

the problems of a company's external relations. Chemical firms have not faced the same problems of access to capital and marketing, and so they have looked with more favour upon the "productivist ideology" of the chemical engineers.<sup>7</sup> Those charged with the future of the engineering profession would find it of service if they made inquiries into the extent to which considerations such as these inform the recent attempt to blame the higher educational system for the shortcomings of engineers.

## Foreign Scientists, the Rockefeller Foundation and the Origins of Agricultural Science in Venezuela

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THE FOREIGN SCIENTISTS working in the first stages of scientific activity in the tropics were "expatriate scientists". Although their professional careers occurred entirely in the countries to which they emigrated, these were also expatriate careers which were defined by the criteria of scientific careers in metropolitan countries. Their achievements were assessed by the criteria prevailing in metropolitan countries. "French scientific functionary", "German research worker", or "mercantilist scientific agent", although very different among themselves, fall nonetheless within this group which was defined according to the standards of the scientific metropolis.<sup>1</sup> Some of them acted as "gate-keepers" of science in the poor countries where they worked; they determined which scientific knowledge was to be admitted, and which was to be rejected. This was true of most of the expatriate scientists. Where they worked in a colonial territory, they were employed by the colonial government in its scientific services, or they were assimilated with a missionary body, or a philanthropic institution with its headquarters in the metropolis. There was also another category of foreign scientist. They remained within the scientific code of their mother country, and lived quite isolated lives among the native scientists.<sup>2</sup>

There were individual exceptions. Not all foreign scientists who arrived in Latin America did so to further the colonial policies of the advanced countries. Sometimes in the scientifically backward countries which were independent, foreign scientists were invited by the indigenous government or a subsidiary institution. Often, it was on the initiative of Latin American governments that European or North American scientists were brought into their countries.<sup>3</sup> It was very common for them to arrive with

<sup>1</sup> Pyenson, L., "Functionaries and Seekers in Latin America: Missionary Diffusion of the Exact Sciences, 1850-1930", *Quipu*, II, 3 (September-December 1985); and "Pure Learning and Political Economy: Science and European Expansion in the Age of Imperialism", in Visser, R.P.W. et al. (eds), *New Trends in the History of Science: Proceedings of a Conference held at the University of Utrecht* (Amsterdam and Atlanta: Rodopi, 1989).

<sup>2</sup> Krishna, V.V., "The Colonial 'Model' and the Emergence of National Science in India: 1876-1920", in Petitjean, J. et al. (eds), *Science and Empires: Historical Studies about Scientific Development and European Expansion* (Dordrecht, Boston and London: Kluwer Academic Publishers, 1992).

<sup>3</sup> Safford, F., *The Ideal of the Practical: Colombia's Struggle to Form a Technical Elite* (Austin: University of Texas Press, 1976).

little or no sponsorship from the foreign government: they had to fend for themselves. They came as independent individuals, in search of better opportunities for their own scientific work and professional careers.

These scientists were not totally independent of the interests of the metropolitan government or foundation, and they were not totally isolated from the foreign scientists who worked under their auspices. Nevertheless, they were regarded as a category apart. They were often distrusted by their fellow-countrymen who worked for the foreign institutions, and they did not enjoy the protection of the indigenous institutions.

The literature on the institutional establishment of Venezuelan agricultural research and development does not mention the roles of either the American geneticist, Derald G. Langham, or the Rockefeller Foundation. However, the foundation's support of Langham's research was one of its earliest activities in the natural sciences in Latin America.

#### *The Rockefeller Foundation's Programme in the Natural Sciences in Latin America*

In 1940, largely as a consequence of the interruption caused by the war to the activities of the Rockefeller Foundation in Europe, Warren Weaver, the director of the foundation's natural sciences division, broached a plan to explore opportunities for research in Latin America, where the Rockefeller Foundation was already well known for its contributions to medicine and public health.<sup>4</sup> In January 1941, H.M. Miller Jr, Weaver's assistant director, started an intensive programme of interviews of North American scientists, to determine what persons, facilities and opportunities existed in the natural sciences in Latin America.<sup>5</sup> From the very beginning he thought that, if a programme of research could be undertaken in Latin America, it should include agriculture, although the foundation had never been active in this field.<sup>6</sup> One reason for such a programme was stated by C.M. Tucker, head of the department of botany at the University of Missouri: extensive collecting of South American plants might furnish better breeding stocks for American laboratories. Tucker also thought that local experiment stations in Latin America could test high-yielding American varieties of vegetables. In view of the higher quality of the improved American varieties, it would be desirable to introduce many of those varieties in the local

experiment stations by providing seeds and by helping with the planting and cultivation of the experimental plants.<sup>7</sup>

During 1941 Miller visited nine Latin American countries.<sup>8</sup> In the choice of places to visit, emphasis was placed on pure science in other than medical faculties, and on the basic sciences in agricultural institutions. Miller's previous experience had been in some 25 European countries—he found conditions in Latin America to be very different in many respects. His report dealt very briefly with the level of science in Latin America. He found that Argentina (with a population of approximately 13 million) had, in proportion to its population, more and better equipped universities and science research institutes than any other Latin American country. Brazil (with some 43 million) was “probably a poor second, even after leaving out of account the large population of the ‘back country’”. Ecuador (with three million inhabitants) was in his eyes the most backward of all with respect to both teaching and research. Smaller Uruguay (with two million people) had and needed only a single university, which was already good and undergoing some improvement, but research in the natural sciences had been little developed. Almost no pure scientific research was done in Chile (five million); and even the teaching in the faculty of natural sciences of Peru (six million)—one of the few in Latin America—was at a low level, because of the lack of equipment, libraries and adequate laboratories. He found Colombia (nine million) better off in some respects, while the progress then becoming visible in Venezuela (3.5 million) had started only after 1935.<sup>9</sup>

Miller visited universities, vocational schools, ministries of agriculture and institutions connected in any way with science, trying to find out where the Rockefeller Foundation could helpfully co-operate with local biologists, chemists, physicists, mathematicians and other workers in related fields. The foundation made an effort from the very beginning to distinguish between the medical and natural sciences. Representatives of the latter were to leave to the medical divisions of the foundation the development of research in medical schools and medical research institutes.<sup>10</sup> All the programmes of the natural sciences division in the first year cost less than \$18,000; until 1949, they remained on a modest scale. In 1949 they expanded markedly (Table 1). The expansion was primarily in the field of agriculture.

<sup>7</sup> Miller Jr, Supplement to his Diary, *op. cit.*, 30 January, 1941, p. 212.

<sup>8</sup> He visited Mexico first, and shortly afterwards Brazil, Uruguay, Argentina, Chile, Peru, Ecuador, Colombia and Venezuela.

<sup>9</sup> H.M. Miller Jr, South America: First Survey Trip in Connection with Program in the Natural Sciences, 30 March, 1942, RFA, RAC, RG 1.2, Box 12, Folder 95.

<sup>10</sup> *Ibid.*, Box 4, Folder 29.

<sup>4</sup> Internal Report, Rockefeller Foundation Archives (hereafter RFA), Rockefeller Archive Center (hereafter RAC), RG 1.2, Series 300 Latin America, Box 13, Folder 104.

<sup>5</sup> Information on Latin American scientists by North Americans qualified to give information and advice, in Series Miller Jr, H.M. (1941), Supplement to his Diary, 27–31 January, 1941, RFA, RAC, RG 12.1, Box 45.

<sup>6</sup> H.M. Miller Jr, interview with Dean M.F. Miller, School of Agriculture, University of Missouri, 30 February, 1941, in *ibid.*, p. 210. There was also an idea that the only “pure” science likely to be found in Latin America would be associated with practical applications, e.g., with medicine or agriculture. See W. Weaver to A.G., 6 February, 1941, RFA, RAC, Series 300 A, Program and Policy.



world.<sup>13</sup> The pronounced oscillations in the period—despite the high general rate of growth—resulted from variations in the tax level and in the revenue from oil itself, which diminished during the war because of the obstacles to export and then grew vertiginously afterwards (Table II).<sup>14</sup>

TABLE II  
Venezuelan Oil Revenues, 1936-1949

Year	Oil Revenues bolivares (in millions)	Oil Revenues US\$	Population	Oil Revenues/per capita US\$ (1968 exchange rate)
1936	52	13	3,341,000	11
1937	84	25	3,438,000	17
1938	133	43	3,538,000	26
1939	92	30	3,641,000	18
1940	76	25	3,747,000	14
1941	133	43	3,856,000	22
1942	68	22	3,968,000	10
1943	116	37	4,088,000	15
1944	236	76	4,212,000	29
1945	298	96	4,339,000	34
1946	397	129	4,471,000	40
1947	665	215	4,606,000	58
1948	1,077	349	4,746,000	86
1949	771	250	4,890,000	59

SOURCE: Baptista, A. and Mommer, B., "El petróleo en las cuentas nacionales: una proposición", *Revista del Banco Central de Venezuela*, No. 2 (April-June 1986), pp. 181-210.

Wealth from oil created conditions favourable to industrialisation: a sufficient accumulation of capital and effective demand for industrial products. But the country's increased purchasing power encouraged imports of agricultural and manufactured products, to the detriment of the expansion and improvement of domestic production. Living costs were among the highest in the world and the difficulty was principally the inability to produce sufficient beef, wheat and corn economically. There was an urgent need for grain to feed the livestock produced in Venezuela.<sup>15</sup> A powerful complex of commercial and service enterprises emerged without an industrial base. In the growth of the gross domestic product, the tertiary sector advanced at greatest speed. Between 1936 and 1950,

<sup>13</sup> Furtado, C., "El desarrollo reciente de la economía venezolana", in Valecillos, H. and Bello Rodríguez, O. (eds), *La economía contemporánea de Venezuela: Ensayos escogidos*, Vol. I (Caracas: Banco Central de Venezuela, 1990).

<sup>14</sup> Mommer, B., "La distribución de la renta petrolera: El desarrollo del capitalismo rentístico venezolano", in *ibid.*, Vol. IV, pp. 155-235.

<sup>15</sup> See Kyle, E.J., "A Tour of Central and South America, 28 July-6 November, 1941", Report submitted to Nelson Rockefeller, RFA, RAC, RG 1.1, Series 300, Box 6, Folder 37.

the annual mean growth of the gross domestic product reached 12.2 per cent. Production of goods in that period increased annually at 6.6 per cent.<sup>16</sup> The export of agricultural products, which until the mid-1920s had constituted the basis of the economy, was much neglected and survived precariously only through state subsidies. On the other hand, agricultural produce for the domestic market was insufficient to match the expanded demand and a large proportion of foodstuffs had to be imported. The relative prices for food and other basic products were very high.<sup>17</sup>

Given the enormous technical backwardness and low productivity of the peasant population, living conditions in the countryside continued to be very exiguous; consumption levels were much lower in Venezuela than might have been expected in view of the level of income. Large modern agricultural projects were promoted by government and superimposed on the existing agricultural structure, in response to the weakness of the industrialisation process. In 1944, a Commission for the Promotion of National Production was created. In the case of agriculture, preference was given to agricultural goods for industrial processing. Six years later, clear precedence was given to the exploitation of vegetable oil seeds, i.e., the extracting and refining of edible fats and oils.<sup>18</sup>

Illiteracy, estimated at 65 per cent, was another critical handicap. In 1930, there had been only 60 teachers with pedagogical degrees in the entire country, no rural school, only 18 secondary schools, and only two universities—in Caracas and Merida—with a total of 532 students. In 1944, the educated population was still so small that all the secondary students of Venezuela could take their final examinations together at the pedagogical school in Caracas.<sup>19</sup> In 1933 the government had established a School of Practical Agriculture—Escuela Práctica de Agricultura—for elementary school level technicians, locally called *peritos*. However, teaching and research in agriculture began only with the creation of the Agricultural Experiment Station in 1936, and linked to it, the College of Agriculture—the Escuela Superior de Agricultura—founded in 1937, and the College of Veterinary Medicine—the Escuela Superior de Veterinaria—founded in 1938; the Ministry of Agriculture itself had been established only in 1936. These colleges of agriculture were based on the American land-grant college model, proposed, among others, by a group

<sup>16</sup> Rangel, D.A., *El proceso del capitalismo contemporáneo en Venezuela* (Caracas: Ediciones de la Dirección de Cultura de la Universidad Central de Venezuela, 1968), pp. 207-227.

<sup>17</sup> Córdova, S., *Inversiones extranjeras y subdesarrollo* (Caracas: Universidad Central de Venezuela, 1973), pp. 135-136; Rangel, D.A., *Capital y desarrollo* (Caracas: Instituto de Investigaciones Económicas y Sociales, Universidad Central de Venezuela, 1969); Mieres, F., "Los efectos de la explotación petrolera sobre la agricultura venezolana", in Malavé Mata, H., *Petróleo y desarrollo económico en Venezuela* (Caracas: Ediciones Pensamiento Vivo, 1962).

<sup>18</sup> Araujo, O., "Caracterización histórica de la industrialización en Venezuela", in Valecillos, H. and Bello Rodríguez, O. (eds), *La economía*, Vol. I, *op. cit.*

<sup>19</sup> República de Venezuela, *Memoria del Ministerio de Instrucción Pública*, Caracas.

led in 1939 by a phytopathologist from Cornell, Herbert H. Whetzel, which had the task of reorganising the Experimental Institute of Agriculture and Zootechnics.

There was a marked scarcity of qualified staff to deal with the problems of agricultural development. It was unlikely that government would "import" these technical men in sufficient quantity to meet the demand".<sup>20</sup> Out of 105 persons employed by the Ministry of Agriculture between 1948 and 1950, 90 were of foreign origin and 40 were agronomists.<sup>21</sup> At the same time, these few qualified persons thought their capacities were not fully used because politicians, from ministers downwards, did not understand research. A high official might be aware that something ought to be done about a particular plant pest, or that an important crop ought to have the same high yield obtained in other countries, but the unstable political support for research programmes, insufficient funds, sheer ignorance and lack of understanding, hindered the execution of any plans. Adequate remedial measures were seldom taken, and if taken were not well carried out.<sup>22</sup> The very lack of experience of the Venezuelan participants meant that some foreign "experts" who were appointed to technical positions in governmental agencies had few proper qualifications.

In 1937, Nelson Rockefeller, in his capacity as a member of its board of directors, visited the oil fields of the Creole Petroleum Corporation, the Venezuelan subsidiary of Standard Oil of New Jersey. He had decided to try to make American capital contribute to the economic development of the country in which it was investing. He created one of the earliest private development firms in Latin America, the *Compañía de Fomento Venezolana, SA*, which in the 1940s started innovative projects aimed at influencing the entire national economy by producing and distributing food on a major scale. In its early years, it operated four large farms that produced beef, sugar, milk, poultry, and a variety of vegetables; a fishing company which built freezing units provided fishermen with iceboxes and new motors for their boats in exchange for a portion of the catch; a chain of small supermarkets to lower the cost of retailing food and a milk company were also set up.<sup>23</sup> The *Compañía de Fomento Venezolana* was formally dissolved in 1947, shortly after VBEC, the Venezuelan subsidiary of the Rockefeller International Basic Economy Corporation (IBEC) began its operation in Venezuela.

<sup>20</sup> Langham to Miller, 14 November, 1942, RFA, RAC, RG 1.1, Series 339D, Box 2, Folder 17. Unless indicated otherwise, all correspondence cited with regard to Langham is from this source.

<sup>21</sup> Ministerio de Agricultura y Cría, *Memorias* (various years).

<sup>22</sup> Miller Jr, South America: First Survey Trip, *op. cit.*

<sup>23</sup> Interview with Lawrence Levy by LGA, 27 January, 1948, RFA, RAC, GC 1948, Subseries 200 International Basic Economy Corporation, Folder 2759; Brochl Jr, *United States Business Performance Abroad: The Case Study of the International Basic Economy Corporation* (Washington, DC: National Planning Association, 1968).

Rockefeller's scheme seemed plausible because the population of Venezuela was so small, and also because the oil companies, with their enormous profits, could be tapped for large sums for this and another of his projects, the American International Association for Economic and Social Development (AIA).<sup>24</sup> His projects in Venezuela had at least as many failures as successes, and in the end a sizeable portion of the original investment was lost. They did however confer great prestige on the name of Rockefeller in Venezuela.

#### *A Young American Scientist in the Tropics*

As H.M. Miller revealed to H.A. Moe of the Guggenheim Foundation in February 1941, when the natural sciences division of the Rockefeller Foundation began to explore the possibility of establishing a new programme in Latin America, Venezuela, and Colombia, Ecuador and Peru, were "almost completely terra incognita" to North Americans in these subjects. The foundation therefore thought that it might discover worthy candidates for scholarships. After his visit in 1941 to Caracas, Miller reported that good progress in systematic botany had "been made for many years by a resident Swiss-American botanist [Henri Pittier] working under handicaps".<sup>25</sup> He found no other research in the natural sciences. However, he was truly enthusiastic about a young American from Cornell University, Derald Langham, who was working for the Venezuelan Ministry of Agriculture; in his view, Langham was making good progress in research on the genetics of corn and sesame.<sup>26</sup>

When Derald Langham arrived in Venezuela in 1939, he was still in his twenties, married, with one child. He had a doctorate from Cornell University where he had worked under Professor R.A. Emerson on corn breeding research; Emerson had received Rockefeller Foundation support. Herbert Whetzel, who had been Emerson's successor at Cornell and had directed a mission for the Venezuelan Ministry of Agriculture earlier in 1938, recommended Langham to the Venezuelan government for a position at the Agricultural Experiment Station in Caracas.<sup>27</sup> The abundance of funds available to the Venezuelan government since the late 1930s allowed it to spend freely on developing modern technical professions. It appointed foreign technicians on a scale which could not be achieved by other countries in the region.

Langham was one of these technicians. He was put in charge both of the research on grain genetics at the Agricultural Experiment Station and

<sup>24</sup> Cobbs, E.A., *The Rich Neighbour Policy: Rockefeller and Kaiser in Brazil* (New Haven and London: Yale University Press, 1992), p. 148; Dalrymple, M., *The AIA Story: Two Decades of International Cooperation* (New York: AIA, 1968).

<sup>25</sup> For a recent analysis of Pittier's contribution to Venezuelan botany, see Texera, Y., *La exploración botánica en Venezuela (1754-1950)* (Caracas: Fondo Editorial Acta Científica Venezolana, 1991).

<sup>26</sup> See Miller Jr, South America: First Survey Trip, *op. cit.*

<sup>27</sup> *Ibid.*

of teaching genetics at the new College of Agriculture founded by the Venezuelan government a year earlier. The pattern of close links between the station and the college was taken from the North American land-grant college. There were seven disciplinary sections in the experiment station—agricultural college complex: phytopathology and genetics, entomology and zoology, soils science, chemistry, zootechnics, agricultural engineering and minor industries. Because trained staff were scarce, several of these fields were left uncultivated for some time. The most scientific work was done in entomology under Professor Charles Ballou, who had a BSc from Cornell, in soils science under L. Eleizalde, a doctor in natural sciences from the University of Madrid, and in genetics under Langham.

When he arrived in Venezuela, Langham found that local customs were incompatible with scientific research. Regulations required that the grounds of the Agricultural Experiment Station be closed at 6 p.m., which prevented him from working at night in the genetics building. He was further hindered, both in planning experiments and in writing up their results, by the lack of a good library. The Ministry of Agriculture subscribed to many periodicals which were not received at the station, but although the ministry employed him, Langham was obstructed by the indifference of the library attendants and—so he thought—perhaps by some resentment towards a foreigner who made unusual requests. Instead of being allowed to consult periodicals when he visited the ministry, he was told to come back for them several days later. Another apparent obstacle was the unavailability of the minister of agriculture for discussions, despite the fact that Langham had to submit his proposals to the ministry for approval. Often, he found these proposals had been kept by a minor official who had not even submitted them to higher officials for consideration.<sup>28</sup> His equipment took a long time to arrive. The common answer to his inquiries and complaints was that the ministry “just can’t understand why it does not arrive”, although he guessed that the orders were probably lost among the papers on the mahogany desks.<sup>29</sup> As a result of his “competitive”, “aggressive”, “dynamic”, “American” attitude, contrasting with the easy-going, slow, “not-to-worry”, “let-it-go” attitude more common among Venezuelans, Langham probably faced some friction from the very beginning—as may be shown in his comment that “the other men at the station and others who know how slowly things move down here, cannot understand how I have been able to obtain so many concrete results in my work. The answer is that the only things I have accomplished were done with my own hands, working overtime and even many Sundays”.<sup>30</sup>

<sup>28</sup> *Ibid.*

<sup>29</sup> Langham to Miller Jr, 21 July, 1942, *op. cit.*

<sup>30</sup> *Ibid.*

Langham had received financial and personal support from the Rockefeller Foundation, through H.M. Miller Jr, ever since their first meeting in 1941.<sup>31</sup> Miller had requested information about Langham from teachers and colleagues in the United States before going to Venezuela. Initially Miller thought of him as a suitable member of the agricultural group for the work planned in Mexico. In selecting a corn specialist for the Mexican programme, the exploratory commission appointed by the foundation went to great lengths to find the best technologists available in the United States. In fact, the foundation continued to think of Langham as a valuable prospect for the Mexican programme until at least 1943, when E.C. Stakman reported that he seemed vital to progress in Venezuela; he doubted, even if Langham could be induced to go to Mexico, whether it would be wise to damage a valuable development in Venezuela merely to develop a project in Mexico.<sup>32</sup> Moreover, as Miller commented, the American ambassador in Venezuela was deeply interested in Langham’s work and would probably have protested to the Department of State had an American foundation tried to move him from Venezuela. In the years to 1950, Langham and Miller developed a cordial relationship, in which Miller showed a keen interest in helping agricultural science in Venezuela.

Langham also received personal support from the agricultural attaché of the United States embassy in Caracas, James H. Kempton, an influential figure in plant genetics and corn improvement in the second decade of the century who made his professional career at the United States Department of Agriculture.<sup>33</sup> Langham’s contacts with the American embassy, with the Rockefeller Foundation, with Nelson A. Rockefeller’s firms in Venezuela, and with Standard Oil and other weighty American interests in Venezuela, undoubtedly helped him in local agricultural circles.

#### *Grants and Fellowships Programmes of the Rockefeller Foundation*

Langham started to teach genetics as soon as he arrived in Venezuela. He taught both at the College of Agriculture and at the School of Practical Agriculture. In November 1942, he asked Miller about the possibility of a small grant in order to employ as apprentices in the department of genetics two young men soon to graduate from the college and four from the school.<sup>34</sup> A grant for US\$2,500 was made in January

<sup>31</sup> H.M. Miller Jr, Diary, 19–24 November, RFA, RAC, RG 1.1, Series 339D, Box 2, Folder 16.

<sup>32</sup> Stakman, E.C., Bradfield, R. and Mangelsdorf, P., *Campaigns against Hunger*, *op. cit.*  
<sup>33</sup> In 1911, with G.N. Collins, he studied the transmission and segregation of characters in a cross between American and Chinese corn, and how cross-breeding affected the size of corn seed. See Fitzgerald, D., *The Business of Breeding: Hybrid Corn in Illinois, 1890–1940* (Ithaca and London: Cornell University Press, 1990), p. 49; reviewed by Palladino, Paolo, in *Minerva*, XXIX (Winter 1991), pp. 506–515.

<sup>34</sup> Langham to Miller Jr, 14 November, 1942, *op. cit.*

1943. Fifteen additional students were selected to serve as apprentices in 1944, with a grant of US\$7,500 from the Rockefeller Foundation and a commitment by the Venezuelan government to provide an equivalent sum to be spent over a two-year period. The subsidy was designed to incorporate students into the life of the laboratory and thereby test their aptitudes for research. This type of support was given only to Langham's department, "in recognition of Dr. Langham's work in stimulating young men in genetics and plant breeding".<sup>35</sup>

In addition to this small subsidy for the discovery of new talents which might be turned towards research, the natural sciences programme of the Rockefeller Foundation was also interested in identifying fellowship candidates for further training in the United States. On his first visit to Venezuela, Miller had asked Langham to inform him of possible candidates for fellowships. Langham mentioned three students of the fifth-year class in the College of Agriculture, who were about to graduate in 1942. One of them, Carlos Rojas Gómez, became the first fellow of the natural sciences programme in 1943. He went to Ames for one year to study experimental statistics and genetics at Iowa State College under George Snedecor and E.W. Lindstrom.<sup>36</sup> On his return, Langham reported that Gómez had "not come back with the much feared know-all attitude. I am convinced that his knowledge of statistics is more than sufficient for our purpose".

Four fellowships were granted by the natural sciences programme from 1942 to 1949; all the recipients had been Langham's associates in the department of genetics and plant breeding.<sup>37</sup> The first and second fellowships went to two Venezuelan-born agronomists: one to Rojas Gómez, and the other to Rubén Ortega, a recent graduate who had already received a small grant from the Rockefeller Foundation for apprentices in Langham's genetics laboratory.<sup>38</sup> The third and fourth went to non-Venezuelan postdoctoral fellows who worked with Langham: the Europeans Werner Jaffé, who had received a doctorate from Zurich in biochemistry in 1939, and Issar Budowski, a chemical engineer from the University of Toulouse, with a degree granted in 1941. Jaffé went on to Wisconsin in 1946–47 to undertake special studies on nutrition and ferments with Elvehjem. Budowski worked on fat and oil biochemistry in the Southern Regional Research Laboratory of the United States Depart-

<sup>35</sup> *Ibid.*, 10 January, 1944; Miller Jr to Angel Biaggini [minister of agriculture], 17 April, 1944.

<sup>36</sup> Langham to Miller Jr, 2 May, 1944; Miller Jr to Langham, 11 May, 1944, *op. cit.*

<sup>37</sup> These four fellowships set a trend that became dominant after the Second World War, when Venezuelan government fellowships were mostly granted for study in the United States, whereas previously most agricultural fellows had gone to Argentina, Uruguay and France.

<sup>38</sup> In 1945, he received the second fellowship of the natural sciences programme to study genetics and plant breeding at Cornell; he obtained a master's degree two years later. Langham to Miller Jr, 24 April, 1945, *op. cit.*

ment of Agriculture in New Orleans, under Dr Markley. Both were judged to have done excellently. Jaffé was described by an official of the Rockefeller programme as the most outstanding scientist he had met in Venezuela, and Budowski was employed by the Weizmann Institute in Israel after leaving Venezuela in 1954. Miller described both men as so first class that he would be fully justified in recommending a grant for equipment and supplies for them, had the Venezuelan budgets not been so large already.<sup>39</sup>

By 1949, the natural sciences programme in Venezuela had waned. Miller saw no further opportunities deserving even token support. The foundation argued that Venezuela was a country with sufficient wealth to send its own fellows abroad. The Venezuelan agricultural budget for 1948 was so large—US\$20 million for a population of four million people, compared to Colombia's agricultural budget of \$5 million for a population of ten million—that the Rockefeller Foundation considered it unnecessary to grant any further fellowships to Venezuela. The natural sciences programme completely ignored Venezuela until the 1960s, when a number of fellowships were granted for training in Mexico or Colombia, through the Rockefeller Foundation's inter-American programmes.

#### *The Feud Between the Peritos and the Ingenieros*

Langham was drawn, quite unintentionally, into a bitter feud. His involvement began when he approached the Rockefeller Foundation to obtain small student assistantships for his laboratory. The conflict was over social status and arose because he accepted as assistants in his department not only university students from the College of Agriculture, but also pupils from the lower School of Practical Agriculture. The requirement for admission into the latter was simply completion of the sixth level of elementary school. Its diploma of *perito agrícola* was awarded after a three-year course of study which was much more practical than theoretical. On the other hand, the College of Agriculture required the high school diploma of *bachiller* and the programme covered five years of study, which became more theoretical with each succeeding year. The lower-status *peritos*, who were much more numerous than the higher-status *ingenieros agrónomos*, had a club and association of their own in Caracas. They were looked down on by the agronomical engineers.<sup>40</sup>

Each group was very self-conscious about its status and contended that it had received the most appropriate training for the profession of

<sup>39</sup> Fellows' Recorder Cards, Medical/Natural Sciences, RFA, RAC; JJM, Diary, 1–3 November, 1954; Miller Jr, Diary, 18 August, 1949, *op. cit.*

<sup>40</sup> Miller Jr, Diaries, 21–25 November, 1946, *op. cit.* The word "*perito*" could cause confusion; the usual translation, "expert", does not apply to the kind of empirical, unsophisticated training *peritos* received.

agronomist. The *ingenieros* argued that a theoretical training was the best, the *peritos* that a practical training was superior. The former were able to establish a claim to superiority which the latter acknowledged, although resentfully. The *peritos* had outstanding proponents such as Augusto Bonazzi, an Italian-American agronomist who was the first director of the college; Amenodoro Rangel Lanus, minister of agriculture in the first post-Gómez government; and Henri Pittier, the Swiss-American botanist who had settled in Venezuela. Langham was associated with this viewpoint, which represented something like the ideal of the land-grant college. But in the College of Agriculture those who favoured a more theoretical—some critics spoke of “bookish”—orientation got the upper hand.<sup>41</sup>

The disposition to disregard the practical problems of agriculture in the tropics became more marked as the tensions between university teachers and public sector officials grew more acute in the second half of the 1940s.<sup>42</sup> The functional separation between the experiment station on the one side and the agricultural and veterinary colleges on the other, fostered by the Education Law of 1940, was reinforced by the transfer, between 1946 and 1951, of the two colleges to a university campus in the city of Maracay, 100 km from Caracas. Raised to the status of faculties of the Central University—Universidad Central de Venezuela—in 1946, in both a certain “academicist” style of organisation came to prevail, although they continued to depend administratively on the ministry until 1948.

The conflict about status did not end there, particularly since after October 1945 a *coup d'état* brought to power a new political party, Acción Democrática. The new profession of agronomical engineering gained political power in their control of the Ministry of Agriculture. A young agronomist, Eduardo Mendoza, was appointed minister of agriculture. He and the members of his cabinet were all graduates of the College of Agriculture, and with only one exception had been Langham's students or assistants, or both. In their administrative positions at the ministry, the new agronomical engineers confronted the acute problem of lack of trained staff. They realised that it was relatively simple to draw up a good research or extension project, but quite another to put it into action when qualified persons were lacking. Time was needed to produce the kind of men needed in sufficient quantity.<sup>43</sup>

However, in Venezuelan society, a higher education diploma was viewed as more important for social status than as evidence of qualifica-

tion for performing a technical task. The stress on social status led to the creation of a doctorate in agricultural engineering and veterinary medicine for the graduates of the Central University during the second half of the 1940s, without the presentation of a doctoral dissertation, without graduate studies or anything involving training at a level higher than that corresponding to a professional degree. This experiment was abandoned after a few years.<sup>44</sup> A society of agronomical engineers—the Sociedad de Ingenieros Agrónomos—was also founded as a chapter of the powerful national engineers' association, the Colegio de Ingenieros. Competition for technical positions at the Ministry of Agriculture became harsh. *Peritos*, some of whom were very able, were prevented by the agricultural engineers from occupying positions of technical responsibility at the ministry.

Langham had become a victim of the agricultural engineers' concern with asserting their superiority to the *peritos*. He had collaborated too closely with some of his former students from the School of Practical Agriculture. In 1947 he explained the situation to H.H. Hume, dean of the College of Agriculture in Gainesville, Florida: in working with several hundred of these boys, Langham said that he had found some who were especially good.<sup>45</sup> Two in particular, Máximo Rodríguez and Eduardo Chollet, who came from poor families in regions with practically no educational facilities, were, in his view, capable of gaining a doctorate at any university. They had worked with him for four years. One was his co-author on a number of publications and was head of Langham's team which did the work on oil crops; the other was doing an excellent job as head of the work on rice. In view of the conflict between the two groups of agricultural technicians, Langham asked Hume if, because of their exceptional qualities and despite their lack of a Venezuelan high school certificate, his collaborators could be allowed to enrol for a bachelor's degree in an agricultural college in the United States.

In Langham's version of the story, while he was on holiday in the United States in January 1947, two members of the department of genetics decided to take control of the department. Langham argued that the agricultural engineers resented his close association with the *peritos* and the teaching responsibilities he gave them in the department. Kempton, who had followed Langham's career in Venezuela closely, told Miller in a confidential letter that the engineers “managed to get the idea propagated that Langham was afraid of the competition of Venezuelan experts, and so surrounded himself with *peritos*”.<sup>46</sup>

Complaints against Langham reached the government, apparently through prominent members of the ministry who had all, in one way or

<sup>41</sup> Pacheco, J.G., “Historia de la Facultad de Agronomía de la Universidad Central de Venezuela”, mimeograph (Maracay: Instituto de Economía Agrícola, 1988).

<sup>42</sup> Langham to H.H. Hume, 1 April, 1947, *op. cit.*

<sup>43</sup> Kempton to Miller Jr, 8 April, 1947, *op. cit.*

<sup>41</sup> See Arvanitis, R. and Bardini, T., “El papel del ingeniero agrónomo en el contexto político de la agricultura venezolana”, in Freites, Y. and Texera, Y. (eds), *Tiempos de cambio: La ciencia en Venezuela 1936-1948* (Caracas: Fondo Editorial Acta Científica Venezolana, 1992), esp. p. 161.

<sup>42</sup> Arvanitis, R., “De la recherche au développement: Les politiques et pratiques professionnelles de la recherche appliquée au Vénézuéla”, doctoral thesis, Université Paris VII, 1990.

<sup>43</sup> Langham to Miller Jr, 19 November, 1945, *op. cit.*





in observation plots in three experiment stations. The yellow corn variety from Cuba was the most successful.<sup>53</sup> With all this heterogeneous material as a starting point, a programme of inbreeding was set in place to achieve pure lines. Mass selection, although it was the oldest method of selection, occupied an important place in Langham's improvement programme, leading to his achievement of Venezuela-1 variety, produced almost directly by mass selection of the Cuban yellow type.<sup>54</sup>

In 1941, the first large-scale hybridisations were carried out. The hybrids obtained were simple—or simple crosses—and double—or double crosses; the first were obtained by the crossing of two pure lines and the second by the crossing of two simple hybrids. The yields of both types were practically the same, but the second had the advantage that the seed to be distributed among farmers could be obtained in larger amounts. This was particularly important in view of the absence of private seed-producing firms. The programme of hybridisation had to be carried out by the government, which was the only agent with the capacity to distribute seed to farmers in a wide scale. However, this fact and the widespread acceptance by producers of the yellow Venezuela-1 and white Venezuela-3 corn varieties, were given as reasons for not distributing the new hybrids, despite the supposedly higher yields obtained. Work had been under way since 1939 on the production of synthetic hybrids, but the process was very slow and by the mid-1940s no results were in view.

Langham also worked on sesame, a plant neglected by geneticists and other agricultural scientists. He obtained seeds from China, India, Mexico, Brazil and elsewhere. On planting these seeds, he found a wealth of material for genetic studies. For several years, Langham accumulated considerable data on the inheritance of some of the characteristics of sesame and became one of the outstanding international specialists. Quite by chance, he found a single plant which served as the departure for his breeding experiments. Most sesames have single pods containing four rows of seeds, but Langham had developed genetically a variety with three pods at a given level on the stalk, each containing eight rows of seeds. On genetic analysis, these were found to be double recessives. Artificial pollination of sesame and hybridisation work provided a rich base for selecting individual plants and groups of plants. The list of selections made in the first five years of work was very extensive; some of the practical results were the development of promising varieties such as Venezuela-52, and the achievement of outstanding plants for future

<sup>53</sup> In 1938, the Venezuelan Ministry of Agriculture sent Dr R. Pinto Salvatierra to Cuba to obtain seeds from different corn varieties. Research, begun in Cuba in 1936, resulted in several high-yielding varieties; during the Second World War, the United States Office of Foreign Agricultural Relations selected these for distribution throughout Latin America. Langham, D. *et al.*, *El ajonjolí*, *op. cit.*; Martínez Viera, R., *70 años de la Estación Experimental Agronómica de Santiago de las Vegas* (Havana: Academia de Ciencias, 1977).

<sup>54</sup> Langham, D. *et al.*, *El ajonjolí*, *op. cit.*

hybridisation work and for genetic studies on the mode of inheritance of characteristics.

Publicity in the local press—and even in *The New York Times*—about the new types of sesame and corn adapted to Venezuelan conditions, aroused local interest in genetics. The interest was however limited. For example, at a field demonstration of sesame and maize at Maracay in November 1942, at which at least 200 persons were expected, only four farmers appeared and not a single official from the Ministry of Agriculture.<sup>55</sup> Nonetheless, the section of genetics at the Agricultural Experiment Station was rapidly made into a separate department with Langham at its head with a larger budget. From 1942 to 1945, the annual reports of the Ministry of Agriculture showed that each year the department doubled or trebled its budget and its research compared with the previous year.

For his work in the early 1940s, Langham had at his disposal a small building some distance from the main experiment station in Caracas, field-plots in the region, and the use of as many as he needed of the 100 hectares of the agricultural land at Maracay Station, some 75 km by rail from Caracas at an altitude of 500 metres. In his work on seed improvement, Langham relied on the assistance of *peritos* for corn, sesame and rice. University assistants worked on potatoes, tartagum and corn. Carlos Rojas Gómez, the first Rockefeller Foundation fellow, on his return from Iowa State College was put in charge of the work on experimental statistics.

By 1943, with the arrival of another geneticist from Cornell, Dr F.A. Weaver, the range of crops studied in the department broadened further. Weaver undertook work on cotton and rice, with the help of a student; research on forage crops was also started in 1943 by Langham's new assistant Eduardo Mendoza, who later became minister of agriculture, and who had just returned from a fellowship at La Plata University in Argentina. From 1944, in view of the importance of the department of genetics, the Gonzalito Experiment Station near Maracay was refurbished in order to concentrate there all Langham's research work on genetics. A large hacienda building was reconstructed to provide laboratories, adequate seed and drying equipment, refrigeration, storage facilities, etc. It turned out not to be too large, in spite of its size, for Langham's expanding programme and staff. The budget of the department of genetics was over US\$275,000 a year, a substantial sum for an agricultural laboratory at the time.

Langham was the first agricultural professional in Venezuela to work in the field, selecting seeds and varieties and engaging in sowing experiments. He was also a pioneer in spreading the modern practice of research among his students.<sup>56</sup> In his introduction to Langham's book on

<sup>55</sup> Kempton to Miller Jr, 11 November, 1942, *op. cit.*

<sup>56</sup> C. Rojas Gomez, personal communication.

sesame. Tobias Lasser, a Venezuelan botanist trained under Henri Pittier, acknowledged that before Langham, phytotechnical methods with genetic criteria were not applied in Venezuela; he insisted that Langham ought to be considered the pioneer of phytotechnology there.

It eventually became obvious to Langham that the work in genetics needed to be accompanied by similar studies in chemistry, pathology, entomology and other specialties. Around 1945, he proposed a broad programme to the Rockefeller Foundation. The same year he admitted that he had not yet started to work with sesame wild types and near relatives.<sup>57</sup> He added to his department two very good foreign scientists from the Ministry of Agriculture—Dr Issar Budowski, on a full-time basis, and Dr Werner Jaffé, on part time—and soon began to consider working with them as a joint team on the biochemistry and genetics of sesame. Among Langham's projects was an institute for the investigation of tropical oil crops, which would be divided into three parts: fundamental research, production and exploitation. He expected to be financed by the Ministry of Agriculture, the Corporación Venezolana de Fomento and the Rockefeller International Basic Economy Corporation. He is said to have had the informal backing of Kempton, from the American embassy in Caracas, and also of the head of the American Oil Mission, Dr Markley, from the fats and oils regional laboratory of the United States Department of Agriculture in Louisiana. Dr Robert Russell, from the International Basic Economy Corporation, was also said to like the project and to be helpful. However, Langham commented that there was confusion regarding the Rockefeller name. It seems that the corporations had some difficulty in joining the project, particularly because since they were both profit and non-profit bodies, it was not known which, if either, would contribute to the fundamental investigation.<sup>58</sup>

Russell consulted the officials of the Rockefeller Foundation's natural sciences division.<sup>59</sup> Immediately afterwards, the foundation prepared a brief internal report on Nelson Rockefeller's corporations, which then were limited to Venezuela and Brazil—IBEC and AIA. Warren Weaver, head of the natural sciences division, said that the questions posed by Russell required more technical understanding of the Venezuelan economy than the officials of the division possessed. He suggested that Russell consult Kempton as someone not only intimately acquainted with Langham, and with the country and its agricultural problems as a result of extensive travel, but also because he combined a scientific approach with hard-headed judgement of individuals and of the economics of agriculture.<sup>60</sup>

<sup>57</sup> Langham to Miller Jr, 1 May, 1945, *op. cit.*

<sup>58</sup> *Ibid.*, 23 February, 1948.

<sup>59</sup> 23 January, 1948, RFA. RAC. RG 2, Series GC, Folder 2759.

<sup>60</sup> Weaver to R. P. Russell, 28 January, 1948, Sub-series 200 International Basic Economy Corporation, *ibid.*

By this time, Miller thought that the only reason why the natural sciences division might not make a grant was the fact that all the principals in Langham's project would be foreigners: North Americans—Langham, and Samuel Streb, a soils and agricultural engineer who would be on a salary from the American International Association—a naturalised Venezuelan (Jaffé), and another foreigner, Budowski, who was in the process of becoming naturalised. The only native Venezuelan was the *perito* Maximo Rodriguez, who was "not in the exalted class of Ingenieros Agronomos".<sup>61</sup> Miller believed that a grant to the project would mean placing Langham and the others in a vulnerable position.

#### *An Unexpected Arrival from the South*

At the beginning of 1946, Langham was enthusiastic. He wrote to Miller that he expected to have a record year, "looking forward to the best year of our existence".<sup>62</sup> But when he asked permission to go to Africa to collect wild sesame and to pick up seed for other crops along the way, his request was refused. This is perhaps the first sign that there was a "change of mind of [Langham's] superiors" at the Ministry of Agriculture.<sup>63</sup> Although for a while, he seemed to keep things under control, his situation at the ministry and at the faculty of agronomy was already impaired. By April 1947 his position had deteriorated considerably. Salomon Horowitz, the "corn man" from Argentina who was acknowledged among specialists in Latin America and the United States as one of the most serious research workers on corn in the region, arrived in Venezuela. He had recently been dismissed as dean of the faculty of agronomy of the University of Buenos Aires as a result of political disagreements with governmental authorities; he had come to Venezuela at the invitation of his former student, the minister of agriculture, Eduardo Mendoza. Horowitz joined Langham's critics. As stated by Kempton, Horowitz "filed charges claiming Langham to be a charlatan and a disgrace to Venezuela. This last he bore down hard on, as he knows an Achilles' heel when he sees one..."<sup>64</sup>

Mendoza appointed an investigating committee which included Horowitz to report on Langham's work. Kempton was informed by Langham's new American assistant, Charles Breitenbach, who had just arrived in the country, that the report would describe Langham's work as a failure, and would suggest cancelling his contract or reducing his appropriation and putting him under a board of control; the chief member of the board was to be Horowitz, whose opinion was taken very seriously by Venezuelan officials. Ironically, Horowitz had also been a

<sup>61</sup> Miller Jr to Langham, 19 August, 1949, *op. cit.*

<sup>62</sup> Langham to Miller Jr, 18 February, 1946, *op. cit.*

<sup>63</sup> *Ibid.*, 22 August and 15 December, 1946.

<sup>64</sup> Kempton to Miller Jr, 29 August, 1947, *op. cit.*

student of Emerson at Cornell, as the first Guggenheim fellow from Argentina, and Miller's references to him when the natural sciences division's programme in Latin America started in 1941 were very good. On 8-9 April, 1941, he interviewed Emerson who said that Horowitz was "really good", and in the same conversation mentioned Langham at Caracas as being "excellent".<sup>65</sup> Kempton admitted that: "Langham, of course, [was] over-extended. No one man could carry on all the work he has started and the corn work suffered from some bad guesses on assistants. In my opinion Langham has done the correct thing. He has established two good corn varieties and in normal years Venezuela is self-sufficient in corn. Having done this he has put his main effort on sesame, and Venezuela normally imports half of its vegetable oil needs."<sup>66</sup>

In October 1947, H.M. Miller Jr and Warren Weaver, the director of the natural sciences division, visited Venezuela. Before they returned to the United States they had a discussion with the minister of agriculture, Mendoza. At the airport, on departure, they had a disagreeable encounter with Horowitz. Apparently Horowitz attacked Langham, asking Miller whether he knew how bad Langham's work on corn was, and accusing Langham of being an unscrupulous liar. After mentioning the considerable contribution of Langham to the training of Venezuelan research workers, Miller suggested in a letter to Mendoza that they:

obtain the most expert advice in the field, from a person or persons of recognised world leadership in genetics and plant breeding. [He] cite[d] the names of five men of distinction and highest personal integrity, and . . . purposely omitted from the list professors at Cornell and at Iowa because of the fact that Dr. Langham was a student at those institutions:

- Prof. Paul C. Mangelsdorf, Harvard University
- " R.A. Brink, University of Wisconsin
- " M.M. Rhoades, Columbia University
- " L.J. Stadler, University of Missouri
- " H.K. Hayes, University of Minnesota<sup>67</sup>

Before acting on Horowitz's charge, Miller urged that such a step be taken so that "the true value of the work be established by an expert of very high scientific and personal reputation, and (equally important) . . . by a man who has no possible personal interest in the decision".<sup>68</sup>

Kempton was not convinced of the usefulness of this step in view of the way things functioned in Venezuela and the complexity of the matters to be assessed. Kempton wrote:

The background of Langham's operations cannot be encompassed in a month or two. If he had to stand on his corn work alone, he would be vulnerable and of the

<sup>65</sup> Information on Latin American scientists by North Americans qualified to give information and advice, Miller Jr, Supplement to his Diary, *op. cit.*

<sup>66</sup> Kempton to Miller Jr, 29 August, 1947, *op. cit.*

<sup>67</sup> Although I have not found the letter Miller wrote to Mendoza on his return to New York, I did find a draft letter sent to Kempton for advice, as well as Kempton's remarks on it. Miller Jr, draft letter to E. Mendoza, 16 October, 1947; Miller Jr to Kempton, 28 October 1947; Kempton to Miller Jr, 3 November, 1947, *op. cit.*

<sup>68</sup> Miller Jr, draft letter to E. Mendoza, 16 October, 1947, *op. cit.*

group you [i.e. Miller] have in mind only Hayes and Brink have ever had to work with more than one crop. Actually these men have only worked, shall we say, with a limited phase of one crop whereas Langham has had to spread himself, not only over the cornfield but over other crops as well. There is also a vast difference in technical aides that won't be immediately apparent to the U.S. investigators. I am not questioning the objectivity and sincerity of the men you suggest. Given time to study the situation they could evaluate Langham's work fairly, but the situation here is so foreign to the experience of any of them that it will take careful briefing to get them to view Langham's accomplishments within the proper frame. Between us, also we must recognise that the Anglo-Saxon idea of objective fairness is not honoured hereabouts. If you cannot endorse a man 110 percent you are in fact condemning him. My criticisms, or rather differences of opinions, as to Mangelsdorf's work would lose him his job here but does not shake his security at Harvard.<sup>69</sup>

Things seemed to become quiet in Caracas, although the experienced Kempton remained cautious. He argued that Langham's chief danger came from the thoroughness with which he had committed himself to life in Venezuela. It was only human, Kempton thought, for the Venezuelans to conclude that Langham intended to remain at all costs.<sup>70</sup> Kempton feared this might mean that the ministry would reduce Langham's pay when his contract expired shortly. The ministry had repeatedly offered Langham a five-year contract which he had just as repeatedly refused. So far, he had gained by insisting on short-term appointments, but Kempton thought he should now accept a contract for a longer period. His contract was indeed renewed for five years, but Langham's difficulties did not diminish. According to Kempton, the number of Venezuelans whom he had helped, and who had subsequently turned against him and were "plotting his eventual downfall", had mounted.<sup>71</sup>

For a while, despite changes in government, Langham continued to enjoy support at the ministry. In 1949, he was appointed head of the joint department of genetics and agronomy and proceeded to discharge "the incompetent" members of the department of agronomy, thwarted a strike against him by the rest, and acquired additional enemies.<sup>72</sup> Langham said that the minister wanted him to become director of the large polytechnic institute under construction in Maracay, but he was aware how vulnerable he would be in such a position and did not accept. He decided to retreat to the headship of a newly created section of oil crops, and to devote himself entirely to research. He continued to insist on a much more modest version of the project for the tropical oil crops research institute. But Miller worried that Langham's position was very damaged. In the meantime, before making any decision, Mangelsdorf would be consulted.<sup>73</sup>

<sup>69</sup> Kempton to Miller Jr, 3 November, 1947, *op. cit.*

<sup>70</sup> *Ibid.*, 20 January, 1948.

<sup>71</sup> *Ibid.*

<sup>72</sup> Interview with Langham in Maracay. Miller Jr, Diary, 18 August, 1949, *op. cit.*

<sup>73</sup> *Ibid.*

Mangelsdorf's comments were negative. He was inclined to think that Langham's usefulness in Venezuela was at an end:

During his ten years, or almost ten years, in Venezuela, he has never developed a single synthetic variety of corn or a true hybrid corn. The two varieties which he has distributed, Venezuela No. 1 and Venezuela No. 2, have never been demonstrated to my satisfaction to be superior to the varieties already being grown in Venezuela. Most of Langham's time and effort have been devoted to the genetics of sesame. I have never been convinced that sesame is the most promising oil crop for Venezuela. Certainly I regard it as a serious mistake for Langham to have neglected other oil crops, especially the soybean. A commentary on Langham's objectiveness in this matter is furnished by a statement made to Dr. Bradfield and me on our visit to Venezuela in 1948 that it is "considered heresy to speak of the soybean in Langham's department".<sup>74</sup>

Langham's preference for sesame does not seem to have been as arbitrary as Mangelsdorf's comment might imply. He had always maintained that while soybean entailed the introduction of a new crop, sesame was already grown locally. He argued that soybean did not present genetic problems so much as environmental ones, while sesame had ample scope for genetic improvement, being more primitive. Besides, Venezuelan peasants did not understand the problems of soybean while they were successfully producing sesame.

However, Mangelsdorf mentioned another element which so far had not appeared in Miller's documentation, although it emerged frequently in the interviews with local agronomists. Mangelsdorf said he had learnt that:

Langham actually devoted very little time to his research, being more interested in his dairy, truck farm, and various other real estate investments. He gave practically no direction to members of his staff. On the other hand, when a member of the staff showed evidence of accomplishing something and coming into public attention as a result of doing so, Langham took steps either to submerge or to remove him.<sup>75</sup>

Mangelsdorf ended by saying that he was convinced that Langham had not made the most of his opportunities in Venezuela. He thought his accomplishments were not to be compared with those of Wellhausen in Mexico and were scarcely equal to Brieger's in Brazil.

In December 1949, Langham received notice that his contract was terminated three and a half years before it was expected to expire, on a technical clause which permitted this action without recompense.<sup>76</sup> Maladministration was charged, based on a loss of a few thousand bolívares on one class of seed, although, according to Kempton, the seed service as a whole showed a handsome profit. In fact, in Kempton's view, the ministry would have been on sounder ground using this profit as the evidence of maladministration because the seed service was supposed to

operate at cost!<sup>77</sup> On 10 May, 1950, Langham wrote again to Miller that all installations, projects and persons linked to his work in genetics in Venezuela had been "wiped out with one fair swoop".<sup>78</sup>

Although both Kempton and Miller tried to find alternative employment for Langham in other countries—they thought he was losing face the longer he stayed in Venezuela—he refused several offers and stayed on for a while, working for the local Phelps Syndicate in the sale of tractors and fertiliser.<sup>79</sup> In April 1950 Kempton reported that Langham seemed "contented and he [might] turn out to be a wealthy expatriate".<sup>80</sup>

Langham's Venezuelan story from the point of view of agricultural science ends here. Horowitz took over the department of genetics, where his influential presence in the faculty of agronomy over the next decade resulted in what is often considered the consolidation of local plant genetics. He was the founding editor of *Agronomía Tropical* and in 1964 was awarded the Interamerican Agricultural Medal at the suggestion of the Venezuelan government.<sup>81</sup> Meanwhile, Langham fell into oblivion.

### Discussion

What can be concluded from this particular case-study for the understanding of the early stages in establishing scientific research in a developing country?

*The strategy and tactics of the Rockefeller Foundation:* It has been repeatedly said that the overseas programmes of the philanthropic foundations complemented to a significant degree the foreign policies of the United States government. The Rockefeller Foundation was closely associated with the United States Department of Agriculture and Department of State. At the same time, when in 1948 the Rockefeller International Basic Economy Corporation and the Corporación de Fomento Venezolana expressed interest in the development of sesame in Venezuela, high officials of the foundation became upset at the possibility that Nelson Rockefeller's commercial endeavours and the foundation could be confused in Latin American eyes. In the Venezuelan case, the

<sup>77</sup> Kempton to Miller Jr, 13 December, 1949, *op. cit.*

<sup>78</sup> Langham to Miller Jr, 10 May, 1950, *op. cit.*

<sup>79</sup> Kempton to Miller Jr, 15 December, 1949; Langham to Miller Jr, 21 February, 1950; Kempton to Miller Jr, *op. cit.*

<sup>80</sup> Kempton to Miller Jr, 28 April, 1950, RFA, RAC, RG 2, GC 1950, Series 100 Diplomatic Services, Folder 3150. Later, Langham worked as a landscape architect and organised a "sesame foundation" to promote the improvement of sesame, its production and use as a basic food. At the end of the 1950s, he returned to the United States and started a firm, the Sesaco Corporation. For an obituary, see Mazzani, B., "In Memoriam Dr. Derald G. Langham", *Agronomía Tropical*, XLI, Nos 1-2, pp. 111-112.

<sup>81</sup> For an analysis of Horowitz's contribution to genetics research in Venezuela, see Vessuri, H., "The Argentine 'Corn-Man' in Venezuela: Salomon Horowitz and the *Agronomía Tropical* Project", paper presented at the symposium, "The Military Decade: 1948-1958. New Perspectives for its Study", Caracas, National Convention AsoVAC, 1992.

<sup>74</sup> Mangelsdorf to Miller Jr, 24 October, 1949, *op. cit.*

<sup>75</sup> *Ibid.*

<sup>76</sup> Langham to Miller Jr, 13 December, 1949, *op. cit.*

dividing lines between the subsidy by the Rockefeller Foundation's natural sciences division to Langham and the interests of the Rockefeller family were blurred; the substantial presence of Standard Oil and of Nelson Rockefeller's other companies had led to this blurring of the lines between the family and the foundation. The criticisms were not necessarily well based. They did, however, express nationalistic suspicions of a famous American capitalistic family, and these suspicions were extended to the Rockefeller Foundation itself, which was a separate and independent institution. The irrationality of these suspicions is evident in the fact that Langham was not an employee of the Rockefeller Foundation.

There was also an unusual feature of the foundation's support for Langham which rendered his position anomalous. In Venezuela, the Rockefeller Foundation's programme for the natural sciences departed from its usual practice in Latin America by supporting a North American scientist. Two of the four fellows on the Venezuelan programme were foreigners living in the country. The foundation usually gave preference to scientists of local origin; foreign scientists were brought in as consultants, advisers and teachers. In the case of Venezuela, the work of the North American Langham received significant coverage in the local press, at a time when the modernisation of agriculture was considered an important governmental priority. This surprised even the officials of the Rockefeller Foundation, who preferred American nationals working with their support in Latin America to be less prominent.

Conditions in Venezuela in the 1940s were unusual. The country was very rich, but highly unstable politically. As described by Warren Weaver, agricultural officials were under tremendous pressure to increase production, but were not well trained, did not trust their own judgement, committed vast sums, and then changed their minds. They had boundless confidence in the Rockefeller Foundation and were determined that it stay by them for counsel, moral support and stability.<sup>82</sup> At the same time, they were deeply distrustful of an imperialistic institution seeking to gain control over Venezuela.

The moral support of the Rockefeller Foundation for Langham was continuous, close and substantial over ten years; it would probably have continued had political circumstances not forced the abrupt conclusion of its subsidy to him. However, the financial support he received from the foundation was meagre; it never surpassed 6 per cent of the budget of the department of genetics, because Langham's budget from the Venezuelan government was considerable, even by international standards.

The subsidy Langham received from the Rockefeller Foundation, small though it was, aggravated the growing conflict between the technicians of low status and the agronomical engineers of high status—the conflict

<sup>82</sup> W. Weaver. Report on Travel to Venezuela, 16 October, 1947, RFA, RAC, RG 1.1, Series 339D, Box 2, Folder 19.

which had begun in the College of Agriculture between students from the low-level technical schools and those with superior qualifications for the work as Langham's laboratory assistants. The foundation was unaware of the bitterness of the conflict between the two groups competing within the same department for the same scholarships.

By the end of the Rockefeller Foundation's ten years of support of the genetics group, the outcome appeared to the foundation as a wasted effort. Reflecting, in 1950, on the Venezuelan experience, Miller was interested to learn whether the fourth foundation fellow from Venezuela, Budowski, had a decent appointment and an opportunity to do research in Venezuela—or whether the foundation would have “to add a fourth ‘zero’ to record out of four fellowship attempts. No other country has anything like the same score. In fact Brazil has a 100 per cent result, with considerably larger numbers, on the positive side”.<sup>83</sup> As a consequence, in the 1950s even trips by foundation officials to monitor changes and progress in the country were made only sporadically. Not until the 1960s was activity, on a very modest scale, re-established in Venezuela. For an entire decade after the end of the 1940s, Venezuela remained at the margins of the natural sciences programme of the Rockefeller Foundation in Latin America.

But the actions of the foundation cannot be understood independently of the scientist whom they supported.

*The position of the foreign scientist vis-à-vis local scientific circles:* In his early years in Venezuela, Langham, appointed by the Venezuelan government as an individual, acted as a free agent, working for a salary from the host country. But he soon became aware of the possibility of making fruitful alliances with powerful persons and institutions from his own country, and his role became that of a middleman between donor and recipients. He was regarded by Venezuelans as a foreigner who failed to fulfil his obligations to local needs. At the same time, he became isolated from scientists in the United States, because of his independent commitment to the promotion of agricultural research in Venezuela. After the initial promise of his Venezuelan research, which was generally esteemed, he was attacked as an “opportunist” by rivals and by those who disapproved of his generosity towards students of humble origin, and of his profitable activities outside his official positions in the university and ministry. He had lost living intellectual contact with American scientists, who viewed him as someone who had “gone native” in Venezuela. But in Venezuela he was attacked as an agent of the United States.

*Research or teaching?* In an underdeveloped country without a scientific tradition, very often the individual scientist finds himself in a personal

<sup>83</sup> Miller Jr to Langham, 17 May, 1950.

dilemma between doing research—which involves building a laboratory, creating a substantive bibliography and trying to associate himself with an international group of colleagues—or providing for the scientific education of younger persons and awakening a vocation for scientific research in them.

Although Langham continued his basic research for a while, attending congresses and retaining connections with American laboratories, he decided to give precedence to training Venezuelan students, and to improving the scientific level of the country where he worked. His double affiliation to the Ministry of Agriculture's Experiment Station and to the College of Agriculture helped him to do this. He also accepted in his laboratory young persons from the School of Practical Agriculture who were willing to learn and work with him, although they had unfavourable educational and social backgrounds. In doing this he violated the rules of the local social hierarchy.

*Science or technology?* A third dilemma has to do with whether research should be basic or applied. In Venezuela, the model for agricultural research initially adopted, in general terms, was that of the land-grant college. But there were several limitations on its full application. The research carried out in the United States land-grant colleges achieved a national impact primarily through the work of the far-flung system of state agricultural experiment stations, and the country agents of the Department of Agriculture. A single land-grant institution could not be expected to furnish the agricultural, scientific and technological knowledge needed in a backward society to cover all the functions handled in the United States by the state experiment stations, the Department of Agriculture and private enterprise.<sup>84</sup>

As early as 1909 the Carnegie Foundation had reported negatively on the land-grant colleges of the United States. It was clear then—and even clearer in Venezuela in the 1940s—that agricultural knowledge was not a unified, coherent subject and that it had to respond to larger scientific trends. Not all research was appropriate for practical applications, nor were all farmers' needs worthy of research. Yet the system was designed as if all these factors were compatible. Furthermore, in Venezuela the scarcity of qualified scientists meant that responsibility for a whole range of research was left in the hands of one person. Langham's coverage of so large a number of crops is not exceptional in backward societies. Even if a scientist has a sizeable number of not wholly qualified subordinates, no one individual, no matter how competent, can provide inspiring leadership over such a wide range of research.

Furthermore, Langham's view of teaching seems to have corresponded to the practical philosophy of the land-grant college, linked more to

production than to theory. His views were probably reinforced in the Venezuelan circumstances in which he found himself, and he relied on able *peritos* to carry out his field programmes. At a certain point, some of his former students who thought that work in the College of Agriculture should be more "academic", accused him of being insufficiently "scientific".

One question here is whether someone as experienced as H.M. Miller Jr—who had previously been in charge of the administration of European fellowships in the Rockefeller Foundation's office in Paris for over ten years<sup>85</sup>—would have made such a gross overestimation of Langham's scientific merit. It appears that Langham's attitude was out of harmony with the desire of certain circles in Venezuela to gain the renown of science for themselves and their country. They did not esteem technological or practical achievement. They wanted the dignity of science. Langham's practical interests and his use of the services of persons of lower class origins were very distasteful to them.

An agricultural science such as plant breeding is a:

. . . different discipline from genetics, not because it is less scientific but because of the more visible uses to which it is put. During the first third of this century, plant breeders and geneticists received virtually the same training, often at the same schools, and most shared a common set of skills, procedures and professional knowledge. What made them different were their agendas: geneticists focused on explicating the mechanisms of heredity for the use of other geneticists, while plant breeders focused on the same thing but for the use of farmers. . . Their responsibility to a farm clientele determined the sort of questions plant breeders asked and the sort of solutions they sought.<sup>86</sup>

Langham started his professional career as a geneticist, but in Venezuela he became a plant-breeder. Horowitz, although he insisted in being called an engineer in order to emphasise the technical nature of his skill, was regarded in Venezuela as a geneticist and a scientist.

*Public good or private profit?* When starting a scientific research programme in an underdeveloped country, one issue is whether to pursue scientific knowledge for its own sake, or for the sake of the practical benefit to society, or in order to gain private profit. When there is a scarcity of trained persons, technical capability is at a premium. Although an academic scientist has traditionally been expected to choose the course of the full-time appointment in a university or research institute, practical good or private profit are other alternatives. Often these turn out to mean a growing estrangement from the academic ethic. This, we may infer from the comments of Mangelsdorf and others, seems to have been Langham's choice at a time when money was in ample supply and Venezuela had more than a small resemblance to California during the gold rush of an

<sup>84</sup> Moseman, A.H., "Research Systems", in Blase, M.G., *Institutions in Agricultural Development* (Ames: Iowa State University Press, 1968).

<sup>85</sup> RFA, RAC, Biography Files.

<sup>86</sup> Fitzgerald, D., *The Business of Breeding*, *op. cit.*, p. 2.

earlier day. There is no firm evidence of this. The rumour served however to discredit him.

### Conclusion

Langham's ultimate defeat in Venezuela was the outcome of a number of forces. For one thing, he was placed in a vulnerable position as a foreigner from a powerful country distrusted by Venezuelans at a time of growing nationalism and anti-Americanism. This was aggravated by the fact that his principal foreign patron was the Rockefeller Foundation, which was vaguely assumed to be the agent of United States government and American capitalism. Rockefeller business interests were different from those of the Rockefeller Foundation, but they were amalgamated in the minds of nationalistic Venezuelans.

On top of this, Langham weakened his position by his interest in practical results. He cut himself off from eminent scientists in the United States, by not publishing in their journals and by falling out of touch with them. Furthermore, at a time when the prestige of academic science was increasing in intellectual circles of Venezuela—quite apart from the actual doing of serious scientific work—Langham allowed himself to be regarded as someone interested in practical results.

Finally, in his concern for practical results, he disregarded the social status of his collaborators and assistants. He took as much interest in collaborators and assistants from the lower classes as he did in those of higher social status. The upshot of all these factors was that he left himself without allies, either in Venezuela or abroad. His fate tells something important about resistance to the establishment of science in a nationalistic, economically undeveloped country without a scientific tradition, which is also a country with a steep hierarchy of status.

## The Hybridisation of Scientific Roles and Ideas in the Context of Centres and Peripheries

MICHAEL CHAYUT

BY THE EARLY 1960s, sociologists and historians of science had begun to give concerted attention to the growth of the profession of science.<sup>1</sup> Earlier, they had only sporadically studied the conditions for the growth of scientific knowledge. Robert Merton's work on science and technology in Restoration England was the pioneering work on this subject.<sup>2</sup> As the field developed, its two parts were fused. The issue on which historians and sociologists of science then focused was: how does scientific research, a highly specialised, differentiated and organised activity with very powerful traditions, give rise to unorthodox ideas and to innovations? Once scientific activity has become organised in disciplines, scientific research might appear to be confined to the application of established theories and rigorous, well-tested methods. Professional scientific research appears to be based on conformity with traditions of scientific knowledge and activity, even at the expense of innovation.<sup>3</sup> Nevertheless, the growth of scientific knowledge, although it became increasingly dependent on its institutional structure of differentiated and specific roles—corresponding to disciplines—repeatedly broke through these constraints.

This problem was dealt with by Joseph Ben-David in 1960.<sup>4</sup> Ben-David distinguished medical research in Germany, which during the nineteenth century had become sharply demarcated from medical practice, from the significantly less specialised medical research in France and England. The transformation of scientific research into a specialised professional career had been pioneered in Germany. Scientific research became a pattern of a plurality of distinctive and rigorously differentiated roles and disciplines. This began to make Germany a world centre in scientific and technological research and contributed to its industrial growth.<sup>5</sup>

<sup>1</sup> Mendelsohn, E., "The Emergence of Science as a Profession in Nineteenth-Century Europe", in *The Management of Scientists* (Boston: 1964), pp. 3-48.

<sup>2</sup> Merton, Robert K., *Science, Technology and Society in Seventeenth Century England* (New York: Howard Fertig, 1970), first published in *Osiris*, IV, Pt. 2 (1938).

<sup>3</sup> Kuhn, T.S., *The Structure of Scientific Revolutions* (Chicago: University of Chicago Press, 1962).

<sup>4</sup> Ben-David, Joseph, "Roles and Innovations in Medicine". *American Journal of Sociology*, LXV (1960), pp. 557-568.

<sup>5</sup> Ben-David, Joseph, *The Scientist's Role in Society* (Englewood-Cliffs: Prentice-Hall, 1971), p. 108.