Truncating a Disease. The Reduction of Silica Hazards to Silicosis at the 1930 International Labor Office Conference on Silicosis in Johannesburg

Paul-Andre Rosental

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Historical Perspective

Truncating a Disease. The Reduction of Silica Hazards to Silicosis at the 1930 International Labor Office Conference on Silicosis in Johannesburg

PA Rosental[1,2,3,4]*

The current nosology and etiology of silicosis were officially adopted by the 1930 International Labor Office (ILO) Conference on silicosis in Johannesburg. Convened by the International Labor Office and by the Transvaal Chamber of Mines, it paved the way to the adoption of a 1934 ILO convention which recognized silicosis as an occupational disease. Even though it constituted a social and sanitary turning point, the Johannesburg conference, strongly influenced by South African physicians working for the gold mining industry, reduced silica hazards to silicosis, an equation which is questioned nowadays. While the definition of silicosis adopted in 1930 was a major step in the recognition of occupational pneumoconioses, it also led to the under-identification of some pathogenic effects of silica. Going back to history opens new avenues for contemporary medical research. Am. J. Ind. Med. 58:S6–S14, 2015.

KEY WORDS: pneumoconioses; silicosis; silica; occupational disease; Johannesburg

INTRODUCTION

To a large extent, silicosis as we know it today is an illness whose nosology and etiology were defined in 1930 at the International Labor Office (ILO) Conference on silicosis in Johannesburg. Not that the knowledge about this pathology suddenly formed on this occasion: rather, the conference contributed to negotiating minimum agreement on the conclusions of previous work often going back several decades. The conference also paved the way for the adoption of the 1934 ILO convention on silicosis, which triggered its official recognition as an occupational disease (and, therefore, its financial compensation) in several industrialized countries. The conclusions of the conference, which were voted by the medical delegates, shaped the definition of the disease, with consequences that continue to influence contemporary medical knowledge.

A crucial point of the present article is to show how the history of the recognition of the disease informs current

[1]Centre for European Studies and Centre for History, ERC Grant Silicosis Sciences Po, Paris, France
[2]Interdisciplinary Laboratory for Evaluation of Public Policies (LIEPP), Sciences Po, Paris, France
[3]National Institute for Demographic Studies (INED), Paris, France
[4]ESOPP, Paris, France

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*Correspondence to: P.A. Rosental, Sciences Po, 27 rue Saint-Guillaume, F-75007 Paris. E-mail: rosental@sciencespo.fr

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medical issues. The Johannesburg conference reduced silica hazards to silicosis, an equation which was due to last for decades, but which is increasingly questioned today. "Reduction" needs to be taken here in the literal meaning of the word: a major outcome of the conference was that its delegates voted the transformation of silicosis from a 5-stage to a 3-stage disease. While the definition of silicosis adopted in 1930 was a major step in the recognition of occupational pneumoconioses, one may argue that it also led to the under-identification of some pathogenic effects of silica.

This process highlights the role played by employers' medical experts, in particular South African physicians working for the gold mining industry, in the definition of silicosis. Another aspect of this paper is to explain why and how a "social" transnational institution, the ILO, and an employers' organization, the Transvaal Chamber of Mines, cooperated in working towards the recognition of an occupational disease.

In 1838, by proposing the term "anthracosis" to designate the illness caused by the inhalation of coal dust, the Englishman Thomas Stratton was the first to recognize the etiological role of an inorganic dust in a specific pathology [Heppleston, 1992; Meiklejohn, 1959]. However, his hypothesis was challenged, and mineral dust only really started to be considered an etiological factor in the 1860s. In 1867 the German anatomopathologist Friedrich Albert von Zenker (1825–1898) used a comparison of anthracosis and "siderosis" (a term he created to designate the pathology linked to exposure to iron particles) as a springboard to create the term "pneumoconioses" [von Zenker, 1867]. Four years later, the Milanese doctor Achile Visconti used the term "silicosis" for the first time in the death records of his hospital [Rovida, 1871].

This profusion of terms flowed from the growth and increasing accuracy of anatomopathological and experimental observations in the mid-19th century [Carozzi, 1941–1942; Rosen, 1943; Meiklejohn, 1951–1952]. But it also reflected extra-medical developments. The occupational diseases of workers were of increasing interest to public authorities, employers, and industrial hygienists: as the number of diseases increased with industrialization, they started interfering with the productivity of workers, and particularly skilled workers. By mobilizing doctors with different know-how the commissions (administrative, parliamentary, consular, academic) focused on this issue created a fuller and de-compartmentalized medical approach, which had previously divided diseases by trade.

Another driver of change was the political and union pressure exercised by the labor movement beginning in the last decades of the 19th century: labor law and social protections emerged in Europe to counter the risk of revolution. In the area of occupational health, this dynamic led to the medico-legal notion of "occupational diseases" granting the right to compensation. However, a particular development prevented pneumoconioses from joining this category right away: the identification of Koch's bacillus in 1882. It allowed employers' experts to attribute these diseases to the workers' living conditions and thereby relieve companies of the obligation to provide financial compensation.

This tension explains why scientific developments alone did not suffice to establish silicosis as a specific disease, even though silicosis was the subject of a comprehensive Milroy Lecture by the great British industrial hygienist Edgar Leigh Collis in 1915 [Collis, 1915]. As a medical inspector of factories with the Home Office, he combined field knowledge, experimental statistics and radiographic data to create an analytical framework that remains mostly relevant. It served as the basis for the United Kingdom's recognition of silicosis as an occupational disease in 1918. But this formalization was limited, since it did not spread to Europe or the United States; even in Great Britain the mining sector was excluded!

Nowhere were the industrial and medical stakes so tightly imbricated as in South Africa, where silicosis decimated the workforce as soon as the gold mines started to be exploited in the last two decades of the 19th century [Katz, 1994]. Due to diplomatic pressure after 1900 from the United Kingdom, whose emigrant miners from Cornwall were struck by the disease, and to economic rationale mediated by a strong racial divide between (White) miners and (Black) "laborers" (who comprised about 90% of the workforce), South Africa soon became a pioneering country on silicosis issues. This was expressed in terms of medical expertise, sanitary monitoring and financial compensation, as objectified by a series of annual reports starting in 1912 [Union of South Africa, 1912].

However, the medical definition of silicosis could not be settled without the establishment of an economic and political consensus. The South African gold mining industry was central in this process. But in order to impose it internationally, it had to cooperate with a transnational entity, the International Labor Office.

WHY JOHANNESBURG?

The two partners which organized and jointly funded the Johannesburg conference, formalized its agenda and programme, and determined its list of participants—foreign medical experts who were selected in consultation with their respective governments—were the ILO on the one hand and the Transvaal Chamber of Mines on the other.

In a previous publication I had the opportunity to analyze the ILO's motivations [Cayet et al., 2009]. Instituted in 1919 by the Treaty of Versailles to develop social protections and labor law, this international organization created an Industrial Hygiene Section (IHS) in 1920 that was placed under the leadership of the great Italian social doctor

Luigi Carozzi (1880–1963) [Carnevale and Baldasseroni, 1999]. Since then the ILO's mission has been to convince states to vote on and ratify international conventions through tripartite negotiations between governments, employers and unions. In 1925 it secured the adoption of a first international agreement on occupational health, "Convention C18 concerning workmen's compensation for occupational diseases". Notwithstanding the pressure from certain international labor organizations, silicosis was not included. Carozzi was a leading proponent of covering this disease, the "king of occupational diseases" [McCord, 1940] of his time, but he deemed there was insufficient consensus on it in the medical community. The IHS director decided to use his channels of influence to advance research and discussion on silicosis, but his budgetary allocation was limited. Thus, he embraced a proposal by William Gemmill, secretary of the Transvaal Chamber of Mines, to co-fund a congress that would take place in Johannesburg.

In Johannesburg, the Rand Mines' Superintendent of Sanitation, Alexander J. Orenstein (1879–1972), was Carozzi's direct partner in organizing the conference. The two men followed the ILO's usual process. On the one hand, they needed to select renowned international experts representing a wide range of views, without running the risk of systematic obstruction. French experts, who denied the very existence of silicosis, were therefore excluded from the conference [Devinck and Rosental, 2009; Geerkens, 2009]. On the other hand, they first had to secure agreement from the governments concerned: the ILO failed, for instance, to secure that of the United Kingdom to send Edgar Collis, even though he was a major expert on the issue. Finally, Carozzi and Orenstein created a specific agenda, reflected in a questionnaire sent to experts before the conference: the latter were asked to define the nosology and etiology of the disease, and to lay the medical basis for its prevention and financial compensation.

What interest would an employers' organization have in working towards the recognition of an occupational disease? This is the crucial question here, because it determined the conclusions of the conference. In 1930, South African medicine dominated global research on silicosis. Since this country was the first, in 1912, to implement a compensation system for the disease, along with medical monitoring of the workforce, South African doctors had thousands of X-rays of the disease at a time when these were the most reliable tool for early detection.

The Australian historian Jock McCulloch has shown that one of the purposes of the Johannesburg conference–for the ILO, the first held outside of Europe—was to display South Africa's medical and "social" superiority at the global level, with a view to maintaining the supply flows of miners coming from all of Southern Africa, and especially from the Portuguese and British colonial empires [McCulloch, 2012]. But various other reasons, which have been neglected by historiography, were determining as well. Despite its medical and engineering know-how (pioneering use of humidification and ventilation in the mines), South Africa also needed international expertise, both to legitimize some of the choices it had made, and to improve them through comparison with the experience of other countries. Here, medical concerns—the explicit focus of the conference—were not paramount, as they were accompanied by utilitarian concerns about optimizing the management of personnel and of social protections with respect to the risk of silicosis.

This objective was sometimes expressed directly in the conference proceedings. On the subject of humidification for example, Louis G. Irvine, Chairman of the Miners' Phthisis Medical Bureau, explicitly drew on the experience of other countries to advance the quest for optimal dosage: "We realize that although water will take one a large part of the way [. . .] its use has certain positive disadvantages both hygienic and economic. Hence the minds of medical men and engineers are turning today to the question: have we not been overdoing water? Could we not do better with less water, and a greater extension of alternative methods?" [ILO, 1930 p. 22].

But most often, the South African agenda was formulated in a partial and indirect way. Piecing it back together involves working from the fragments disseminated throughout the conference proceedings and the attendant expert reports. These reveal a great managerial unity that explains the Transvaal Chamber of Mines' investment in the conference.

The general objective was formulated by Anthony E. Mavrogordato (1874–1944), a British physiologist employed by the South African Institute for Medical Research [O'Connor, 1991, p. 118-119]: it was to delay as much as possible the appearance of clinical manifestations of silicosis likely to diminish the productivity of workers; the doctors who divided the disease into stages called this "ante-primary silicosis". Thanks to the prevention policy in place since the beginning of the century, Mavrogordato specified, entering this phase "now takes thirteen years instead of eight to nine years [. . .]. If the time taken to produce a clinical silicosis could be pushed up to twenty years, silicosis could be considered as eliminated on the Rand from the social point of view" [ILO, 1930, p. 79]. *In other words, in parallel with the evolution of medical knowledge at the time* [Weisz, 2014]*, the priority of the Johannesburg conference was to cast silicosis as a chronic disease of long latency.*

This objective required the coordination of medical experts at the international level because it faced several hurdles. One of the thorniest obstacles was the erratic progression of the disease: "the "injury" inflicted is in the majority of cases not a stationary one, but one which tends to get worse, yet which does so very erratically and in general over a period of a good many years" (Irvine in ILO, 1930, p.

25). Unpredictability was reflected in both the "wide individual variations" [Irvine et al., 1930, p. 252] and the difficulty in correlating the three approaches to diagnosing the course of the disease: pathological, radiological, and clinical. This difficulty is crucial because it thwarted the desire—which was common in medicine at the time—to definitively delineate the "stages" of development of silicosis. Even though the South African Medical Bureau "has been able to carry out such a correlation in a series of 400 cases", it sought to compare these with studies conducted elsewhere, particularly by Leroy U. Gardner, director of Saranac Laboratories in the United States, and Edgar H. Kettle, Professor of Pathology at the University of London.

Another priority important worldwide was to understand the interplay between silicosis and tuberculosis. While "denier" countries like France and Belgium considered silicosis to be a complication of tuberculosis (and therefore a disease that did not qualify for compensation from employers), the South Africans believed the former was conducive to triggering the latter as a result of allergic[1] or toxic[2] mechanisms.

Regardless of their importance, it would be artificial to completely separate these medical questions from labor management issues. While the former have a certain autonomy linked to the disease's great nosological complexity, they only really take on significance in view of managerial concerns. While the Johannesburg conference deliberately emphasized the medical aspect of silicosis (rather than engineering, for example), economic and financial concerns were actually omnipresent. We noted the adjective Mavrogordato used to describe the desire to push back the onset of the disease by several years: he believed such progress would resolve the issue of silicosis "from the *social* point of view", whereas today we would consider this improvement to be an *economic* advantage for employers seeking to keep their skilled workforce active, while miners were condemned to a dreaded and incurable disease.

However, the conference took place at a time when social insurance systems around the world were developing in line with a model that combined economic utilitarianism with social and health concerns: growth in economic productivity was supposed to be the best way to improve workers' living standards, while social and medical protection was in turn supposed to "improve" the workforce [Cayet and Rosental, 2013; Fontaine, 2014]. The inaugural speech by Edward Joseph Phelan (1888–1967), who was then Chief of the Diplomatic Division of the ILO, illustrates this alliance: he underscored "the enormous burden which the [South African] industry has to bear of nearly £1,000,000 per annum", by joining in the same sentence "the suffering to the victims and loss to the industry" [ILO, 1930, p. 14]. The problem was compounded by the status of the material extracted from the mines: given that gold was the ultimate reserve asset of the monetary system, its price could not be adjusted to reflect the cost of compensating miners. This constraint affected the whole industry, but it was especially severe in a country with dozens of mining companies, where it "may make the difference as to whether a low-grade mine may run at a profit or not", as a South African insurer put it [Watt in ILO, 1930, p. 595].

It is therefore important to return to the precedence of South African measures: how was this country able to force the Transvaal's powerful goldmines to compensate silicosis victims as early as 1912, and accept successive legislative reviews increasing benefits for miners? In comparison, in 1930 silicosis was not yet recognized as an occupational disease in either France or Belgium. In the United Kingdom, coalmines were exempted from the silicosis compensation provided for in the 1918 Workers' Compensation Act. Financial compensation for this disease was only required in a 1928 law, but the conditions for miners to qualify were such that they considerably reduced the extent of recognition.

The first South African measures were initially a response to political and media pressure from the United Kingdom, whose miners employed in South Africa experienced high and rapid mortality. Their replacement by Afrikaner miners did not provide any respite. As members of strong unions, the latter were able to push for social and health measures. Moreover, in line with the conventional wisdom of the time, the government hoped that the establishment of a compensation system would force mining companies "to stimulate prophylactic measures" (Orenstein in ILO, 1930, p. 85). Another consideration also played a decisive role. In a still rural country where retraining options were limited, miners afflicted with silicosis were tempted to remain active as long as possible to maintain their standard of living. One of the doctors even recognized that it was difficult to distinguish between the health risk of slowly contracting silicosis and of falling into great poverty. This dialectic created health risks in the mining workforce (increased risk of contracting and spreading tuberculosis) and economic risks (decreased productivity). Financial compensation was established in response to this threat: it stipulated that the compensated miner would leave his employment.

As compensation improved throughout the 1920s, South Africa came to face an increasingly acute dilemma:

[1] "How the silica acts in influencing the growth of the tubercle bacillus is still unknown, but it appears likely that it is a metabolic phenomenon [. . .]. One problem is to find out whether silica rock, like certain other inorganic material, set up an allergic state in the tissues and whether tissues which are allergic to silica are also allergic to tubercle" [Mavrogordato in ILO, 1930, p. 45].

[2] "As has been shown in particular by Gye and Kettle, finely divided silica acts as a soluble cell poison and has in consequence a specific effect in determining the selection by a tuberculous infection of sites where silica is aggregated" [Irvine in ILO, 1930, p. 23].

increasing social costs or decreasing economic productivity. The terms of this dilemma were explicitly stated during the conference: "on the one hand, if silicotics were allowed to remain in their underground occupations without any restrictions, the position might be reached after a period of years when the gold mining industry would be entirely run by employees who are silicotics and this in the end is bound to affect efficiency. On the other hand, no State can be expected to legalize what amounts to slow suicide" [AB Du Toit (Chairman of the Miners' Phthisis Board) in ILO, 1930, p. 82].

For this reason South African experts hoped that the conference would help them to better link clinical, pathological and radiological evaluations into a definitive assessment of the evolution of silicosis: so long as the management of workforce flows ran up against the uncontrollable variety of single cases, they could not know at what moment in the lifecycle afflicted miners should be removed. This debate was the source of a spectacular conflict that played out within the South African delegation throughout the conference. Louis G. Irvine, who led the Miners' Phthisis Medical Bureau that was responsible for silicosis compensation, called for continuing the prevention policy pursued over the previous twenty years. In his opinion the policy had reduced the number of "ante-primary cases" and could continue to improve results. However, he butted heads with Orenstein, who by virtue of his office reasoned both in medical terms *and* in terms of optimizing workforce management. By citing foreign experts to buttress his argument, he denied the progress made and went as far as casting doubt on the accuracy of mining statistics[3] and challenging the very possibility of health improvement with respect to silicosis: "The Reporters may consider whether silicosis can be called preventable. It is a misconception that removal from work in the earliest possible stage would prevent further development; if it was true that continued employment was really slow suicide, no man should be allowed to work in any dusty occupation at all". He condemned the very principle of legislation on pneumoconiosis, which cost a lot, reduced the workforce, and condemned sick miners to poverty: "under the present system in the ante-primary stage of silicosis a man is penalized if he did not leave the mine at once, and about £500 is given to a man thus thrown out of employment. It might be better to wait until a marked degree of incapacity was reached and that search should be made for other avenues of employment" [Orenstein in ILO, 1930, p. 78].

Indeed, Orenstein blamed the insurance schemes in place for the loss of skilled workers who had to stop working in the mines after receiving compensation, even though, he maintained, this removal did not protect them from silicosis' irreversible progression. Rather than touting the merits of the South African social health organization, he deemed it necessary to recognize its limitations and propose an alternative policy, to which the social insurance's budget would be reallocated: "the money now set aside for compensating cases of the disease might be better spent upon rehabilitation methods". Despite its stated medical goal, the agenda of the Johannesburg conference was shaped by South Africa's bitter internal conflict between an approach based on workforce management and one based on managing social insurance. These issues are key to understanding the legacy of this meeting.

JOHANNESBURG'S LEGACY

As I have stated earlier, even if the Johannesburg conference did not produce a revolution in medical knowledge, it is justifiably considered a turning point in the history of the recognition of silicosis as an occupational disease. First of all, the adopted medical resolutions defined the pathology: "Silicosis is a pathological condition of the lungs due to inhalation of silicon dioxide. It can be produced experimentally in animals" [ILO, 1930, p. 86, 2nd medical resolution]. They also dispelled the idea that silicosis was simply a complication of tuberculosis by emphasizing how the latter exacerbates the effects of the former: "infection of the lung with B. tuberculosis or other pathogenic organisms, whether it occurs before, simultaneously with, or subsequent to the development of silicosis, alters the disease and influences it unfavorably, tuberculous infection being particularly unfavorable" [ILO, 1930, p. 87, 6th medical resolution]. This was a decisive point because it paved the way for a medical-legal recognition of silicosis as an occupational disease at the international level.

To a large extent the conference also advanced one of its key priorities, viz. to link clinical, anatomo-pathological, and radiographic approaches to the disease.[4] This was the basis for defining silicosis as a disease progressing in three distinct stages: "In the 'first stage" symptoms referable to the respiratory system may be either slight or even absent. Capacity for work may be slightly impaired. There may be a departure from the normal in percussion and in auscultatory signs, and the radiograph must show an increased density of linear shadows, and the presence of discrete shadows,

[3] Reported as: "The present statistics were perfectly reliable, but did not reflect the whole picture. It was impossible to say whether the real production of silicosis was more or less than that shown by the figures [. . .]. The statistical methods of the Rand were not sufficient to give the facts which practical hygienists wished to know. [They] did not give the fundamental data and he was not satisfied that they demonstrated a reduction in silicosis" [Orenstein in ILO, 1930, p. 78 and p. 80].

[4] Note by Luigi Carozzi to Harold Butler and Fernand Maurette, 10 February 1933, ILO Archives, Geneva, HY 1000/50/1.

indicative of nodulation. In the "second stage", there is an increase of the physical signs observable in the "first stage", and the radiograph shows an increase in the number and size of the discrete shadows indicative of nodulation with a tendency to their confluence. There must be some degree of definite impairment of working capacity. In the "third stage" all the above conditions are grossly accentuated and indications of areas of massive fibrosis are usual. There is serious or total incapacitation" [ILO, 1930, p. 88, 18th to 20th medical resolution].

This nosology became the foundation of international medical comparisons, national laws, the implementation of compensation and, beginning in 1958, the establishment of international radiographic standards. The health improvements it brought were well summarized by Francesco Carnevale, who is both a medical inspector in the workplace and a historian of occupational health: "reducing exposure to silica and in general to dusts, [...] gradual and partial prevention measures introduced at different times and different ways in diverse industrial sectors (always seeking the economic compatibility of the process), produced a metamorphosis of the disease, which became "chronic", less specific, and with greater survival rates" [Carnevale, 2013, p. 112].

At the same time, ILO archives shed light on the conference's limitations *even from the perspective of the organizers*. Indeed, in the ensuing years Carozzi and Orenstein worked to ensure international recognition of silicosis. The notes they exchanged helped them make a lucid assessment. From their perspective, the Johannesburg Conference did not really succeed in creating a clear and consensual medical basis for an international convention. "All we should aim at", Carozzi wrote two years later, "is to secure that silicosis in whatever form and however defined should be recognized as an industrial disease for which compensation is payable. If this principle was established, it might well be left to the individual countries to define the disease".[5] This realistic position, while remaining true to the ILO's spirit of compromise, led to a very particular recognition of silicosis in an international convention that was finally passed in 1934. While the other occupational diseases were defined by exposure to a substance or work process, the silicosis risk was formulated in a completely circular way: it covered workers employed in "industries or processes recognized by national law or regulations as involving exposure to the risk of silicosis" [ILO, 1934]. This criterion can be compared to that used for phosphorous poisoning, for example, in the same convention: "any process involving the production, liberation, or utilization of phosphorous, or its compounds". This caution can be explained by the ILO's general policy aiming to protect workers from dismissal by the courts by refusing to recognize a disease over which full medical agreement had not yet been achieved.[6] The conclusions of the Johannesburg conference were not as decisive as international union pressure in pushing for the recognition of the most serious of occupational diseases: according to A.J. Orenstein, the new Deputy Director of the ILO, Harold Butler, "felt strongly" in 1932 that it "had not so far resulted in any very important information on the subject being acquired".[7]

Luigi Carozzi was also under no illusions about the classification of the disease into three stages, which became the basis of medical and radiological knowledge and of victim compensation for decades: "the adoption of the three stages represents merely a somewhat arbitrary classification, commonly adopted by medical experts on the subject, exclusively in regard however to clinical study of silicosis and with a view to clinical, radiological, and anatomo-pathological correlation of findings; such a classification has nothing whatever to do with compensation, in regard to which the only element to be considered is reduction of earning capacity or working capacity. To be convinced of the above it suffices to refer to the ILO Draft convention which takes no account whatsoever of any such division or stages".[8]

Indeed, several major questions remained unanswered by the great experts of the time. The conference did not revise the disease's triggering mechanism at all—even in general terms—thus hampering any prevention worthy of the name: "in the case of pneumoconiosis in general, and silicosis in particular, it is not so far known what is the dust content below which the system remains immune from attack by silicosis, nor what is of even greater importance, the size frequency of particles which constitute the harmful element in the dust".[9]Several decades later, it is still unclear whether this puzzle has been solved. As stated by Catinon and Chemarin [2013, p. 101], "many of the hypotheses put forward at the conference still have not been tested [...]. Silica or asbestos carcinogenesis and fibrogenesis processes have not still been elucidated".

[5] L. Carozzi, Internal Note, 15 June 1932, ILO Archives, Geneva, HY 1000/50/1.

[6] The ILO, "in agreement with its medical experts, considers that it is impossible to propose a system of compensation resting on a sure and solid basis without being able to define the condition and to recognize the definition. To obviate disputes in the courts it is essential that legislation should be substantially definite to preclude all doubt as to the definition of the disease, or at least to permit of the least possible doubt, such definition being accepted by the majority of authorities on the subject" (Luigi Carozzi, Note on a letter from Verne A. Zimmer from the Division of Labor Standards of the US Department of Labor, ILO Archives, HY 1000/34/2).

[7] Talk by Orenstein at the Special meeting of the Medical Research Council's Committee on Industrial Pulmonary Diseases, London, 27 July 1932, ILO Archives, Geneva, HY 1000/50/1.

[8] L. Carozzi, Note on a letter from Verne A. Zimmer, op. cit.

[9] Ibid.

Second, not only was the correlation between these different approaches to the disease imperfect, but the most reliable detection tool—radiology—presented uncertainties. Even A.J. Orenstein, who is probably one of the doctors who by virtue of his position had access to the greatest number of X-rays, recognized that "the question of a correct diagnosis, not only clinically but also post mortem, is presenting difficulties as the work progresses and workers in "new" industries are investigated. The abrasive powder workers and certain colliery workers are instances. I saw the lungs and microscopic preparations from some of these, and it would indeed be almost impossible to say whether one looked at true silicosis or chronic tuberculosis [...]. It seems to me hopeless to attempt any international convention on this matter until we can definitely say what is silicosis and by which dusts it is produced [...]. In South Africa they do know what silicosis is. But, and it is a very big "but", I now think, we only know our silicosis, and I am afraid there are quite a number of other varieties"[10].

The fact that Orenstein's misgivings focused on workers employed in the abrasive powder sector is particularly interesting: given the very large concentration of quartz, which can account for up to 90% of the product, exposure to silica in this sector can cause an acute rather than chronic illness. Yet the risks linked to intense but short-term exposure to silica were left out of the conference's agenda and resolutions. Black miners, labelled as "laborers", who were the vast majority of the workforce in South African gold mines, were recruited for the most dangerous positions and experienced a rapid turnover, which doctors claimed would protect them. The racial management of South African workers and, more generally, the dual management of mining labor in the world (with the vulnerable population such as immigrant workers or political or war prisoners being at highest risk) played a decisive role in establishing and maintaining silicosis as a chronic disease, or one could even say a lifecycle disease.

Several articles in this issue delve into the consequences of this choice [Blanc, 2015; Vincent et al., 2015]. In conclusion, I would like to underscore the epistemological coup achieved in Johannesburg, for better or worse. Following the conference, the global classification in three stages that became the hallmark of silicosis, spread throughout the world. As we have seen, this disease is defined as fibrotic in its first stage. But a careful reading of the conference's medical resolutions reveals a more complex and surprising dynamic.

In the conference's conclusions, the famous three phases are not coded a, b and c, but c, d, and e [ILO, 1930, p. 88, 9th medical resolution]. After stipulating that "the disease can conveniently be divided into three stages", the 16th resolution even took care to note that they could be "designated "first", "second", and "third" stages" [ILO, 1930, p. 88]. Specifying this was not tautological; rather, it was pivotal. Medically, the conference discussed an illness in five stages. But the 9th medical resolution simply decided to exclude the first two phases from the characterization of silicosis. The first one, labelled "a", designated "a dry bronchiolitis, characterized by an accumulation of dust filled phagocytes in or in relation to the terminal bronchioles, with possibly some desquamation of their epithelium". The second one, named "b", concerned "the accumulation of dust-containing phagocytes about and in the intra-pulmonary lymphoid tissue, and their transportation through the lymphatics into the tracheo-bronchial lymph nodes". The resolution took care to note that "the conditions described above under (a) and (b) do not constitute the disease silicosis". This is the reason why the "first" stage of silicosis is labelled c...

We can speak of a coup because this truncation of the disease was far from having a purely medical basis. It reflected the state of South Africa's silicosis compensation, which began at the third stage—relabelled as the first stage: "it was suggested that, for purposes of compensation, cases should be divided into three stages: early, intermediate and advanced, and that for the two latter a pension or annuity should be payable". In the Miners' Phthisis Act of 1916 "the two "stages" had been termed "primary" and "secondary". The interpretation given to the definition of the "primary" stage by the legal advisers of the Crown was that it should be held to include only such cases as showed some amount of disability; an interpretation in conformity with the general usage regarding cases of industrial "injury" [Irvine et al., 1930, p. 188 and p. 195]. In other words, one of the functions of the Johannesburg conference was to ensure the transposition into medicine and international medico-legal measures of the legal criteria for silicosis compensation in South Africa. This effort was no secret at the time. Indeed, Italian representative Giovanni Loriga, Chief Medical Inspector of Factories, "dissented from the proposal [...] on the ground that these notes should properly be inserted in the Report on Compensation, since arbitrary legal limits might be laid down between the various pathological stages, while pathology must insist on the progressive nature of the evolution of the disease and could not properly indicate hard and fast divisions between its different stages" [Loriga in ILO, 1930, p. 93].

Even though Irvine had acknowledged during discussions that "the question of what is happening in the lung and respiratory passages during the long period of exposure prior to the development of actual silicosis [phases (a) and (b)] requires further investigation, both experimental and by

[10] Letter from A.J. Orenstein to L. Carozzi, 10 June 1932, ILO Archives, Geneva, HY 1000/50/1.

observation in the human subject" [Irvine in ILO, 1930, p. 59], the coup of 1930 would profoundly shape the subsequent medical debate. Once silicosis was defined as both *the* silica disease and as a *fibrotic* disease, any other possible pathogenic manifestation of exposure to silica fell outside of the scope of medical investigation, except for tuberculosis whose intimate relationship with silicosis was still recognized. Aside from recurrent but isolated questions on the role of silica [Collis and Yule, 1933; Vigliani and Pernis, 1963], only the evolution of detection tools in the past thirty years (with the scanner and then bronchoalveolar lavage), and the sarcoidosis (or "sarcoid-like disease") "epidemic" in the aftermath of the September 11 tragedy, reopened the debate [Jordan et al., 2011; Crowley et al., 2011]. To return to the source of codification of silicosis in 1930 is a way to contribute to contemporary medical research on the topic. The present issue explores this novel interaction between history and medicine.

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