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Chemical Experts & their roles in the Belgian Sugar Industry

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Scientific expertise related to a profession can sometimes find its origin in rather unusual contexts, especially if it is appreciated through our present representations. Most of the time, it is considered that the production of an unbiased judgement rests upon the work of an institution generally settled in academic circles and sheltered from the disturbances and vicissitudes of public affairs. This general and widespread conception makes the understanding of the gradual process by which a professional and scientific autonomy is reached, quite difficult. A discipline recognized as scientific is built through other spheres of connected activities ; it doesn't originate, as it stands, from the university field.

The case of Chemistry, in Belgium, is quite revealing in that respect. While studying the running of an industrial laboratory, the beet testing laboratory in the sugar industry, I became aware of the prevailing part played by the chemical engineers in their attempt to solve public controversies and to shape a new scientific society. As a matter of fact, this laboratory is rather different from other industrial settings: instead of just being a private place for secret industrial practices, the beet testing laboratory is widely open to public scrutiny. The reason for this is, of course, linked to its basic function : that is to say to produce technical and quantitative evidence of the financial value of raw materials. To manufacture white sugar, it is necessary to buy raw material from which it is easy to extract saccharose at low cost. So, the beet testing laboratory becomes the technical mediator through which principles of payment for beet delivery will be worked out. One of these principles mainly deals with the “objective” determination of the saccharose content in sugar beets.

The principle of Objectivity which guides the whole discussion around the establishment of a legitimized analytical protocol of the deliveries has to be replaced inside a context of technological innovation. This context is the one of the meeting points between a

scientific apparatus and a scientific and professional Association in the making. More precisely, it's the "displacement" produced by the latter to the former - in a situation of intense and public controversy - which constitutes the issue of this paper.

The institutionalisation of a scientific profession doesn't originate, as I have said, just from the enunciation of a theoretical competence, or a disembodied skill, but just as much by grasping the opportunity offered by the hazards of public and economic life. This means - in opposition to common sense - that the production of a scientific recognition can emerge from a collective ability to translate the interests or the necessities encountered inside an interpretative framework... An interpretative framework through which the "milieu de référence" - here the chemists - search to be associated with and identified by. In this sense, it becomes difficult to make a distinction - as autonomous entities - between this interpretative and technical framework and a political strategy... A political strategy in the sense of an endeavour aiming at defining the categories of actors entitled to intervene in the situation and... at the suitable means by which a controversy may be resolved.

The link, heuristically important for the social sciences' investigations, between the construction of the legitimacy of a scientific and industrial expertise and the reappropriation of a scientific apparatus, puts the finger on the indeterminate place occupied by the technical object in the production of this expertise. Very often, the engagement of a technical mediator inside a "social field of usage" doesn't appear inevitably in a relation of pure causality but much more in a relation of contiguity, of proximity... The object is not necessarily created for... but frequently re-adapted in order to... It is, consequently, "displaced"; that's to say: arranged to meet specific practical purposes. And by this move render possible, in this very movement, the formulation of a problem and its solution. And if the protagonists - in this case: the chemical experts - "inscribe" the particular relation between means and ends within a relation of causality, it is in the intention to give more and more publicity to the efficiency of their interventions.

Now, what can be shown here is that in this present case this particular way to engage one's action in the causal argumentation (that's to say: "we must use this instrument because it's the most scientific and, thus, the most rational and the most efficient") has to be qualified. The sociological and historical description of the events that is favoured here is different in the way that this description highlights a relation of affinity between a problematic situation and the solutions rendered possible by the use of this apparatus ...an instrument moved out of its

usual context. Therefore, it is possible to assert that concepts which describe what is definitely a sugar beet may come not only from botanical theory for instance, but from the instrument itself. Indeed, the polariscope - the instrument in question - doesn't just help to quantify the parameters that characterize the sugar beet (its industrial value...) : it produces them.... This is particularly blatant with regard to the issues that have become crucial since the development of the polarimetric methods in the area of the industrial production of sugar : as for instance the notions of distribution of sugar inside the beets ; or those of the industrial quality of beets... For sure, all those items have a direct impact on the contractual relation between growers and sugar producers.

As Van Helden and Hankins have correctly noted : “ Because instruments determine what can be done, they also determine to some extent what can be thought. Often the instruments provides a possibility ; it is an initiator of investigation. The scientist asks not only : “ I have an idea. How can I build an instrument that will confirm it ? ” but also : “ I have a new instrument. What will it allow me to do ? What question can I now ask that it was pointless to ask before ? ” (Van Helden & Hankins, 1994). One of the characteristics of the beet testing laboratories is to be open to public control ; and this control, of course, includes all the instruments of measurement that make it up. This is, at least, the explicit opinion of the sugar producers : they share in the responsibility for beet testing. In order to deal with the critics, they have to play the transparency card towards their grower clients.

As a result of many disputes between growers and sugar refiners, the Belgian State and its administration intervene in order to solve disagreements about the correct assessment of the value of beet deliveries. A commission initiated and presided by the Minister of Agriculture came into being at the end of last century. This “ Sugar Commission ”¹ - as it is called - is put in charge of taking stock of the situation and of setting up an efficient and trustworthy chemical procedure. To achieve that, chemical experts from different backgrounds are put around the table.

The consequences of this Commission are numerous : at least three of them will hold our attention here : First, by the emergence of the polarimetric analysis as a quasi-legal entity ; second, by the development of a scientific and professional association of chemists in Belgium ; and third, by the appearance of a new kind of chemical expert.

1. A new arena, public in its conception, will give birth to a new rhetoric in the debate : that of chemical science and its objectivity. It was thought that only Science and its common sense was capable of bringing back some serenity in the relations between growers and refiners. The recent invention of a scientific measuring instrument, the polariscope, renders the assesment of the quantity of sugar in the beets more effective. The saccharimeter, its sugar industrial application, rapidly became essential for a standardized protocol.

At that time, many existing conflicts between growers and producers of sugar were caused, to a great extent, by a too great diversity of receiving and buying methods. The objective aimed at and acknowledged by the Commission was to put into shape a national standard system to secure uniformity in the terms of purchase.

The stake was to go from an indirect method - by densimetry - to a direct one - by polarimetry. The latter engages the optical properties of sugar and through them the know-how of the chemists. But beyond the disputes on the various polarimetric methods, it was the instrument itself that progressively became the “ boundary object ” around which an expertise was constructed . It was therefore necessary to pacify the situation by applying a common language and above all a practical sequence of manipulations with a suitable device. The result was the ratification of the famous Belgian “ Sachs-Le Docte method ” on which the majority of sugar content analyses of beets in the world is still based. It was, indeed, the first time that a polarimeter was introduced in the contractual relations between growers and refiners. As Theodore Porter put it², a protocol enunciation in the form of a quantifiable and standardizable principle seems to prevail where vulnerability to public criticisms is the strongest. The mechanical objectivity, according to the author, serves as an alternative to personal confidence³.

¹ *Commission chargée d'étudier et de déterminer les conditions d'analyse de la betterave à sucre, instituée par l'arrêté ministériel du 7 juin 1893.* P. Weissenbruch, imprimeur du roi (éd.), Bruxelles, 1893.

² Porter, T. M. (1995). *Trust in numbers. The pursuit of objectivity in science and public life.* Princeton: Princeton University Press.

³ Chemical engineer August Aulard proclaimed at one of the meetings of the Association Belge des Chimistes at the end of the nineteenth century : “ Once agreed on the scientific part, we should apply the method we found the best as we did for the analysis of the beets, without bothering about selfish outcry wherever it comes from. We must do our duty as chemists and we must not have a method imposed neither for sugar nor for other products. Let us work out a practical method, let us follow it and the present disagreements will disappear forever ” (Bulletin de l'Association Belge des Chimistes, n°2, 1889, p.69 - translation by the author).

2. Moreover, the Commission, by offering the role of expert to chemical engineers on the public stage, furthered the legitimacy of a new learned society : *l' Association Belge des Chimistes* (The Belgian Chemists' Association). This association played a major part in the professionalization of chemists in Belgium as well as in their admission to the academic world : “The central importance of determining the sugar content of the beet also secured a prominent place for the analytical chemists. Whereas in most Belgian industries, chemists were scarcely represented, in sugar industry their role was crucial and well recognized” (VanPaemel & Van Tiggelen, 1998). The Belgian Chemists Association was created just several years before the commission : in 1887. It is thanks to its collective work that a protocol was so easily established after just one-month work of the Sugar Commission. Therefore, it is striking to notice that this association, with a scientific calling, was established on the occasion precisely to try to resolve this technological and financial controversy about the sugar beet receiving in the sugar house.

If we look into the Sugar Commission, what strikes us is the heterogeneity of the chemists that compose it. Indeed, its creation is the consequence of the problematic relation between some private chemists and the work done by chemists belonging to the Belgian State. It represents two opposite conceptions of a chemist's work in the analysis in beets' testing. In 1893, the question was : where is the expert ? : ...in each private chemist practising either for the sugar producers or for the growers ? ...or in each official chemist supposed to be disinterested by working in the State laboratories ? Can the notion of expertise be defined by means of disinterestedness or must it take account of the “ partisan spirit ” ?

In the controversy of 1893, this “ partisan spirit ” is in the heart of the debate : it is presented by the refiners as the mainspring of the expert' action. The reason for this was that it would enables the necessary proximity with the interests in play and, thus, it would enables a better evaluation of the relevance of the decisions to be taken. But, at the same time, this “ partisan spirit ” would be sharply disapproved by the refiners if it influences the judgement and the results of the official chemists. The State chemist is supposed to represent Science - and not the growers.

In the first acceptance of the image of the chemist (the private one) the essence of its work lies in the context of its practice, locally situated and therefore essentially indexed to the situation. In the second acceptance, the official chemist finds the essence of his intervention in

his ability to extract from the situation the rules, the vision of things that would leave aside conflicting interests because its analysis would be embodied in the nature of things, in the objectivity of matter.

3. Finally, the work of the Sugar Commission initiated the establishing of a new legal figure in chemical expertise : a chemist called *chimiste départageur* (a “Referee Chemist”). In order to make economic matters more impartial, an appropriate operator is needed to control the procedure. In spite of the thorough standardization of the protocol, this one could not uphold on its own the transparency and the objectivity of the control. However paradoxical it may seem, human operators were necessary to provide the protocol with all those characteristics. The written records of the debates within the Commission show that the mentioning of the professional category of chemical engineers is not sufficient to secure impartiality. Giving that there were as many chemists in the refiner’s as in the planter’s camp (by way of the presence of chemists of the State), different chemical principles and technical routines were called upon according to their specific interests. It became absolutely necessary, in accordance to the assembly, to appeal to a third type of chemical expert who would gain authority by the particular position he would hold in the control of the samples.

It is quite interesting to notice that these “public” chemists share, in their administrative selection, the same principles of transparency and objectivity as those used to determine the samples of the beets to be analysed. There is, indeed, a striking homology between the way of getting beets representative of a delivery and the way of getting “referee chemists” representative of an unbiased judgement. In both cases, a kind of “technology of producing randomness” (technologie de production de l'aléatoire) is worked out between opposing camps in order to found the legitimacy of the testing device : Indeed, a random, organised selection of sugar beets which constitutes the beet samples is organized according to a random, organised selection of “referee chemists” in charge of the control.

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