive enterprise of French colonialism were many, and while the French experience in Algeria did not define the colonial encounter for the entire nineteenth century, it framed its contours. Well before 1900, however, the targets of the "wars" of colonization had expanded beyond indigenous peoples and climates inhospitable to Europeans. By the 1890s, some felt that the main enemies of colonization resided in Paris. A veritable cacophony of critics arose and diagnosed the colonial malaise as a problem occasioned by the piecemeal administration of the colonies by various ministries of the French government. At issue was the *mise en valeur* of the colonies, and by the early 1900s many Frenchmen agreed with the conclusions of the liberal English economist, J. A. Hobson, whose *Imperialism: A Study* had calculated that colonization, or at least the settler system of colonization, was almost always a losing economic proposition. By century's end, as French physicians and politicians worried about declining birth rates and national degeneration (4), French colonial discourse shifted to the problems of other colonial products such as a sufficiently abundant and disciplined labor force, and soldiers.

The coming of the Great War, as Christophe Bonneuil and others before him have pointed out, revalorized the colonial endeavor (5). Yet a depopulated France still "needed" and extracted exotic colonial products. Now, however, the products were African men who would find their way to the trenches and battle fields of Europe. The war also ushered in an era of cooperation between France and Africa, the echoes of which would be heard much later during the founding of Orstom and the post-World War II era. Having sketched the evolution of the extractive enterprise in the French colonial empire, let us now contextualize that evolution by examining the empirical and ideological concerns which participated in the definition and genesis of these products.

Settlement, Science and Religion in French Algeria

It is not surprising to find reference to a war against nature in the literary canon of French colonialism. The construction of the French empire was mainly the work of the Army and Navy. Indeed, French troops in Algeria gave clear definition to the war on

nature. It was in May 1841, for example, the harvest season of Algerian wheat farmers, when Algeria's most famous governor-general, Thomas-Robert Bugeaud, began a sustained and total war of *rhazzias* against the indigenous population. This technique systematized the seizure of livestock, the burning of crops and villages, and the destruction of fruit trees. By the time metropolitan opposition forced Bugeaud's resignation in 1847, he had reduced much of North African society and its agriculture to shambles. When he was not conducting campaigns, Bugeaud devoted time to the improvement of his estate in the Dordogne where he gained a reputation as an advocate of scientific agriculture and a supporter of the French system of small peasant farmers (6).

Bugeaud's legacy in Algeria was not limited to his fame as a soldier. Under Bugeaud the French expanded Algiers Jardin d'essais and its associated network of botanical gardens, conducted a scientific reconnaissance of the country, and prepared to replace what remained of native agriculture with their own crops and scientifically justifiable systems of cultivation. The Second Empire's agricultural policy in Algeria rested on these foundations erected by Bugeaud. Napoleon III's administrators clung to the vision of an Algeria settled by transplanted French peasants cultivating tropical crops with the assistance of modern scientific techniques.

Perhaps Duval, Hardy and other apologists of empire, by highlighting the clearing, sanitation and cultivation of alien environments, sought to deflect attention from the simultaneous and parallel war directed at the indigenous peoples of Africa and Asia. The utilitarian trajectory of French colonial science, overwhelmingly concerned with the practical aspects of military and civilian occupation, was born of the conjuncture of two circumstances. The first was an overriding concern of metropolitan authorities with economic development. The second circumstance relates to the highly militarized environment of colonial scientific work. Except for a few months, a general ruled Algeria from 1830 until after the Franco-Prussian War. In the Far East, French Cochinchina, from its origin in June of 1862 until 1879, was the private domain of the French Navy. Thus the vast majority of those who conducted colonial science prior to 1880 were in some way linked to the military, either as officers or as former officers working on a "contract" basis on projects with military or paramilitary agendas.

In the approximate ledger of empire in the 1860s, France controlled about 60 million hectares of the globe outside its European boundaries. Depending on where one drew the borders on maps of the Sahara, Algeria accounted for about 40 million hectares, and the South American colony of Guiana added about 12 million. Of the four million or so people under the French flag in foreign lands, nearly half that number were in Algeria.

The ethos of economic protectionism which animated the research program at the Algiers Jardin d'essais was entirely justified by the potential perturbations Algerian grain and wine production posed for French agriculture. Even if France had only succeeded in gaining access to the forty-five mile long Mitidja plain near Algiers, site of many early French settlements, it would still have had a resource with more arable land than the total acreage cultivated in the colonies of Martinique, Guadeloupe and Réunion. Moreover, Algeria was geographically close to France, and the two countries grew ever closer as the century progressed. In 1830, for example, the trip from Paris to Algiers via the port

of Marseille required a week of hard traveling. By 1860, improvements in sea and especially rail travel had cut the trip to about three days. In 1890, tomatoes shipped from Algiers could appear the same day in the markets of Marseille, and needed only another day to grace tables as far away as Paris.

When the French took the city of Algiers in 1830 scientists did not accompany French troops to North Africa as they had during Napoleon's incursion into Egypt, but army physicians and engineers arrived in abundance. By 1832 civil hospitals were functioning in the cities of Algiers, Oran and Bone. By the middle 1840s, 38 hospitals, 418 health officers, and more than 2,000 nurses cared for the health of a French army which numbered more than 100,000. Separate health services also treated colonists and North Africans. But the Arabs, who looked upon disease as a divinely inspired condition which overtook the body all at once, imagined that therapy too ought to be heroic, something which cured disease with one dose. To visit the French physician was to expose oneself to the conqueror and also to recognize the poverty of native medical technique. Hence North Africans seldom visited Western physicians, and then only as a last resort (7).

The colonization of Algeria occurred during the glory years of French medicine and the construction of the hygienic movement in the urban centers of Europe. But France did not immediately transmit these agents of civilization to the Algerians, although the training of Arab doctors in Western medicine would accelerate during the Third Republic. The Algerians tenaciously and with reason rejected the canons of French hygiene, disease avoidance and prevention (8). Hygienic measures, like public works, the segregated city, and European agriculture appropriated Arab lands and replaced them with monuments which mirrored metropolitan models. These institutions constituted a system of symbolic and physical coercion which forced Algerians to adopt new rules of commerce, living, and dying (9).

Anglophone authors in particular have been quick to find links between missionary activity and the construction of the British empire. But in Algeria, Catholicism followed the flag to North Africa and failed to prosper. It remained little more than a ritual performed by some settlers for much of the century. Yet religious orders were important for the diffusion of science in the Far East and other regions of the French empire. By the 1850s several missionary orders routinely prepared their brothers for overseas duty by sending them to classes at the Paris Museum of Natural History. Particularly important too for French missionaries was the triumph of Enlightened civilization over barbarism, which in their minds freed up souls for conversion, signaled the mastery of science over magic, and hastened the raising up through instruction of people who suffered under a "profound ignorance of the first principles of nature" (10).

On the whole then, French technological and scientific progress rather than Christianity came to be seen as an essential agent of Western civilization by the colonizer and perhaps too by certain members of the colonized peoples. Although Islam remained officially closed to the Christian message, there are some indications that Muslim intellectuals admired and coveted European science, an activity they viewed as a species of philosophy. For example, a genre of North African literature written during the colonial era and known as the lives of the saints, debated the presence of the French. While the saints condemned most aspects of French culture and the occupation, they singled

out France as the best infidel nation to introduce Muslims to science because the French displayed the least attachment to their religion of all European nations. The saints praised without reservation French science, public security, philanthropy and the European agricultural technology and ideas which constituted the front line of attack in the war on nature (11).

According to Paul Bert, the physiologist and colonial functionary who died in the service of the empire, some Algerians welcomed the war on nature, or at least wanted to enjoy the fruits of it. In a small pamphlet of 1885 entitled *Lettres de Kabyle: La politique algérienne,* Bert describes how when he asked the chief of the Beni-Yenni tribe what they most needed, the chief tersely replied water and schools. Upon further questioning Bert determined that by water the chieftain meant not just water for irrigation and drinking, but the whole constellation of Western technology and science required to support a water system and sustain prosperity, that certain "working together for which science [was] necessary". Bert concluded that it was not religion but science and the French sense of justice which marked his nation's "true superiority in the eyes of the natives" (12). Even in Asia, where missionaries could boast of a few hundred converts, a conviction persisted that the lettered Chinese were more susceptible to the scientific spirit of Comtean philosophy than to Christianity (13).

Science, then, in addition to its use as a tool in forming colonial products through rationalizing alien environments, had an ideological value in the war on barbarism. At times, this ideological dimension of science exceeded its concrete value. For example, the botanist Hardy, engaged in expanding the number of French botanical gardens in 1851, argued that a new garden ought to be created at the Biskra oasis in south-central Algeria, an area only recently pacified by the French. The Biskra garden was, he wrote the governor general, an "excellent idea on all accounts, but I think that it will have a much greater importance with respect to policy in virtue of its influence on the mind of the populations of the South than with respect to new products which it will cause to bloom in this region." Hardy added that meteorological studies indicated that Biskra was likely to produce products almost identical to those cultivated at the Algiers experimental garden (14).

A War with too many Generals

In truth, French colonization and its associated war on nature lacked coherent and firm metropolitan guidance until the end of the century (15). Indeed, the portfolio of the colonies bounced from ministry to ministry, and functions of colonial governance were frequently shared by the Navy and Army. In addition, France did not have an autonomous department of agriculture until 1881, and agricultural information had to be gleaned from a variety of sources. Thus in the absence of a strong lead agency, the Army, Navy, and agents of a small cluster of metropolitan learned societies shaped colonial agronomic policy prior to the 1880s. Oftentimes their ideas were in conflict. In this policy vacuum geographical societies, chambers of commerce, and the Société zoologique d'acclimatation, which had been organized in 1854 by zoologists at the Paris Museum of Natural History and heavily patronized by Napoleon III, were influential in Algeria. The latter learned group was a hotbed of Lamarckian and transformist zoological philosophy

and created a zoo in Paris for the display and diffusion of colonial "products". This society became the Ministry of War's *de facto* consultant for Algerian agricultural development (16). Most of all, the group supported the government's central dogma of agricultural development which derived from General Clauzel's idea that tropical crops could be forced to adapt to Algeria. The botanist Hardy and members of his staff, who by the 1850s were encountering difficulties in cultivating tropical crops such as vanilla beans and sugar cane in Algeria, received something of a reprieve when they linked up with the influential Parisians of the Société zoologique d'acclimatation.

During the 1860s the colony's program to introduce exotic crops faltered, leading to a softening of the rhetoric of the war on nature. By 1867 only the Algiers Jardin d'essais was funded by the government. When Auguste Hardy retired that year, the Société zoologique d'acclimatation lost a devoted colonial member and easy access to what had become its quasi-official home in Algeria. Soon the Jardin d'essais ceased its pretensions to agronomic research and became the property of the Société générale algérienne, a large private corporation headed by the industrialist Paulin Talabot. Indeed, as measured in terms of products produced, the utility of horticultural institutions such as jardins d'essais to the extractive enterprise was very much in doubt. Only later were jardins d'essais joined by more modern scientific institutions, colonial agricultural experiment stations. Accordingly, the Jardin d'essais began to market plants already common in Europe and to function as a reified memory for colonists of the fields and soupgardens of their native lands. Simultaneously, some agents of French colonial science began to worry that the war on nature had gone too far. Colonial resources, which had once seemed limitless and able to sustain the excesses and inefficiencies of the exploitative enterprise, were now deemed in need of scientific management and conservation (17). The combative image of a war against nature receded still further, and gave way to a scientized rhetoric of development founded on a cooperative and semi-industrialized labor force.

Talabot was first and foremost an industrialist imbued with Saint-Simonian ideals who promoted large-scale agricultural enterprises, and his vision of the war on nature and colonial production was a highly industrialized one. Talabot charted Africa's path to modernity in terms of scientized agricultural techniques deployed on a grand scale, and the associated railroads and canals which would bring colonial products to market. It was Talabot's vision of an industrialized, economically efficient, and rational mode of extraction, rather than Hardy's botanical exoticism, which informed the Third Republic's management of its sub-Saharan and Asian holdings. Factories, of course, require a special kind of labor force, and it was this colonial product that France now "needed" and sought to develop.

The Problem of the Colonial Labor Force

As France added newer colonies and expanded from its Asian base in Cochinchina, the philosophy of empire based on settler agriculture gave way to a strategy of plantation agriculture. As in the British Empire, the strategies of colonialism changed and terms such as "scientific colonialism" and "scientific imperialism" were heard with increased frequency (18). Questions of labor for the mines, rice paddies, and palm and

rubber plantations, came to the fore. Around 1900, for example, a typical example of popular colonial literature identified the first mission of the French in the Congo as the organization of a labor force. It was said that the populations of the Congo had never known sustained and disciplined work, and that this was to their detriment. For the French, the lack of a work force of indigenous peoples constituted the "greatest obstacle to colonization". Much could be accomplished, however, with a simple formula; Europeans would provide the "brains", and Africans the "arms" (19). This and similar homilies of colonization were repeated time and time again.

Of course the brain in the body of colonization needed to protect its arms. On the eve of the Great War, even the Minister of Colonies and former Governor of Indochina, Albert Sarraut, portrayed himself as protecting indigenous laborers in the mines of Indochina by creating a colonial health service for their use and by interceding on their behalf with abusive French employers. Yet this instance of the "conservation" of human resources is less humanitarian than it seems at first glance. Paramount for Sarraut was the continued economic development of the colony, and he is alleged to have warned French labor contractors that he would not let them "kill, by [them]selves, all the mining enterprises and interrupt the progress of the mining industry in the colony" (20).

In Algeria, metropolitan and later the colony's own learned societies had prospered because European settlers and government functionaries had demanded a cultural milieu which approximated their former way of life. In Indochina, the French found it easier to develop an export economy through engineering and banking than by the emplacement of settler agriculture and its considerable social overhead of good schools, social clubs, scientific societies and sporting clubs (21).

The regime which developed in Indochina was meant to be cost-effective above all other considerations, and labor costs formed a significant part of the equation. This is not to say that the French civilizing mission, in its manifold forms (22), was not prosecuted and protected to the full extent of the law. The civilizing mission was alive and well in Asia (23). Treaties negotiated by the French with Asian powers, beginning with the Treaty of Whampoa of 1844 which "opened" the port of Shanghai, routinely accorded protection to missionaries and scientists traveling in the country. The episodic cultivation of science by French diplomats was encouraged and at times even subsidized by metropolitan scientific bodies such as the Paris Museum of Natural History, and a handful of scientific societies. But in Vietnam, unlike Algeria, neither the state nor the military was particularly solicitous of agricultural science or horticulture in the early years of the colony's organization. The best that may be said of the Ministry of Foreign Affairs is that it tolerated scientific work by its functionaries if it did not detract from their commercial activities.

Throughout the nineteenth century science was never a high priority in Indochina. A naval colony until 1879, it remained a bastion of reactionary clericalism. For Napoleon III, who stationed 800 men in Saigon but sent 6,000 to Syria and another 40,000 to Lombardy, Asia itself was a minor aspect of foreign policy. In the early 1860s France nearly sold most of Cochinchina to the Vietnamese government, and Napoleon III became cautious of additional foreign entanglements after the collapse of the Mexican campaign and as the threat of Prussia grew (24). Although the French remained in Southeast Asia and

began a journey which lead to the ashes of Dien Bien Phu, Vietnam was a mere side show to the greater gains imagined in China.

Like the Algerians, the Vietnamese felt that their inability to resist the French invasion had been based in part on technological backwardness, and this occasioned some attempts to obtain the talisman of Western science. In 1868 the Vietnamese made an unsuccessful attempt to do as the Japanese were then doing and establish a scientific and technical institute with western teachers and textbooks. It was not until the first decade of the present century, however, that the French opened European-style universities in Asia. Western medical science was among the first disciplines to be taught, and the first medical class graduated from the University of Hanoi in 1907 under the direction of Pasteur's protégé, Alexandre Yersin. French initiatives to teach pure science in their Asian universities, a goal sustained for a time by functionaries in Asia, met with resistance from metropolitan administrators who wanted a technical and practical curriculum (25).

In Asia as in Africa, colonial labor was identified as a central problem. But unlike in the situation in Africa, the Indochinese were said to be good industrious workers. In Indochina, the French war on nature and the organization of indigenous labor was successful in altering the nature of the country's agriculture, particularly its rice production for export. This in no way implies a better way of life for the colonized peoples, but between 1868 and 1880, the land under cultivation doubled, and by 1943, when 2,303,000 hectares were cultivated, the total area was nine times what it had been in 1868. Large-scale engineering projects, especially dams, dikes and irrigation systems, and bank credit to large landholders, constituted the tools of the war on nature in Asia and fueled this rise in production.

While attempts to found a Vietnamese institute for colonial agronomy date from 1918, not until 1929 did laboratories for crop selection and plant improvement begin to function. Practical training in agriculture for the Vietnamese began at the University of Hanoi and a half-dozen other schools near the end of World War I. Thus it was the campaign to rationalize the nature of Vietnamese agriculture, particularly the imperialism of hydraulic engineering, labor organization, and changes in land tenure, which animated French scientific activity until World War I. The cultivation of rubber plants, after rice the next great extractive industry developed by the French in Southeast Asia, began in the first decade of the century. Dominated by large corporations which bought their knowhow from Malaya and the Dutch East Indies, the French rubber plantations were astoundingly successful because of the region's "good soil, a favorable climate, disciplined labor, and low taxes" (26).

Colonial Manpower and the Great War

The outbreak of the Great War reshuffled the hierarchy of colonial products desired by the metropolis, but the colonial enterprise remained a project dedicated to the extraction of products deemed exotic or in scarce supply. Now, of course, France needed men for its armies. Disciplined laborers were still needed too, but their tasks and the geographical areas in which they conducted them expanded to encompass Europe. Once again, the rhetoric of the extractive enterprise transformed.

The ultimate and most dear of all colonial products, is of course human lives. After gaining experience at organizing colonial labor and in growing and exporting other colonial products, France was well-poised to draw on the human wealth of its dominions. In 1910, Charles Mangin and other representatives of the Comité de l'Afrique Française set out from Bordeaux "to survey the potentialities of the black reservoir of men in French West Africa" (27). Mangin's many publications, including his *La Force Noire* of 1910, display his obsession with the notion of a France in decline and provide a blue print on how to use African forces in the modern military (28). Marshalling cultural and anthropological "evidence", Mangin argued that Africans were born soldiers and that their underdeveloped nervous systems made them less sensitive to pain than the French (29).

Mangin's views were contested by some French military leaders such as General Voyon who wanted a specialized colonial army composed mainly of indigenous soldiers. This was not, strictly speaking, an extractive enterprise similar to those previously discussed because the products were not transferred to Europe. Europe certainly stood to reduce the costs of holding its empire, however, and Voyon argued that such an army would be extremely cost-effective, serve only in the colonies, and leave the more important task of the defence of France to army regulars. Reservations about the physical and mental capabilities of Africans, and about the danger of having armed Africans in Europe, was common in this era. On the eve of the war, for example, professors at the Institut Colonial in Marseille had been ill-at-ease when African troops serving with the French colonial forces found it necessary to stay in their city (30). However, as soon as war broke, Dr. Edouard Heckel, Directeur des Cours Coloniaux at the Institut, issued a call to transform the discipline of colonial medicine to one which would produce practitioners with a broad knowledge of science, hygiene, and tropical demography. A product called manpower was now needed, and colonial health matters leaped to the fore as the learned professor and others realized that the colonies had become an "important reservoir of national forces" (31). The French shifted easily from developing a source of colonial labor to exporting that labor to the metropolis. In point of fact, the effective strength of the colonial armies had been growing in tandem with the expansion of the French empire. In 1870 only 1,100 or so indigenous peoples served in the colonial forces. By 1900 this total had grown to 21,530, and by 1914 the total had more than doubled to 48,700 (32).

As soon as the war began, the lines between colonial and domestic troops began to crumble, as colonials were frequently integrated with the remains of European battalions. The colonies, especially French West Africa and French Equatorial Africa, responded in abundance to the call for men. The need for men increased, and one recruiting trip to Senegal in 1918 by Blaise Diagne netted 80,000 men. In August of 1914, France marshalled 83 battalions of Europeans and 60 battalions of "mixed" or "indigenous" troops. Toward war's end in 1918, there were 76 European battalions, and 201 battalions of indigenous troops. In all, more than 257,000 men were recruited in the colonies. Voyon's opinion that African troops were not fit for the conditions of war in Europe was disproved time and time again.

Conclusion

This paper has stressed the similarities between three aspects of French colonialism which are frequently treated as separate subjects: agriculture, labor, and military recruitment. The installation of scientific agriculture and organized labor on Europe's periphery was not part of a conspiracy to swell the ranks of the European armies. But by deploying technosciences such as military organization and modern agriculture in its colonies, France gained the skills and knowledge which allowed it to accomplish the task of military recruitment. Intent on extracting the wealth of the colonies, France experimented with various methods of farming, and organizing and disciplining colonial labor. In the last half of the nineteenth century, France pacified and rationalized selected sectors of colonial nature and colonized peoples. In the early decades of this century, successful techniques applied to the former tasks paved the way for production of a new colonial product. By the end of the war, the colonial armies themselves had become a kind of jardin d'essais bent on producing an exotic crop. In the words of one old soldier, the African troops had become a "marvelous nursery of [reserve] officers" (33).

Scientific and economic activity, no less than other colonial "products", must be seen within the changing framework of Empire and in relief against the changing needs of the colonizer (34). The French intended for a time that Algeria would become a settlement colony, a future not charted for Senegal and Vietnam. In the larger picture, the institutionalization of French colonial science occurred mostly in the settler colonies. In addition, much of nineteenth century French colonialism can be likened to an extractive enterprise which evolved toward an industrial model of extraction. At mid-century this process took the form of a war on nature and required applied sciences such as agronomy, meteorology, medicine and engineering to rationalize the productive capabilities of alien environments. Later on, as in mature industries, the problems of cost control through labor organization, economies of scale, efficiency, and maintaining a flow of raw materials came into play. In tandem with this process, epiphenomenal products of colonialism like conservation and preservation gained currency.

In the final analysis, the technosciences of colonialism achieved their mission at the altar of political economy. Most science in the colonies was intended first to be useful and only secondarily to be pure or basic, within the constraints of time and money. Military matters, and concern for the safety of colonists, were abiding features of French colonialism and the extractive enterprise. Unfortunately, military requirements defined utility as it was applied to the colonies in the early decades of this century. Science then aided in the extractive enterprise and provided inspiration for scientistic and rationalized models of colonial governance and management. The cataclysm of World War I provided a true audit of the value of the empire to France, and this clear evidence of the colonies' value required that France try to reconstitute and re-exert its control over the colonies in the interwar period.

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NOTES

1) Jules Duval, *Les colonies et la politique coloniale de la France* (Paris: Arthus Bertrand, 1864), vi.

2) Quoted by Charles-Robert Ageron, *France coloniale ou parti colonial?* (Paris: Presses Universitaires de France, 1978), 16.

3) Auguste Hardy, "Note climatologique sur l'Algérie au point de vue agricole" (Algiers: Imprimerie du gouvernement, 1847), 16.

4) Robert A. Nye, *Crime, Madness, & Politics in Modern France: The Medical Concept of National Decline* (Princeton, N.J.: Princeton University Press, 1984).

5) Christophe Bonneuil, *Des savants pour l'Empire : la structuration des recherches scientifiques coloniales au temps de "la mise en valeur des colonies francaises" 1917-1945* (Paris: Orstom, 1991), 21.

6) Antony T. Sullivan, *Thomas-Robert Bugeaud, France and Algeria, 1784-1849 : Politics, Power and the Good Society* (Hamden, Conn.: Archon, 1983); see also his article of the same title in E. P. Fitzgerald, ed *Proceedings of the Eighth Annual Meeting of the French Colonial Historical Society, 1982* (Lanham, MD.: University Press of America, 1985), 149-159.

7) See the chapter entitled "Medicine and colonialism" in Franz Fanon, *A Dying Colonialism* (NY: Grove Press, 1967), 121-145.

8) Anne Marcovich, "French colonial medicine and colonial rule: Algeria and Indochina," in Roy MacLeod and Milton Lewis, eds *Disease, Medicine, and Empire: Perspectives on Western Medicine and the Experience of European Expansion* (London: Routledge, 1988), 103-117. Nancy E. Gallagher, *Medicine and Power in Tunisia, 1780-1900* (Cambridge: Cambridge University Press, 1983).

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10) "Mœurs et croyances religieuses des habitants de la Régence d'Alger", *Annales de philosophie chrétienne* 1(1830): 45-56, at 54.

11) Dorothea M. Gallup, "The French Image of Algeria" Its Origins, its Place in Colonial Ideology, its Effects on Algerian Acculturation" (Ph.D. Dissertation, University of California, Los Angeles, 1973), 397.

12) Paul Bert, *Lettres de Kabylie: La politique algérienne* (Paris: Alphonse Lemerre, 1885), 62.

13) Laurence Oliphant, *La Chine* (Paris: Michel Lévy, 1875), 225.

14) Auguste Hardy to Monsieur le Secrétaire Général du Gouvernement, 22 April 1851, Archives nationales, Aix, F80 735. Michael A. Osborne, "The system of colonial gardens and the exploitation of French Algeria, 1830-1852," in E. P. Fitzgerald, ed *Proceedings of the Eighth Annual Meeting of the French Colonial Historical Society, 1982* (Lanham, MD.: University Press of America, 1985), 160-168.

15) C. M. Andrew and A. S. Kanya-Forstner, "Centre and Periphery in the Making of the Second French Colonial Empire, 1815-1920," *Journal of Imperial and Commonwealth History* 16, no. 3 (1988): 9-24.

16) Michael A. Osborne, *Nature, the Exotic, and the Science of French Colonialism* (Indianapolis: Indiana University Press, 1994).

17) The French turn toward conservation is detailed in my "The Museum's errant daughter: The *Société zoologique d'acclimatation* between the Franco-Prussian and Great Wars", in Roger Chartier, ed *Le Muséum au premier siècle de son histoire* (Editions de l'Ecole Pratique des Hautes Etudes en Sciences Sociales, in press), and in idem, *Nature, the Exotic, and the Science of French Colonialism*, 50-54. The point is also made by Christophe Bonneuil and Mina Kleiche, *Du jardin d'essais colonial à la station expérimentale, 1880-1930 : éléments pour une histoire du CIRAD* (Paris: CIRAD, 1993), 29-34.

18) On the specificity of the term scientific colonialism see Roy MacLeod, "On visiting the `moving metropolis': Reflections on the architecture of imperial science", in Nathan Reingold and Marc Rothenberg eds, *Scientific Colonialism: A Cross-Cultural Study* (Washington, D.C.: Smithsonian Institution Press, 1987), 217-249.

19) Médard Béraud, *La main-d'œuvre au Congo français, rapport présenté au Comité consultatif de l'Agriculture, du Commerce et de l'Industrie (Ministère des Colonies)* (Paris: Imprimerie Chaix, 1899), 4.

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