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# **NETWORKS AND PERIPHERIES: JEAN-FRANÇOIS PERSOZ (1805-1868) AND THE 'REPUBLIC OF CHEMIST-DYERS'<sup>1</sup>**

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**Agustí Nieto-Galan**

## **A NETWORK OF SWATCHES, CHEMISTS AND DYERS**

The existence of a *Traité théorique et pratique de l'impression des tissus* (1846) in the collection of the old library of the Industrial Engineering School in Barcelona is evidence of a process of technology transfer between France and Spain, specifically between Paris and Barcelona, in the nineteenth century. It may also be taken to suggest that the art of printing and colouring textiles emerged and developed in France, the “centre”, and that it was later transferred to an area on the “periphery”, in this case industrial Catalonia. Seeing the process in this way reinforces the simplistic view that conceives scientific centres as active and innovative, and peripheries as passive and uncreative. However, it seems clear that models of this kind should be refined and criticized; indeed, this is one of the main aims of the international research group “Science and Technology in the European Periphery” (STEP). Its founding statement, drawn up after its first meeting in Barcelona in 1999, appraised the centre-periphery question in the following terms:

*Although a simple bipolar distinction between center and periphery is useful for broadly delineating the situation, it is incapable of capturing many salient details. There are many centers and many peripheries, and they change in time, spaces, and disciplines. Depending on the subject one is discussing – a place may at one and the same time be both center and periphery. A center may, over time, change into a periphery, and vice versa. And a single country may contain both centers and peripheries, thereby making purely national distinctions of dubious use. To examine such issues requires discussing the ways in which ideas that originate in a specific cultural and historical setting are introduced into a different milieu with its*

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<sup>1</sup> Parts of this paper have been already published in Agustí NIETO-GALAN and Bernadette BENSUADE-VINCENT, “Theories of dyeing: a view on a long-standing controversy through the works of Jean-François Persoz”, pp. 3–24, in Robert FOX and Agustí NIETO-GALAN (eds), *Natural Dyestuffs and Industrial Culture in Europe, 1750–1880*, Canton, Mass., Science History Publications, 1999; Agustí NIETO-GALAN, *Colouring Textiles. A History of Natural Dyestuffs in Industrial Europe*, Dordrecht, Kluwer, 2001, pp. 123–51.

*own intellectual traditions as well as political and educational institutions.*<sup>2</sup>

In fact, the story of the writing, publication, and reception of the *Traité* of 1846 is by no means a simple one. It illustrates the difficulties we face when trying to define specific centres and peripheries; it may also shed light on the exploration of historical problems such as this one by approaching them from the perspective of a network. From this viewpoint, the international community of practitioners of science and technology can be understood as a multi-centred organization with numerous nodes. Scientists, engineers, and industrial experts can be then perceived as tireless builders of systems of personal contacts, as the main agents of the circulation of texts and objects.<sup>3</sup>

The career of Jean-François Persoz (1805–1869) – the author of the *Traité* of 1846 – does not fit at all precisely the standard pattern of a reputed Parisian savant in the “centre”. Born in 1805 in Cortailod, near Neufchâtel, Persoz soon became interested in chemistry through his early experience as an apothecary’s apprentice. Between 1825 and 1833, he was *aide-préparateur* of the chemist Joseph-Louis Thenard (1777–1857) at the Collège de France in Paris, and later, from 1833 to 1848, he held a chair of chemistry in the Faculty of Science at Strasbourg, academically speaking on the periphery but at the heart of an important industrial centre. In 1830, Persoz had married Aimée Verdan, the daughter of a rich Alsatian calico printer, and that marriage introduced him to the industrial secrets of the art of colouring textiles.

Persoz spent long periods in the Parisian centre because of his academic activities, but to a large extent he remained on the periphery. He did not enter the Académie des Sciences, nor did he become head of the dyeing workshop at the *Gobelins* factory, a position held earlier by prestigious chemists such as Pierre-Joseph Macquer (1718–1784), Claude-Louis Berthollet (1748–1822), and Michel-Eugène Chevreul (1786–1889).<sup>4</sup> It was no coincidence that Persoz’s *Traité* was published just two years before the end of his stay in Strasbourg, and after thirteen years of academic and industrial experience in the region. Although Persoz did not have the benefit of a position in the Parisian centre, he was ideally placed in a new node of a network, and this may help us to understand the particular nature of his *Traité*. In the preface, Jean-Baptiste Dumas (1800–1884) introduced the book on

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<sup>2</sup> STEP Founding Document, Barcelona, 1999 (<http://www.uoa.gr/step>).

<sup>3</sup> Michel CALLON (dir.), *La science et ses réseaux. Genèse et circulation des faits scientifiques*, Paris, La Découverte, 1989.

<sup>4</sup> On the biography of Persoz, see: Bernadette BENSUAUDE-VINCENT and Roger CHRISTOPHE, “Persoz, Jean-François (1805–1868). Professeur de teinture, impression et apprêts des tissus (1852–1868)”, II, pp. 389–98, in Claudine FONTANON and André GRELON (eds), *Les professeurs du Conservatoire des arts et métiers*, CNAM, Paris, 1994.

behalf of the Comité des arts chimiques of the Société d'encouragement pour l'industrie nationale:

*M. Persoz, professeur à la Faculté des sciences de Strasbourg, vous offre aujourd'hui le résultat de ses longues et consciencieuses recherches, qu'il a réunies en quatre beaux volumes. Accompagnés d'un atlas de la plus parfaite exécution [...] Deux volumes sont consacrés à faire connaître les matières colorantes, la théorie de la teinture et des divers procédés d'impression en couleurs, la nature et l'effet des diverses machines que cette industrie met en usage. Deux autres volumes renferment l'exposition méthodique de tous les procédés d'impression qui sont mis en pratique sur le coton et sur les étoffes diverses qui en imitent les produits. A chaque recette se trouve joint un échantillon d'étoffe qui donne au lecteur la fidèle représentation de l'effet que la recette fournit. Ces échantillons, au nombre de plusieurs centaines, reproduisent les procédés de tous les pays ; car l'Alsace, la Suisse, la Normandie, les environs de Paris, l'Angleterre et l'Ecosse ont trivalisé de libéralité envers l'auteur ; les principales fabriques ont mis à sa disposition des pièces de leurs étoffes, qui, découpés en échantillons, donnent au lecteur des types inappréciables.<sup>5</sup>*

Dumas acknowledged Persoz's privileged position in an international network of calico printers and dyers. Many of its members were happy to provide Persoz with descriptions of their processes and coloured swatches for publication in the book. His extraordinary collection bore witness to the important links within a network in which the relationship between the centre and the periphery was anything but one-way. In his own preface to the first volume, Persoz himself expressed his indebtedness to the *fabricants* who generously provided the samples. In so doing, he described the geography of a network that embraced Alsace – in particular Colmar and Mulhouse – the Swiss Cantons, Manchester and other industrial towns in Lancashire, and French industrial cities such as Rouen.<sup>6</sup> His *Traité* is testimony to his

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<sup>5</sup> Jean-François PERSOZ, *Traité théorique et pratique de l'impression des tissus*, 4 vols. + atlas, Paris, Victor Masson, 1846, I, Foreword.

<sup>6</sup> Koechlin-Schouch, Huguenin-Ducommun, D. Dollfus-Ausset, Witz-Koenig, J. Fries, Pélissier, E. Schwartz, B. Haussmann, Eck Leber, and J. Schlumberger jeune, in Alsace; Verdan *père et fils* in Neuchâtel; Dupasquier in Cortaillod; Baumgartner in Middleton; Thompson at Primrose Mill in Clitheroe; Graham at Thomas Hoyle in Manchester; Koechlin Ziegler, Trumpy de Schwanden, and Gastard in Colmar; H. Schlumberger, G. Steinbach, N. Hoffer in Mulhouse; Jacob de Saint-

influence among calico printers across Europe and his personal connections, which enriched the work's detailed information on *fabricants*. The collections of swatches are still in very good condition, and they are evidence of a cosmopolitan network of calico printers, dyers, engravers, and designers of printing machines. Sadly not all the geographic origins of the samples are referred to in the text, but a good number of them provide useful information about the cities, towns, artisans, and firms (see Table).

Detailed descriptions of dyeing and printing formulae accompanied the coloured swatches and reflected the dynamism of the network. Swatch number 103, for instance, describes Steiner's Turkey red procedure as follows:

*Depuis quelques années, M. Steiner exploite en Angleterre et à Ribeauvillé (Haut-Rhin), dans un établissement dirigé par son neveu, ancien élève de M. Chevreul, un procédé de son invention dont les produits jouissent d'une grande supériorité, sous le triple rapport de l'économie, de la vivacité de la couleur et de la régularité de la fabrication. C'est à l'obligeance de ce fabricant que nous devons l'échantillon 103.*<sup>7</sup>

Persoz also expressed his indebtedness for slight modifications of Steiner's formula to "*M. Gastard, auquel on doit déjà l'application directe de la matière colorante de la garance, qui en est l'auteur ; il a bien voulu nous autoriser à le publier*".<sup>8</sup>

We know that Frédéric Steiner (1788–1869) learned the art of calico printing with Daniel Koechlin in Alsace, and later travelled from France to England to learn the secrets of Turkey Red dyeing.<sup>9</sup> In 1831, his nephew Charles Émile Steiner joined him in England after studying with Chevreul in Paris. Steiner's family thus established another element in the network and became a point of reference for English calico printers.<sup>10</sup>

With its heart in Mulhouse in southern Alsace, the network had important nodes in Manchester, Munster, Rouen, and Paris, as well as minor connections – at least for the data that emerge from the *Traité* – in other

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Pierre, Depouilly in Puteau; and Girardin and Grelley in Rouen. Jean-François PERSOZ, *Traité*, I. Preface, p. xxi.

<sup>7</sup> Jean-François PERSOZ, *Traité*, IV, pp. 206–207.

<sup>8</sup> Jean-François PERSOZ, *Traité*, IV, p. 207.

<sup>9</sup> George TURNBULL (J.G. Turnbull, ed.), *A History of the Calico-Printing Industry in Great Britain*, Altrincham, St Ann's Press, 1951, p. 75.

<sup>10</sup> Joyce STOREY, "La vie et l'œuvre de Frédéric Steiner (1788–1869)", pp. 52–60, in Jacqueline JACQUÉ, Dominique CARDON, et al., *Andrinopole. Le rouge magnifique. De la teinture à l'impression, une cotonnade à la conquête du monde*, Paris, Mulhouse, Éditions de la Martinière, Musée de l'impression sur étoffes, 1995.

French cities, and in Switzerland, Glasgow, and Barcelona. The *Traité* also referred quite often to relevant academic sources of the art of dyeing and printing across Europe, such as Delormois, Homassel, Vitalis, Dingler, Runge, Thillaye, Schlumberger, Berthollet, Chevreul, Chaptal, Dumas, Girardin, and Thenard.<sup>11</sup>

From a reading of the pages of the *Traité*, a sort of “Republic of chemist-dyers” emerges.<sup>12</sup> This network aimed to integrate *fabricants*, dyers, chemists, colours, and machines through a combination of chemical, mechanical and artistic skills within an international network. Under Persoz’s supervision as a kind of ‘president’, the circulation reinforced particular nodes in the network: Lancashire, Mulhouse and its *Société Industrielle*, the French chemical and dyeing industry in Rouen, Lyon and Montpellier. In the complex intersection between chemical and dyeing skills, the “Republic of chemist-dyers” provided authority and a progressive consensus for a continuous process of innovation.

## REINFORCING THE NETWORK: JOURNEYS AND INTERNATIONAL EXHIBITIONS

Persoz’s contribution to the “Republic of chemist-dyers” went beyond the compilation and diffusion of his *Traité* of 1846. The network evolved not only through the circulation of printed texts with swatches, but also through personal visits and the transfer of machines and colours, and thanks to informal local gatherings which were internationally well connected. Persoz occupied prominent positions in the juries of several national and international exhibitions in Paris and London (1849, 1851, 1855, 1862, 1867), and his reports reflected a thoroughly documented cross-cultural knowledge

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<sup>11</sup> Jean-François PERSOZ, *Traité*, I. Preface, p. iii. Some relevant books on the art of dyeing and printing by the authors cited above are worth mentioning: Claude-Louis BERTHOLLET, *Eléments de l’art de la teinture*, 2 vols., Paris, Firmin Didot, 1791; Jean-Antoine CHAPTAL, *Principes chimiques sur l’art du teinturer-dégraisseur*, Paris, Déterville, 1808; Michel-Eugène CHEVREUL, *Leçons de Chimie appliquée à la Teinture*, 2 vols, Paris, Pichot et Didier, 1829–30; DE LORMOIS, *Le nouveau teinturier*, Paris Ch. A. Jombert, 1800 (1<sup>st</sup> edition 1716); Jean GIRARDIN, *Chimie générale et appliquée*, 4 vols., Paris, Victor Masson et fils, 1869; HOMASSEL, *Cours théorique et pratique sur l’art de la teinture en laine, soie, fil, coton*, Paris, Courcier, 1798; Jean-Baptiste VITALIS, *Cours élémentaire de teinture sur laine, soie, lin, chanvre et coton et sur l’art d’imprimer les toiles*, Paris, Galerie Bossagne Père, 1823; Jean-Baptiste DUMAS, *Traité de chimie appliquée aux arts*, 8 vols. + atlas, Paris, Béchét jeune, 1828–1846; Friedlieb Ferdinand RUNGE, *Chemie der Färbenden Pflanzen Farben-Chemie (dritter Teil): Die Kunst der Farbenbereitung*, Berlin, Mittler und Sohn, 1850; L.J.S. THILLAYE, *Manuel du fabricant d’indiennes*, Paris, Roret, 1834.

<sup>12</sup> For the definition of this category see my chapter “Circulating skills in a European Network: the ‘Republic of ‘chemist-dyers’”, pp. 123–51, in Agustí NIETO-GALAN, *Colouring Textiles*.

of dyeing and textile printing techniques.<sup>13</sup> After the Great Exhibition of 1851 he published the report of the “XVIII<sup>e</sup> jury” – *impressions et teintures* – which brought together the opinions of prestigious international experts on dyeing and textile printing.<sup>14</sup> After delivering the awards for the best novelties on the art of dyeing and printing, Persoz wrote an exhaustive report of the major international developments in the field. He attempted to evaluate the progress of the art of printing textiles, and classified and described the products displayed at the Exhibition by the various countries.

After interviewing many practitioners from both France and Great Britain, and after a careful analysis of the products and swatches of both countries, Persoz reached some general conclusions that are of interest for an understanding of the nature of the network. Among the main achievements of the British, he mentioned mechanization – in particular printing machinery – and mass production, noting the advantages that accrued from the availability of huge markets. He felt that France, on the other hand, was slow to acquire new machinery and was over-dependent on the importation of technical equipment: France, however, retained its old tradition of “bon goût”, of high-quality coloured fabrics. Engraving seemed to be a widespread technique in England, especially in the Manchester area.

Some years earlier, the art of dyeing and printing in the two countries had also been compared by two Alsatian calico printers who travelled through the network. On their journey to England in July 1837, Henri Schlumberger and Auguste Scheurer had this to say:

*C'est toujours l'Alsace qui est le point de mire de l'indienneur anglais ; ses dessins et ses genres sont calqués sur les nôtres. Mais si, pour ce qui est de l'artistique et du goût des dessins, nous avons le pas sur l'Angleterre, il n'en est malheureusement pas ainsi des arts purement mécaniques. Si nous nous arrêtons à la machinerie, vous verrez d'abord, Messieurs, à l'inspection des prix courants que nous vous soumettons, une notable différence sur les prix des machines*

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<sup>13</sup> See, for example, Jean-François PERSOZ, “Impressions et Teintures”, V, pp. 1–74, in *Travaux de la Commission française sur l'industrie des nations*, 5 vols., Paris, Imprimerie Royale, 1854; Jean-François PERSOZ, “Teintures et Impressions”, “Toiles vernies, cirées et gommées”, V, pp. 158–200, pp. 145–51 in *Exposition Universelle de Londres de 1862. Rapports des membres de la section française du jury international*, 5 vols., Paris, Imprimeries Centrales des chemins de fer, 1862.; Jean-François PERSOZ, “Couleurs, matières tinctoriales, teinture et impression, procédés de blanchiment, etc.”, II, pp. 776–94, in *Rapport du jury central sur les produits de l'agriculture et de l'industrie exposés en 1849*, Paris, Imprimerie Nationale, 1850.

<sup>14</sup> English calico printers such as Edmond Porter, John Hargreaves, and C. Swaisland; French chemists such as Persoz and Chevreur; Swiss printers such as Henry Pahud and Charles Boves; and the Scottish dyer Alex Harvey from Glasgow. Jean-François PERSOZ, “Impressions et Teintures”, in *Travaux de la Commission française*, V, p. 1.

*à imprimer, anglaises, d'avec les nôtres... Les drogues et les produits chimiques s'y vendent aussi à des prix inférieurs aux nôtres.*<sup>15</sup>

From their position of privilege in the network, in which they were able to make comparisons, Schlumberger and Scheurer also noted that the British model had been notably imitated in Rouen. Low-quality, mass production of printed cottons in a highly mechanized industrial environment provided good results for the industry in Normandy. In their visits to British firms, they tried to record all the new machines which they thought might be introduced in Alsace and might arouse the interest of the members of the Société Industrielle de Mulhouse.<sup>16</sup> The last paragraph of their report clearly showed the mechanisms of circulation of ideas and objects they were able to use within the “Republic”:

*Nous ne terminerons cette communication, Messieurs, sans donner ici un témoignage en quelque sorte public de reconnaissance, à notre ami et compatriote, M. Adam Baumgartner, pour tous les services qu'il s'est plu à nous rendre pendant notre séjour en Angleterre. Si nous avons eu la facilité de visiter les établissements de Manchester et d'Ecosse qui nous ont offert tant d'intérêt, c'est grâce à sa serviable intervention et à sa recommandation si puissante auprès ses nombreux amis... Nous vous proposerons aussi de donner ce même titre de membre correspondant, à M. Walter Crum, de Glasgow,<sup>17</sup> persuadé que cet homme si distingué par ses connaissances scientifiques et industrielles, ne refusera pas de joindre ses efforts aux nôtres, toutes les fois que l'on voudra faire un appel à ses lumières.*<sup>18</sup>

Some years later, after the International Exhibition of 1862 in London, Persoz prepared another state-of-the-art report on “impressions et teintures” at a time when the new aniline colours had registered a notable victory. August Wilhelm Hofmann (1818–1892), the director of the Royal College of Chemistry and the master of William Perkin (1838–1907), displayed samples

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<sup>15</sup> “Extrait d'un rapport fait par MM. Henri Schlumberger et Auguste Scheurer, sur quelques observations recueillies par eux, en Angleterre, en Juillet 1837”, *Bulletin de la Société Industrielle de Mulhouse*, n° 11, 1838, pp. 33–57 and 66–69 (35–36).

<sup>16</sup> “Extrait d'un rapport fait par MM. Henri Schlumberger et Auguste Scheurer”, pp. 41–42.

<sup>17</sup> “Extrait d'un rapport fait par MM. Henri Schlumberger et Auguste Scheurer”, pp. 68–69.

<sup>18</sup> Walter Crum studied practical chemistry in the laboratory of Thomas Thomson at Glasgow and applied his knowledge in his own factory. He was introduced into scientific circles, where his acquaintances included Faraday, Liebig, and Thomas Graham. See Agustí NIETO-GALAN and Bernadette BENSUADE-VINCENT, “Theories of dyeing”, pp. 10–11.

of artificial dyestuffs in the presence of Queen Victoria. However, Persoz expressed his concern that the new colours could seriously jeopardize the tradition of the art of dyeing and printing with natural colours. In his report, he focused on the international approach to the old technological system. In the Republic, he identified important progress when comparing samples and exhibitors with those of the previous exhibition in 1851. Design, engraving, mechanical printing, mordants, bleaching techniques, and finishing processes were perceived as more advanced, but were all discussed within the framework of natural dyestuffs.<sup>19</sup>

From the Franco-British perspective, Persoz concluded that, in terms of quality, the hegemony of French dyeing procedures, especially for wool and silk, was likely to be challenged in the near future by the emergence of new artificial colours. He recommended that the French government should ease the importation of raw materials and improve the copyright system so as to protect French designers. He also urged that technical education should be strengthened, as should also contacts with foreign dyers and printers.

His detailed report, though apparently written from a French perspective, in practice contained an excellent description of the main features of the Republic as a network for the circulation of instructions for procedures, dyers, chemist, texts, and machines.

## CONCLUSION

Back at the centre, in 1852 the Conservatoire Impérial des Arts et Métiers offered Persoz a chair of “Teinture, impression et apprêt des tissus”, and in the following year he became Director of the “Condition des soies et laines”, a post that he held until his death in 1868. From his chair, Persoz shared with his students his extensive industrial experience and a cosmopolitan approach to the art of dyeing and printing textiles, which had to embrace as many foreign innovations as possible. Although he published a number of papers on specific aspects of the art of dyeing and printing, the *Traité* was the finest testimony to the extent and trans-European dimension of his expertise. It became a natural choice as a fundamental textbook in the chemical section of the Industrial Engineering School in Barcelona for the courses on textiles and dyes. Nevertheless, as I showed some years ago in the book I co-edited with Robert Fox in 1999, Persoz himself had a low view of the creative ability of the Catalan textile industry. In the report on the Great Exhibition of 1851, he stated that:

*... dans les environs de Barcelone il existe aujourd'hui plus de vingt manufactures des toiles peintes, [mais] aucun produit*

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<sup>19</sup> Jean-François PERSOZ, “Teintures et Impressions”, p 175, in *Exposition Universelle de Londres de 1862*.

*de cette espèce n'a figuré dans l'exposition de ce pays. S'il faut croire ce qu'on nous a dit à ce sujet, les fabricants d'indiennes de cette intéressante contrée industrielle, imitateurs des impressions anglaises et surtout des impressions françaises, se seraient abstenues par cette raison de fournir leur contingent de tissus imprimés.*<sup>20</sup>

In spite of the lack of capacity for designing and manufacturing original printed cottons on an industrial scale, Persoz considered the area of Barcelona as a dynamic industrial site that was able rapidly to assimilate foreign technical innovations derived from the network. Indeed, Catalan calico-printers were eager to import textile machinery from abroad and to imitate foreign patterns. They had their own travellers across the network, men whose activities occasionally extended to industrial espionage.<sup>21</sup> In this way, they also formed part of the multi-centred symmetrical network of the “Republic of chemist-dyers”, in which persons, ideas, machines, and dyeing formulae circulated in profusion. In this context, the distinction between centres and peripheries seems to disappear.

Tracing back Persoz's own biography, we can identify a centre in Strasbourg during his years at the University, when he established close links with the Alsatian lobby of calico printers associated with the Société Industrielle de Mulhouse. However, we could equally place the centre in Mulhouse itself, or, later, in Paris when Persoz began to teach at the CNAM, or perhaps earlier in Manchester, an international site of reference for machinery and engraving where Steiner's procedures for Turkey red were refined. Catalan chemists and dyers also circulated within the network, contacting prominent figures such as Chevreul, importing books, machines, and recipes for the local printing firms, and thereby becoming a crucial industrial centre for Spain during the nineteenth century.

It is time, in conclusion, to return to the STEP founding document. This emphasizes the fact that:

*Relatively recent work in the historiography of science has developed various models of networks, which might be of some potential use for our purposes. Scientific practices*

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<sup>20</sup> Jean-François PERSOZ, “Impressions et Teintures”, V, p. 58, in *Travaux de la Commission française sur l'industrie des nations*. Cited in Agustí NIETO-GALAN, “Dyeing, calico printing, and technical travels in Spain: the Royal Manufactures and the Catalan textile industry, 1750–1820”, pp. 101–28, in Robert FOX and Agustí NIETO-GALAN (eds), *Natural Dyestuffs*, p. 101.

<sup>21</sup> Agustí NIETO-GALAN, “Under the banner of the Catalan industry: scientific journeys and transfer of technology in nineteenth-century Barcelona”, pp. 102–25, in Ana SIMOES, Ana CARNEIRO, and Maria Paula DIOGO (eds), *Travels of Learning. A Geography of Science in Europe*, Dordrecht, Kluwer, 2003.

*progressively acquire a homogeneous character through the consensus of the practitioners. This can be understood as dependent on the dynamics of the international network of practitioners, and, hence, the categories of center and periphery cease to be so dominant in the explanatory schemata.*

*There are, of course, relevant nodes in the network that emerge, in a way, as new centers of attraction for the interest of foreign scholars. In addition, networks might help us to revisit the traditional ways of presenting the local-universal tension in science. In that sense an 'obscure' local practitioner represents a useful complement of the work of a great luminary in a particular scientific discipline.<sup>22</sup>*

**Table: The origin of some coloured swatches in Persoz's *Traité***

Swatch	Authors	Place
15	Silberman, <i>imprimeur</i>	Strasbourg
20–30	Banguerel	Alsace
32	Koechlin Ziegler	Mulhouse
36	Charles Verdán, <i>graveur</i>	Barcelona
41,42	Dolfus Mieg	Mulhouse
47	[madder-garance]	Avignon
48	[madder-garance]	Alsace
53	Godefroy, Troublé, <i>imprimeurs</i>	Puteau
58	Dupasquier	Bordeaux [?]
71	Eck	Cernay
102	Jenny et Blumer	Schwanden
103	Steiner, rouge tourc	Manchester
121	Thomas Hoyle and Son	Manchester
129	Hartmann, Dolfus Mieg	Munster, Mulhouse
139	Grant et brothers	Bury
141	Japuis	Claye (Paris)
144, 145	Steiner	Ribeauvillé (Haut-Rhin)
160	Stackler	Rouen
161, 161	R. Peel	Manchester
188	Keittinger	Rouen
201		Munster
210	Steiner, Gastard	Manchester, Colmar

<sup>22</sup> "Using networks to further our understanding of the dynamics of the various scholars from the societies in the periphery of Europe". STEP. Founding document, Barcelona, 1999 (<http://www.uoa.gr/step>).

*Networks and Peripheries*

215	Gastard, Stackler	Colmar, Rouen
216	Girardin, Grelley, Fouquet	Rouen
258	Wilson and Barton, machines	Manchester
260	Fries, Steinbach	
269	Koechlin Schouc	
276	Dolfus Mieg	Mulhouse
279	Schwartz, Schlumberger	Mulhouse
320	Hartmann	Munster
323	Thompson	Clitheroe
341	Steinbach	Mulhouse
344	Muir Brown	Glasgow
352	Steiner	Manchester
395	Japuis	
403	Weissgerber	
417	Jourdan	