

LEARNING FROM ENTREPRENEURIAL FAILURE

Leo Baekeland's Exit from Europe

- Joris Mercelis¹ -

150 years after the birth of Leo H. Baekeland (1863-1944), one of Belgium's most celebrated chemists and high-tech innovators, it has become a priority of policy-makers and academic administrators on both sides of the Atlantic to make university science students and/or faculty more entrepreneurial. It is therefore significant that Baekeland became a successful entrepreneur only after his move to the United States and departure from academia in 1889. Drawing on new source material and various conceptual frameworks regarding the determinants of successful entrepreneurship, this article will reconsider why this was the case. Consistent with recent evidence in entrepreneurship research, it will pay special attention to the institutional incentives faced by Baekeland and examine whether these were responsible for the failure of his first business endeavor. Yet this article will also consider the possibility that non-institutional factors mattered more than the influence of institutional considerations.

Academia has long been a congenial setting for various types of actions and behaviors that could reasonably be termed “entrepreneurial”. The pursuit of organizational innovations, such as the creation of new departments and programs or the adjustment of existing ones in response to changing societal needs and demands, provides one of the more obvious examples. Others include fundraising efforts, the establishment of networks of contacts and resources and of scientific “research schools”, and the conversion of scientific authority and prestige into financial capital by means of industrial consulting work². However, in popular usage as well as in the academic literature, the term entrepreneurship is often equated more narrowly with the founding of new firms. Furthermore, it is widely believed that in this sense, entrepreneurship did not gain a firm footing in academia until the second half of the twentieth century, which witnessed the emergence of university technology transfer offices, venture capital institutions, and several thousand academic biotechnology start-ups, among others things.

The Belgian-American chemical innovator Leo H. Baekeland (1863-1944) was among the academic risk takers who, many decades earlier, did found a business start-up while remaining affiliated with his educational institution(s). When Baekeland co-established *Dr Baekelandt et Compagnie*, a photochemical enterprise, in late December 1887, his appointment as an assistant to the course in general chemistry at the State University of Ghent had just been renewed³. In addition, it was still unclear how long it would take to find a suitable candidate to replace him at the *Middelbare Normaalschool* of Bruges, a teacher training college, where he had been teaching chemistry and physics since the academic year of 1886-87⁴. On the face of it, the history of *Dr Baekelandt et Cie*, a limited partnership (*société en commandite simple*), supports popular notions as to the incompatibility of “traditional” universities and commercial risk taking. Unlike later Belgian-born entrepreneurial scientists such as Marc Van Montagu (b. 1933) or Désiré Collen (b. 1943), Baekeland, the inventor of

1. I am grateful to the anonymous referees of the *Journal of Belgian History* for their valuable comments and suggestions and to Joseph Dunlop for his editing work. In addition, I would like to thank Anna Guagnini and Matteo Serafini for sharing their views on the history of academic entrepreneurship, and Ruben Mantels for his advice regarding the situation at the State University of Ghent. Finally, I am indebted to Nico Wouters and Willem Erauw for their help and encouragement in working towards the definitive version of this article. 2. For examples, see STATHIS ARAPOSTATHIS & GRAEME GOODAY, *Patently Contestable: Electrical Technologies and Inventor Identities on Trial in Britain*, Cambridge, MA, 2013; GERALD L. GEISON & FREDERIC L. HOLMES (eds), “Research Schools: Historical Reappraisals”, in *Osiris*, 1993 (8), p. 1-248; SUSAN MORRIS, *Resource Networks: Industrial Research in Small Enterprises, 1860-1930*, Ph.D. dissertation, Johns Hopkins University, 2003; NATHAN ROSENBERG, “America’s Entrepreneurial Universities”, in DAVID M. HART (ed.), *The Emergence of Entrepreneurship Policy: Governance, Start-ups, and Growth in the US Knowledge Economy*, Cambridge/New York, 2003, p. 113-137. On the historical development of the relations between academia and industry in Belgium, see KENNETH BERTRAMS, *Universités & entreprises: milieux académiques et industriels en Belgique, 1880-1970*, Bruxelles, 2005. 3. Early in his career Baekeland typically gallicized his name as “Léon Baekelandt” or “Backelandt”. 4. State Archives in Ghent, collection 285, folders 648 and 670 (Archives of Teacher Training College of Bruges, 1879-1888). Baekeland had offered his resignation by 30 December 1887. In April 1888 scientist Paul Pelseener (1863-1945) was selected as his successor.

“Velox” photographic paper and “Bakelite” plastic, achieved business success only after having departed from both academia and his home country⁵. Moreover, while his teaching and research obligations at the University of Ghent and the Teacher Training College of Bruges clearly did not prevent him from venturing into business, they have been cited as a reason for his initial difficulties⁶.

entrepreneurial decisions and opportunities that Baekeland made and perceived in these years to his upbringing in a relatively poor family and his technical secondary education – an unusual background from which to enter academia. Accordingly, a primary goal of this article is to offer new insights into a crucial part of Baekeland’s career, about which relatively little is known.

Table 1 : Baekeland as Scientific Entrepreneur

Year	Professional position or achievement
1880	Graduation from Industrial School of Ghent (<i>Ecole Industrielle de Gand</i>)
1884	Ph.D. in Natural Sciences, State University of Ghent
1885-89	Assistant to course in general chemistry, University of Ghent
1886-87	Professor in Chemistry and Physics, Teacher Training College of Bruges
1887	Laureate of <i>concours universitaire</i> , Royal Academy of Belgium
1887-90	Dr Baekelandt et Compagnie
1889	<i>Agrégé spécial</i> , Faculty of Sciences, University of Ghent
1889-90	Research chemist, E. and H.T. Anthony & Co.
1893-99	Nepera Chemical Co. (commercial introduction of “Velox” photographic paper in 1895)
1904	President of Chemists’ Club, New York
1907	Invention of “Bakelite” plastic
1909	President of American Electrochemical Society
1910-21	President of General Bakelite Co.
1912	President of American Institute of Chemical Engineers
1917-44	Honorary Professor, Columbia University
1918	Acting Chairman, Committee on Patent Reform, National Research Council
1922-39	President of Bakelite Corporation
1924	President of American Chemical Society

Based on new evidence, this article will reconsider the history of Dr Baekelandt et Cie, from the partnership’s foundation at the end of 1887 up to its dissolution in 1890. This will include an analysis of Baekeland’s move to the U.S. in the summer of 1889 and his decision to settle down there, which brought an end to his direct involvement in the Ghent-based photochemical firm. It will also connect the

My second and more ambitious aim is to suggest more general lessons for entrepreneurship research on the basis of my case study. Consistent with a recent trend in this field of study, I will put a special emphasis on the role of “institutions”, that is, the formal and informal rules and norms that enable and constrain the actions of socio-economic agents. Following in the footsteps

5. As indicated in table 1, Baekeland would return to academia in 1917, when Columbia University engaged him as an honorary professor. 6. Cf. below, p. 5.

of Douglass C. North, William J. Baumol, and others, many economists and economic historians have come to regard the supply of “productive” entrepreneurs in a given society as dependent upon the reward structures for its entrepreneurially-minded inhabitants. The presence of these potential entrepreneurs is taken for granted, but it is argued that they will only attempt to exploit perceived market opportunities if provided with incentives to do so. Whether or not this is the case hinges, in this view, on institutional arrangements and attitudes with regard to the rule of law, novelty seeking and risk taking, among other things⁷. The empirical evidence supporting this institutional theory of entrepreneurship, drawn from case studies ranging from ancient Mesopotamia and Greece to twentieth-century industrial and developing countries, is strong and highly diverse⁸. But the application of the “new” variant of institutional economics,

developed from the 1960s onward, to entrepreneurship research has not been uniformly successful. Three drawbacks or risks are especially relevant to this article⁹. The first stems from the combination of a focus on institutions and entrepreneurs as the main units of analysis with a sometimes overly individualistic notion of entrepreneurial agency, reflecting a “liberal creed” of “individual autonomy and discretion”¹⁰. As sociologist Mark Granovetter and others have emphasized, this perspective does not always do justice to the complexity of the social structures in which entrepreneurs were embedded and the ways in which these affected their actions and decisions, particularly but not exclusively in non-Western settings¹¹. To avoid this pitfall, the social pressures that influenced Baekeland’s entrepreneurship will be an important theme in my analysis and the autonomy of his decision making will not be taken for granted.

7. See , for example, WILLIAM J. BAUMOL, *The Microtheory of Innovative Entrepreneurship*, Princeton (NJ), 2010, chapters 8-10; BRADLEY A. HANSEN, *Institutions, Entrepreneurs, and American Economic History : How the Farmers’ Loan and Trust Company shaped the Laws of Business from 1822 to 1929*, New York, 2009; DAVID S. LANDES, JOEL MOKYR & WILLIAM J. BAUMOL (eds), *The Invention of Enterprise : Entrepreneurship from Ancient Mesopotamia to Modern Times*, Princeton (NJ), 2010; WIM NAUDÉ, “Entrepreneurship is Not a Binding Constraint on Growth and Development in the Poorest Countries”, in *World Development*, no. 1, 2011 (39), p. 33-44. 8. GEORGE C. BITROS & ANASTASSIOS D. KARAYIANNIS, “The Liberating Power of Entrepreneurship in Ancient Athens”, in YOUSSEF CASSIS & IOANNA PEPELASSIS MINOGLU (eds), *Country Studies in Entrepreneurship : A Historical Perspective*, Houndmills, Basingstoke (Hampshire)/New York, 2006, p. 11-22; FERRY DE GOEY & JAN WILLEM VELUWENKAMP (eds), *Entrepreneurs and Institutions in Europe and Asia, 1500-2000*, Amsterdam, 2002; PAOLO DI MARTINO, “Legal Institutions, Social Norms, and Entrepreneurship in Britain (c. 1890-c. 1939)”, in *The Economic History Review*, no. 1, 2012 (65), p. 120-143; LANDES, MOKYR & BAUMOL (eds), *The Invention of Enterprise*. 9. A further challenge is that the impact of institutions is hard to measure quantitatively – one of the reasons why in-depth qualitative case studies remain important. See STEFAN VOIGT, “How (Not) To Measure Institutions”, in *Journal of Institutional Economics*, 2013 (9), p. 1-26. 10. HOKYU HWANG & WALTER W. POWELL, “Institutions and Entrepreneurship”, in SHARON ALVAREZ, RAJSHREE R. AGARWAL & OLAV SORENSON (eds), *Handbook of Entrepreneurship : Interdisciplinary Perspectives*, New York, 2005, p. 201-232 (here p. 201). 11. FREDRIK BARTH (ed.), *The Role of the Entrepreneur in Social Change in Northern Norway*, Bergen et al., 1967; MARK GRANOVETTER, “The Economic Sociology of Firms and Entrepreneurs”, in RICHARD SWEDBERG (ed.), *Entrepreneurship : The Social Science View*, Oxford/New York, 2000, p. 244-275, and “Economic Institutions as Social Constructions : A Framework for Analysis”, in *Acta Sociologica*, no. 1, 1992 (35), p. 3-11.



*Leo Baekeland during his first years in the United States.
(Chent University, Museum for the History of Sciences)*

A second problem concerns the one-sided perspective through which the relations between entrepreneurs and institutions have most commonly been examined. This particular approach has been used to study the impact of institutions on entrepreneurial activity rather than examining how entrepreneurs have tried to shape the institutional environments in which they operated. This limitation is consistent with the understanding of institutions as durable entities, and the contrasting association of entrepreneurship with innovation and change, in much of the social science literature. A more balanced picture has only recently started to emerge through studies on “institutional entrepreneurship”, a notion that apparently accommodates these conflicting connotations¹². The concept is highly relevant to the analysis in this article because it is known that the older Baekeland qualified as an institutional entrepreneur, if only on account of his efforts to make the U.S. patent system more European in character¹³. Such themes are also evident in connection with Dr Baekelandt et Cie and his migration to New York, as the chemical innovator explicitly reflected on differences and similarities between American and European institutions and their impact on his own career.

Finally, the loose and sometimes inconsistent ways in which the term “institutions” has been used and defined poses a major challenge for entrepreneurship research. For instance, it is striking that well-known (and often controversial) arguments about the importance of cultural and religious factors as determinants of entrepreneurship and economic growth are now being discussed under institutional labels¹⁴. This semantic twist is arguably a logical result of the inclusion of informal norms, values, and attitudes under the concept of institutions, in addition to formal institutions such as laws. For example, if such a broad definition is followed, peer acceptance of academic entrepreneurship can be analyzed very similarly through cultural and institutional lenses. Attitudes towards novelty seeking and risk taking can likewise be considered as either institutional or cultural determinants of entrepreneurship. In the main part of this article, such questions of classification will be subordinate to the identification of the causes that explain why Baekeland’s first business endeavor failed. However, I will return to this problem in the conclusion, when evaluating the relative merits of the institutional approach to entrepreneurship.

12. BRADLEY A. HANSEN, *Institutions, Entrepreneurs, and American Economic History : How the Farmers’ Loan and Trust Company shaped the Laws of Business from 1822 to 1929*, New York, 2009, p. 7; MAGNUS HENREKSON & TINO SANANDAJI, “The Interaction of Entrepreneurship and Institutions”, in *Journal of Institutional Economics*, no. 1, 2011 (7), p. 47-75; HWANG & POWELL, “Institutions and Entrepreneurship”, p. 182 and 201. **13.** JORIS MERCELS, “Leo Baekeland’s Transatlantic Struggle for Bakelite : Patenting Inside and Outside of America”, in *Technology and Culture*, no. 2, 2012 (53), p. 366-400. **14.** An example is MANJULA SALIMATH & JOHN B. CULLEN, “Formal and Informal Institutional Effects on Entrepreneurship : A Synthesis of Nation-Level Research”, in *International Journal of Organizational Analysis*, no. 3, 2010 (18), p. 358-385 (here p. 365-67). See also GARRY D. BRUTON, DAVID AHLSTROM & HAN-LIN LI, “Institutional Theory and Entrepreneurship : Where Are We Now and Where Do We Need to Move in the Future ? ”, in *Entrepreneurship Theory and Practice*, no. 3, 2010 (34), p. 421-440 (here p. 423 and 431-432).

I. Dr Baekelandt et Cie

The failure of *Dr Baekelandt et Compagnie*, a limited partnership (*société en commandite simple*) established at the end of December 1887, has been ascribed to a variety of reasons. Randomly listed, they include the (alleged) distaste for business of Théodore Swarts, the chemistry professor whom Baekeland assisted at Ghent University and whose daughter Céline he would marry in 1889; a disconnect between academic and industrial chemistry; Baekeland's lack of time due to his obligations at the State University of Ghent and the Teacher Training College in Bruges; Baekeland's premature abandonment of the enterprise; intense competition from other home- as well as foreign-based photographic enterprises; financing problems; and Baekeland's unfortunate decision to try to innovate in the area of glass plates at a time when, internationally, more flexible celluloid films were about to be introduced¹⁵. In the following paragraphs, I will throw new light on this episode on the basis of Baekeland's correspondence with his wife, Céline, as well as other letters and a series of legal documents concerning the firm's history, which Baekeland received from his

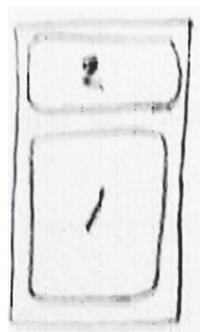
lawyer after his move to the United States. In brief, these sources suggest that financing difficulties and a lack of business experience, as well as commitment, were more important determinants of failure than technical setbacks. That conclusion confirms the observation of historian Susan Morris that the partnership's "struggle with technical problems should not be exaggerated"¹⁶. Nonetheless, as *Dr Baekelandt et Cie* was primarily established for bringing a photographic invention of Baekeland to market, it seems appropriate to start the analysis with a brief elucidation of the invention and the technological field to which it belonged.

Baekeland, a passionate amateur photographer, had aimed at making the predominant photographic process of the 1880s easier to use. That process, the gelatin silver halide dry plate technique, essentially consisted of four steps : 1) the photograph-taking, a process in which an exposure to light resulted in the creation of a latent image on the carrier of the gelatin silver halide photographic emulsion; 2) the chemical development of this invisible image into a visible negative; 3) its "fixing", also by chemical means; and 4) the making of prints. In the second half of

15. GEORGES ANTHEUNIS, *Leo Baekeland*, Gent, 1988, p. 28; GEORGES ANTHEUNIS, GUIDO DESEYN & MARC VAN GIJSEGEM, *Focus op fotografie : fotografie te Gent van 1839-1940*, Gent, 1987, p. 192-193; JAN GILLIS, *Leo Hendrik Baekeland : Verzamelde oorspronkelijke documenten*, Brussel, 1965, p. 10-11 and 32-33; JULES HENS & LAURENT ROOSENS, *De Belgische fotochemische industrie : met behartiging van de chemische nijverheid (1879-1939)*, Brussel, 2008, p. 152-153; CARL KAUFMANN, *Grand Duke, Wizard and Bohemian : A Biographical Profile of Leo Hendrik Baekeland (1863-1944)*, M.A. thesis, University of Delaware, 1968, p. 22-26; SUSAN MORRIS, *Resource Networks : Industrial Research in Small Enterprises, 1860-1930*, Ph.D. dissertation, Johns Hopkins University, 2003, p. 185-188; KRISTEL WAUTIER & DANNY SEGERS, "Nothing succeeds like success' : Het levensverhaal van Leo Baekeland, de uitvinder van het bakeliet", in *Heemkundige kring De Oost-Oudburg v.z.w.*, jaarboek, 2007 (44), p. 125-178 (here p. 146). The research documentation of Jules Hens and Laurent Roosens, available in the FotoMuseum in Antwerp, helped me identify relevant source material.

16. SUSAN MORRIS, *Resource Networks...*, p. 187.

1887 and the first half of 1888, Baekeland was granted patent protection in, at least, Belgium, the United Kingdom, Germany, and the Austro-Hungarian Empire for a new type of dry plate that automatized the second step¹⁷. According to an eyewitness, and as the academic inventor himself later illustrated in a laboratory notebook, Baekeland mixes his developer in two separate portions with



gum arabic, and puts it on the back of the plate in different parts of the plate so that the different chemicals in the developer are not mixed together until the solutions dissolve and therefore no decomposition takes place, and as the gum

Arabic makes a pasty mixture, there is no danger of the developer running around on the face of the plate¹⁸.

Baekeland assigned his intellectual property rights on this invention to a limited partnership named after him, which was registered on 3 January 1888 at the Commercial Court of Ghent. As was legally required with this

type of organization, the firm's articles of association distinguished between a managing partner fully liable for possible debts (Baekeland) and a silent partner/investor whose liability was, in principal, limited to her or his initial contribution – in this case, the provision of a recently erected property on 120 Palinghuizen street (*rue des Anguilles*) in Ghent as well as a sum of 20,000 Belgian francs. This statutory distinction can be traced back to Napoleon's *Code de Commerce* and, compared to ordinary partnerships, was meant to better protect investors who were not interested in actively running firms against opportunistic behavior on the part of their associates. Yet Baekeland's partner/investor, Valérie Gleesener-Guequier – the daughter of Stéphanie-Constance Gleesener-Duhayon (1815-91), a widow of considerable wealth – and her husband, Jules Guequier, were not simply uninvolved investors. Together with the managing responsibilities that they agreed to undertake came the obligation to stand surety for potential debts. In particular, the founding agreement specified that Baekeland and Gleesener were to share equally in profits and take mutual responsibility for losses at the end of each year.

17. See Belgian patent no. 78,957 (“Des plaques photographiques développables dans l’eau”); British patent no. 1201 – 1888 (“Improved photographic plate to be developed in water”); the Austro-Hungarian patent entitled “Verfahren zur Herstellung von in Wasser entwickelbaren photographischen Trockenplatten”; and German patent no. 43,521 (“Photographische Trockenplatten, welche durch Eintauchen in Wasser entwickelt werden”). Additionally, in the context of the partnership's dissolution, Baekeland's lawyer Octave Bruneel referred to a French and an Italian patent; see BRUNEEL, letter to unnamed recipient, 31 August [1890] [Smithsonian Institution, Archives Center, National Museum of American History, *Leo H. Baekeland Papers* (hereafter LBP), series 8, box 34, folder 1]. See also Belgian patents nos. 81,796 (“Préparation de plaques photographiques sèches, que se développent par l’immersion dans l’eau”, in Baekeland's name); and 80,803 (“Nouvelle disposition pour emballer les plaques photographiques”, in the name of Dr Baekeland et Cie). 18. RICHARD ANTHONY, letter to Frederick Anthony, 10 September 1889 (George Eastman Legacy Collection, George Eastman House, Rochester, NY). Illustration reproduced from Baekeland, “Laboratory Notes: 1889-94”, 19 (LBP, series 6, box 25, folder 2).

A further agreement of exploitation (*convention d'exploitation*) established a clear division of labor between Baekeland and Guequier, a colleague of Baekeland at the University of Ghent : while the latter would chiefly take care of the commercial side of the business, technical questions were the former's responsibility. This, at least, was the initial agreement, for it was understood that : as soon as it is acknowledged that Mr Jules Guequier-Gleesener possesses the know-how and competence required for running this industry, Mr Leon Baekelandt will have good reason to make those scientific journeys abroad that he may deem expedient, and to occupy himself with any scientific problem or study that pleases him¹⁹.

The reference to international journeys should not come as a surprise. Less than half a year before the foundation of Dr Baekelandt et Cie, Baekeland had earned a travel fellowship from Belgium's Royal Academy through an inter-university contest for postdoctoral researchers – the *concours universitaire*. But it is notable that Dr Baekelandt et Cie surely did not stand on a firm technical footing around the time Baekeland decided to use this fellowship to travel to Germany and the United Kingdom.

As a case in point, in October 1888 he had to pass a few sleepless nights in the Palinghuizen factory due to a “foolish” malfunctioning machine – a setback which negatively affected his mood²⁰. One month before, as Céline lucidly reported, he had “enraged” his fiancée's family members because the gelatin on the photographic plates which he had given to them had become detached, and it was “ridiculous” to recommend these plates as they clearly were not working properly²¹. In May 1889, the editor of the Viennese *Photographische Rundschau* declared Baekeland's patented invention unfit because of its (apparent) unreliability, claiming that the chemical stability of the attached developer could not be taken for granted. In addition, in September 1889, the American industrialist Richard Anthony pointed to slowness of development as a major drawback of the technique. Still, a few exceptions aside, in the various photographic societies in which they were presented Baekeland's glass plates were generally judged to be a useful simplification for amateur photographers in particular. Moreover, in spite of the invention's perceived shortcomings, Dr Baekelandt et Cie was awarded a bronze medal at the Paris world exhibit of 1889²².

19. BAEKELAND, GLEESENER & GUEQUIER, “Convention d'exploitation entre les associés” (LBP, series 8, box 34, folder 1) (translation mine). **20.** SWARTS, letters to Baekeland, 8 and 10 October 1888 (LBP, series 3, box 13, folder 1). **21.** SWARTS, undated letter to Baekeland (ca. 20 September 1888) (LBP, series 3, box 1, folder 1). **22.** Richard Anthony to Frederick Anthony, 10 September 1889; “Club der Amateur-Photographen in Wien: Protokoll der ausserordentlichen Generalversammlung vom 18. Mai 1889, Abends 7 Uhr”, in *Photographische Rundschau*, 1889 (3), p. 232-37; JULES HENS & LAURENS ROOSENS, *De Belgische fotochemische industrie...*, 155; CARL KAUFMANN, *Grand Duke...*, p. 20; “Section de Bruxelles : Séance du 12 décembre 1888”, in *Bulletin de l'Association belge de photographie* (hereafter ABP), 1889 (16), p. 2-3; “Section de Bruxelles : Séance du 9 janvier 1889”, in *Bulletin de l'ABP*, 1889 (16), p. 65-7; “Section de Gand : Séance du 4 octobre 1888”, in *Bulletin de l'ABP*, 1888 (15), p. 516-19; “Section de Gand : Séance du 4 janvier 1889”, in *Bulletin de l'ABP*, 1889 (16), p. 4-5; “Section de Gand : Séance du 7 février 1889”, in *Bulletin de l'ABP*, 1889 (16), p. 72-4; “Section de Liège : Séance du 16 janvier 1889”, in *Bulletin de l'ABP*, 1889 (16), p. 67-72; “Self-Developing Plates”, in *American Amateur Photographer*, 1889 (1), p. 79-80; “Water-Developing Plates”,



Baekelands wife Céline Swarts with the couple's two children : Nina (b. 1896) and Georges (b. 1895). The photo was printed on Velox photo paper from 1899 (Ghent University, Museum for the History of Sciences). The Baekelands' first daughter, Jenny (b. 1890), had passed away in 1895.

It can also be demonstrated that Baekeland had not yet given up on his photographic plates when he made his journeys abroad. In fact, it is likely that he attempted to further his firm's interests on these trips. In England, as an example, Baekeland visited a Crystal Palace photographic exhibition and, according to his diary, was invited to the inventor-entrepreneur Joseph Swan's home in Bromley, "where he [Swan] wanted to make arrangements for exploiting my first patent, water-developing dry plate"²³. On another trip, this time to Berlin, the inventor could examine the photographic laboratory of Hermann Vogel (1834-98), the occupant of Germany's first chair in photochemistry, at the *Technische Hochschule* of Charlottenburg²⁴.

In the United States, however, Baekeland clearly intended to pursue plans of his own. Intriguingly, Dr Baekeland et Cie's statutes included the provision that future photography-related patents that might be granted to Baekeland in America, as opposed to those granted in all other countries, would remain his personal property. Together with evidence about the young Baekeland's fascination for "heroic" inventor-entrepreneurs such as Thomas A. Edison, Alexander G. Bell, and Benjamin Franklin, this suggests that Baekeland had been contemplating

starting a new life as a U.S.-based inventor long before he and his wife crossed the Atlantic in the summer of 1889²⁵. A letter that Baekeland sent to Guequier relatively soon after his move to New York confirms that his Belgian business associates had no place in this adventure. In response to a request for help, Baekeland informed Guequier that his "stay here [in the U.S.] will last much longer than I initially believed and ... I will not be back before next summer"²⁶. Yet, he wrote, his prolonged absence should be no reason for concern, because "you should easily be able to do without me because you know the manufacture in its entirety[,] you make better emulsions than I do, and[,] as for the selling[,] you will shake up your clients a bit and you will try to find new outlets"²⁷. Likewise, Baekeland wrote Guequier that he and his wife could not afford to deprive themselves of basic needs by carrying part of the financial burden; but, here again, Baekeland believed that this would not be much of an issue, "for Madame Gleesener [Valérie Gleesener's mother] is quite rich and she will be able to provide you with what you need. To repeat once more, the thing is impossible for us at present, and another solution will have to be found. Could you not speed up the formation of the English company, or couldn't you find capitalists seriously interested in joining the enterprise"²⁸ ?

in *The Photographic Times*, 1890 (22), p. 323; "Récompenses", in *Bulletin de l'ABP*, 1889 (16), p. 694-701 (here 698); Swarts to Baekeland, 7 October 1890 (LBP, series 3, box 13, folder 5). On the whole, the invention seems to have been better received in Belgium than abroad. **23.** BAEKELAND, journal 3, 24 February 1909 (LBP, series 4, box 18, folder 3). **24.** "Section de Gand : Séance du 4 avril 1889", in *Bulletin de l'ABP*, 1889 (16), p. 215-18. **25.** See JORIS MERCELIUS, *Leo H. Baekeland (1863-1944) as Scientific Entrepreneur : A Transatlantic Perspective on the Science-Industry Nexus*, Ph.D. dissertation, Ghent University, 2013, chapter 2, and references given there. **26.** BAEKELAND, letter to Guequier, 8 September 1889 (LBP, series 3, box 9, folder 2) (my translation from the French). **27.** *Idem*. **28.** Baekeland to Guequier, 8 September 1889 (my translation from the French).

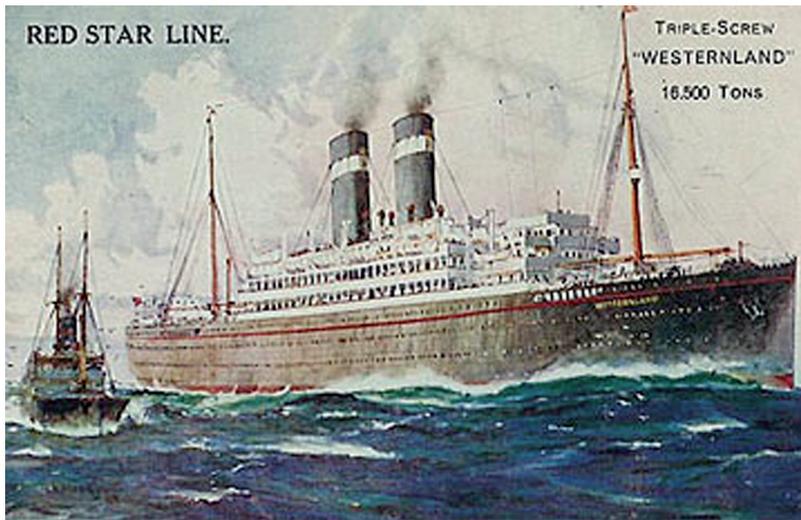
Ideally, Baekeland's association with the Guequiers was supposed to last for eighteen years, from the beginning of 1888 until the end of 1905. However, according to their firm's founding agreement, Dr Baekelandt et Cie could be dissolved "after two years if it is recognized by the inventory drawn up at that date that the partnership has not realized profits", or any time later if it was running a loss²⁹. Baekeland made use of this clause at the earliest possible moment, in January 1890, about five months after his move to New York. Significantly, by then the firm owed 58 creditors a total sum of 107,769.63 Belgian francs – or about 36 times Baekeland's annual salary as an *agrégé spécial* of the Faculty of Sciences at the University of Ghent, the postdoctoral position to which he had been promoted in the summer of 1889. As table 2 illustrates, this amount was distributed extremely unevenly: no more than five lenders accounted for almost 90% of the firm's total debt. The heaviest load was carried by

Valérie Gleesener's mother, who had added about 15,000 francs to the starting capital with which she had already provided her relatives. The identity of the other major creditors shows that Baekeland and his partners, perhaps benefiting from the prestige of the university, could also raise large sums of money from non-relatives in Ghent. The Bank of Flanders (*Banque de Flandre*), to begin with, had its headquarters in Baekeland's home city. Secondly, investor Maris et Cie, a producer of golden frames, employed twenty workers in Ghent by 1885³⁰. Finally, the creditor listed as "Eggermont" most likely referred to Camille Eggermont (1834-1904), a local entrepreneur and philanthropist whose son Albert was later granted a honorary membership of the *Association belge de photographie*. At the same time, Baekeland and the Guequiers also managed to attract funding from outside of Ghent: their creditor Oscar Defer was a merchant from Roux-lez-Charleroi³¹.

Table 2 : Main creditors of Dr Baekelandt et Cie (January 1890)³²

NAME OF CREDITOR	SUM (IN BELGIAN FRANCS)
Banque de Flandre	22,198.36
Oscar Defer	10,103.5
Eggermont	20,514.98
S.-C. Gleesener-Duhayon	35,225
Société Maris et Cie	7,621.18
	Total sum : 95,663.02
	Percentage of total debt : 88.77%

29. "Constitution de la société en commandite simple Dr. Baekelandt et Compagnie", 31 December 1887 (LBP, series 8, box 34, folder 1) (translation mine). **30.** Appendix in DENISE DE WEERDT, *De Gentse textielbewerders en arbeidersbeweging tussen 1866 en 1881: Bijdrage tot de sociale geschiedenis van Gent*, Leuven/Parijs, 1959. **31.** *Dubbele wegwyzer der stad Gent en der provincie Oost-Vlaenderen*, Gent, 1888; OSCAR DEFER, letter to Octave Bruneel, 6 March 1890 (LBP, series 8, box 34, folder 1). **32.** Based on data included in LBP, series 8, box 34, folder 1.



Postcard from the steamship Westernland of the Red Star Line, in which Baekeland sailed from Antwerp to New York in 1889.

While Baekeland seems to have never repaid any of these financiers, the Guequiers agreed to refund Defer and Maris within five years, a pledge for which Stéphanie-Constance Gleesener-Duhayon stood surety. However, according to Céline Swarts, the widow's wealth had considerably diminished by then. It certainly was not sufficiently large to prevent the Guequiers from being "in the soup" : as Céline informed her husband in August 1890, the Guequiers had been begging "at all doors for money", presumably to fulfill their obligations toward earlier creditors as well as to inject new life into their photographic firm³³. They would continue the enterprise in the form of the ordinary partnership (*société en nom collectif*) V. Guequier-Gleesener et G. Van de Poele from 1891 until 1894, and as the limited partnership Valérie Gleesener et Cie until its ultimate dissolution in 1897³⁴. It is evident that they were not able to break out of the negative spiral, or to recover their earlier losses, for in 1931 the Guequiers' daughter Adrienne blamed Baekeland for having ruined her family³⁵.

How could Baekeland sidestep the unlimited liability to which general partners in a *société en commandite* were normally exposed? Remarkably, as part of the partnership's dis-

solution and liquidation, Guequier and Gleesener personally acquitted him of this obligation, thus enabling their associate to get off relatively lightly³⁶. Their motives for doing so are not documented in my sources – perhaps they took into consideration Baekeland's limited means – but afterwards they clearly seem to have regretted the arrangement. For instance, according to a March 1891 letter of Céline Swarts, they had purposefully caused complications by not informing her U.S.-based husband of sums that he was supposed to have paid off, nor of the subsequent visit of a bailiff. As a result of the ill will of his former partners, Baekeland was fined. But his wife appears to have convincingly explained the situation in a beseeching letter to King Leopold II, written, as she noted to her husband, to ensure "that you [Baekeland] won't be busted upon your return"³⁷. More fundamentally, Valérie Gleesener's mother denied ever having approved of the exemption for Baekeland and sought to reclaim up to about 15,000 francs³⁸. Gleesener-Duhayon's own lawyer, however, admitted that the legal basis on which his client's claims rested was precarious. Instead, he proposed "that Mr. Baekelandt commit himself to not engaging, either personally, or through third parties, in the manufacture of

33. SWARTS, letter to Baekeland, 29 August 1890 (LBP, series 3, box 13, folder 4) (translation mine). 34. Cf. JULES HENS & LAURENS ROOSENS, *De Belgische fotochemische industrie...*, p. 161. In regard to Van de Poele's joining the firm, Céline Swarts remarked: "*Je crois que c'est tout ce qu'il faut pour achever de crouler cette affaire. C'est un noceur qui n'a jamais fait d'études et qui je crois ne connaît rien du commerce et sait moins de photographie peut être que la petite femme*". See her letter to Baekeland, 4 February 1891 (LBP, series 3, box 13, folder 7). 35. ADRIENNE DRAPIER, letter to Baekeland, 13 February 1931 (LBP, series 3, box 9, folder 2). See also JAN GILLIS, *Leo Hendrik Baekeland...*, p. 33. 36. See "Reconnaissance de la liquidation de fait" and "Liquidation et dissolution" (LBP, series 8, box 34, folder 1). In Swarts' opinion, "*nous en avons cependant été quitté à bon compte de toute cette sale affaire*". See her letter to Baekeland, 29 August 1890 (LBP, series 3, box 13, folder 4). 37. Swarts to Baekeland, 31 March 1891 (LBP, series 3, box 13, folder 8). 38. Bruneel to Baekeland, 6 August 1890; anon. [Gleesener's lawyer] to Bruneel, 28 July 1890 (both in LBP, series 8, box 34, folder 1).

photographic plates in Belgium during a term of twenty years” – a legal restraint, known as a restrictive covenant, with which Baekeland would also have to deal in the U.S.³⁹.

Baekeland’s role in the Guequiers’ financial downfall is said to have caused him public embarrassment upon a return visit to his home city in 1900⁴⁰. Whether or not this actually happened, the Baekelands’ analysis of what went wrong provides an important alternative perspective on Leo’s early history as an entrepreneur. According to Céline, the Guequiers deserved no pity whatsoever, as they had been squandering Gleesener-Duhayon’s fortune, “living it up and cheating on clients”⁴¹. When Céline vented her opinion, Leo reproached her with scandal mongering⁴². However, the couple clearly concurred that Guequier was incompetent and deceitful. Yet, at the same time, Céline sought to impress upon her husband that his start-up had primarily suffered from capital shortages. In a period in which Leo was considering leaving Anthony & Co., the photographic firm he had joined shortly after his move to New York in 1889, she explained that : “I think it would be a mistake to work on your own ... To do something, and especially to start [something new], one needs a sufficiently firm financial

footing to wait and to bear the losses that are inevitable at the beginning. That is what killed your [photographic] plates factory. G. [Guequier] certainly was a swindler and an imbecile, but chiefly you were lacking capital. There you have had a hard lesson, and frankly, consider that especially in America, where one has concerns established with enormous capital as competitors, it would be even a thousand times more difficult to succeed”.

In the same letter, Céline advised Leo to factor in his ignorance of commerce, thereby revealing the kind of anti-business sentiments that have been ascribed to her father Théodore. In her opinion, since you who are not the kind of man who can keep careful accounts and manage his finances, in a word a real businessman [*commerçant*], it would be wrong to want to undertake something on your own. Work with the capital of others, let them bear the losses and the unavoidable traces and pettiness of commerce, I am sure that you will earn a lot more by offering your services as a director in something⁴³.

With hindsight, it would have been more accurate to state that Baekeland had *not* yet acquired the skills of “the real *commerçant*”, for professional colleagues and acquaintances

39. Anon. to Bruneel, 28 July 1890 (my translation from the French); JORIS MERCELIS, “The Photographic Paper that Made Leo Baekeland’s Reputation : Entrepreneurial Incentives for Not Patenting”, in STATHIS ARAPOSTATHIS & GRAHAM DUTFIELD (eds), *Knowledge Management and Intellectual Property : Concepts, Actors and Practices from the Past to the Present*, Aldershot/Brookfield, 2013, p. 62-83. **40.** Cf. GEORGE ANTHEUNIS, *Leo Baekeland...*, p. 48; JAN GILLIS, *Leo Hendrik Baekeland...*, p. 33; CARL KAUFMANN, *Grand Duke...*, p. 57; and ALFRED R. MATTHIS, *Léo-H. Baekeland 1863-1944: professeur, docteur en sciences, chimiste, inventeur et grand industriel*, Bruxelles, 1948, p. 11. The affair surely was divisive; see SWARTS, letters to Baekeland, 1, 14, and 21 October 1890 (LBP, series 3, box 13, folder 5). **41.** See Swarts to Baekeland, 25 and 29 August 1890 (LBP, series 3, box 13, folder 4); and 4 February 1891 (in folder 7 in the same box) (translation mine). **42.** Cf. Swarts to Baekeland, 1 January 1891 (LBP, series 3, box 13, folder 7). **43.** SWARTS, letter to Baekeland, 29 November 1890 (LBP, series 3, box 13, folder 8) (my translation from the French).

would later consult and admire him for his administrative, business, and financial acumen. Hence, it seems fair to conclude that Baekeland had been hindered by a lack of experience rather than talent – an argument consistent with the contention that successful entrepreneurship is positively correlated with maturity “because [commercial] judgment improves with age and experience”⁴⁴.

In the Belgian photochemical industry of the late nineteenth and early twentieth centuries, however, it was not just novice entrepreneurs who were unable to make it. As Jules Hens and Laurent Roosens have documented, of the more than twenty enterprises founded in this period only one — Gevaert N.V. — was still in business after the Second World War⁴⁵. If one agrees with Mark Casson and other economic theorists that entrepreneurial talent is nurtured through practical experience, it was critical that risk-takers who suffered setbacks like those encountered by Baekeland were not discouraged from trying anew⁴⁶. In light of this, it is significant that Swarts’ derogatory reference to “petty commerce” seems to suggest that business occupations were looked down upon in Baekeland’s aca-

demical surroundings in Ghent. In the next section we will take a closer look at this, as part of a discussion of the formal and informal institutions that possibly influenced Baekeland’s decision to settle down in the U.S., a country in which entrepreneurs have been more celebrated than perhaps anywhere else⁴⁷.

II. A Transatlantic Escape ?

Any attempt to pin down Baekeland’s decision to build a new life in the U.S. to a single moment in time would be doomed to failure. His captivation with American inventors such as Edison, Bell, and Franklin dated back to at least his teenage years. And the exclusion of possible U.S. patents from Dr Baekelandt et Cie’s intangible assets suggests that the inventor in the making had settled his mind on trying his luck on the other side of the Atlantic no later than the end of 1887, when the partnership was formed. The stakes were high, however, because Leo’s transatlantic ambitions risked jeopardizing his relationship with Céline Swarts, who was not as adventurous a person as her fiancée⁴⁸. Eventually, Céline agreed to join her partner, and on 10 August

44. MARK CASSON & ANDREW GODLEY, “Entrepreneurship and Historical Explanation”, in YOUSSEF CASSIS & IOANNA P. MINOGLU, *Entrepreneurship in Theory and History*, Basingstoke, 2005, p. 25-60 (here 58). In a 1931 address, Baekeland himself stated that “[i]ntelligence is inborn, and develops by practice and opportunity, knowledge comes quickly to the intelligent: but experience lingers, and is only acquired slowly through life and mistakes”. See his “Dreams and Realities”, in *Journal of Chemical Education*, 1932 (9), p. 1000-1009 (here p. 1000). 45. JULES HENS & LAURENT ROOSENS, *De Belgische fotochemische industrie...*, p. 43. 46. Cf. MARK CASSON, *The Entrepreneur: An Economic Theory*, Cheltenham/Northampton (MA), 2003 [1982], p. 30; and above, n. 39. 47. According to economic historian Naomi Lamoreaux, “if ever there was a time or place when entrepreneurs were the most admired figures in society, it was the United States during the late nineteenth century”. See her “Entrepreneurship in the United States, 1865-1920,” in LANDES, MOKYR & BAUMOL (eds), *The Invention of Enterprise*, p. 367-400 (here p. 368). 48. For instance, in early March 1889 Baekeland commented “*tu as le droit de protester de ton côté contre les lettres à la Schoppenhauer [sic] que je t’envoie; si je savais seulement trouver une solution pratique pour cette damnée question d’Amérique. Faisons*

1889, two days after their wedding, the couple embarked on the SS *Westernland* steamer in Antwerp. But homesickness and a pregnancy made Céline prematurely return to Ghent in the following summer, and she and Leo lived almost constantly apart until the spring of 1891. During this period, Swarts regularly reminded her husband that, though prepared to leave Ghent, she would prefer to stay in Europe⁴⁹. Baekeland, on his part, clearly was not satisfied with his job at Anthony & Co., his New York employer. Around late November 1890, he resigned from the firm, and afterwards he proved unable to earn a comfortable living for himself, his wife, and his mother, whom he advised to move to the countryside⁵⁰. He actually began to accumulate debts. Why, then, did he nevertheless remain in the U.S. ?

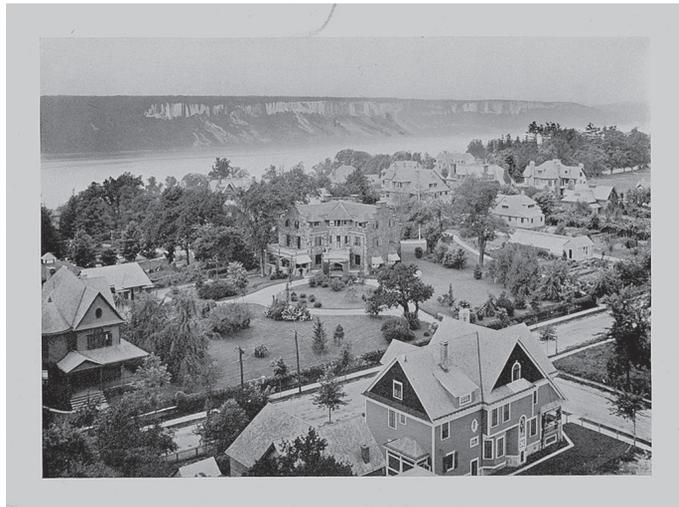
The remainder of this article will demonstrate that this outcome almost certainly had more to do with Baekeland's eagerness to leave his home region far behind than with the quality of his new life in the U.S. In other words, I will make the case that so-called push factors, perhaps even irrespective of Baekeland's troubled relationship with the Guequiers, outweighed the elements that "pulled" the Belgian chemist to America. At the same time, I will argue that the institutional environment

in which his scientific entrepreneurship was embedded was not a binding constraint. First of all, though, I will briefly clarify the context of Baekeland's move to New York.

Push and Pull

Are standard accounts of Baekeland's first transatlantic journey correct in connecting it with the travel fellowship that the Royal Academy had awarded him in 1887 ? There can be no doubt that officially Baekeland was to carry out a scientific mission on behalf of Belgium's Ministry of the Interior and of Public Education, which financially supported his crossing to New York⁵¹. However, it is obvious that this university chemist did not travel to the U.S. for purposes which were primarily academic in nature. Instead, his personal correspondence suggests that his focus was on arranging "his affairs" in New York, which he discussed with a man named Lufbery in or near Paris and which clearly concerned his self-developing glass plates⁵². Baekeland may have been introduced to Lufbery by Jules Lechat, a rubber manufacturer at whose plants in Ghent and Lille the aspiring inventor seems to have regularly conducted laboratory experiments⁵³. For his part, Lufbery, a person "generous to active and entrepreneurial people", was "the one who concluded the

un suprême effort et n'y pensons plus". In May, Céline referred to "*ton' départ pour l'Amérique*" [emphasis mine], but in early June Céline discussed her own journey to the U.S. with her mother. And, on 16 June 1889, Leo urged her to "*réfléchis y bien une toute dernière fois car bientôt ce sera trop tard pour y revenir*". See SWARTS, letters to Baekeland, 14 May and 7 June 1889 and BAEKELAND, letters to Swarts, 3 March and 16 June 1889 (all in LBP, series 3, box 13, folders 2 or 3). **49.** See, e.g., SWARTS, letters to Baekeland, 5 September 1889 and 31 October 1889 (LBP, series 3, box 13, folders 3 and 5). **50.** Swarts to Baekeland, 7 March 1891 (LBP, series 3, box 13, folder 8). **51.** Joseph Devolder to Auguste Wagener, 22 June 1889, published in JAN GILLIS, *Leo Hendrik Baekeland...*, p. 37. **52.** See BAEKELAND, letters to Swarts, 16 and 17 June 1889 (LBP, series 3, box 13, folder 2). **53.** Swarts to Baekeland, 31 January 1889, 14 and 25 February 1891 and 15 April 1891 (LBP, series 3, box 13, folders 2, 4, 7 and 8); BAEKELAND, journal 12, 20 and 25 March 1913 (LBP); Jane Voortman Lechat to Baekeland, 19 August 1935 (LBP, series 3, box 10, folder 12).



The Baekelands' villa Snug Rock (below) in Yonkers, New York, on the banks of the Hudson River (above). Baekeland bought this spacious villa in 1901, using the money earned through the sale of the Nepera Chemical Co. two years earlier. (Yonkers Historical Society)

transactions with Anthony”, the photographic firm that hired Baekeland shortly after his arrival in New York⁵⁴. This clearly suggests that Lufbery, contrary to the common assumption, arranged a meeting for Baekeland with the Anthony company⁵⁵.

At any rate, when Richard Anthony, the firm’s vice-president and Baekeland’s self-proclaimed American “discoverer”⁵⁶, returned to his office in early September 1889 he “found Dr. Baekeland of Belgium here, waiting to show his self developing dry plates”. But Anthony, as well as the technical advisors who witnessed Baekeland’s demonstration with him, were less favorably impressed with Baekeland’s plates than with his skills as a photochemist. In a letter to the company’s secretary, Anthony enthused about Baekeland’s abilities and the ways in which he could add to his firm’s bottom line. Given the scarcity of primary sources concerning this part of Baekeland’s career, including the kind of work that he carried out at Anthony & Co., Richard Anthony’s judgment is worth quoting at length. In his opinion, “he [Baekeland] proves to be a very thorough chemist and a practical emulsion maker. He says that he can make emulsions of extreme rapidity and absolutely the same every time, without the uncertainties that we have been laboring under, and I suggested that he go down to the factory and make some for us, which he agreed

to do, simply to show what he can do. ... He does not use the centrifugal [machine] at all in making his emulsions, and after explaining his method to Mr. Cossett [probably Franklin M. Cossitt, a photographic inventor whom Anthony had lured away from the Eastman company] and Dr. [Arthur H.] Elliott, they both are strongly of the opinion that his method is superior to that by the use of the centrifugal machine, and both say that it is impossible to see how there can be any variation in his emulsions if made after this method. He is extremely particular about every detail of the process, and Cossett says he has never seen a man so clean in his methods as he. ... He says that he can make Aristotype paper perfectly well also, and Cossett is very anxious that we should make an arrangement with him to enter our employ regularly. ... Cossett says he has already learned more from him about emulsion making than he ever learned from any one else in his life; and if he proves all that I hope, I feel strongly inclined to make an arrangement with him. ... He ... has come to us at a time when we are completely floored on our films, as it is impossible to make them work in the Lilliput [miniature camera]⁵⁷ by any method known to Mr. Cossett”⁵⁸.

Like others before, Anthony also appreciated Baekeland’s work ethic and his “push and energy”, traits that resonated with the liberal “go-aheadism” prevailing in the U.S. at that

54. Swarts to Baekeland, 14 February 1891 (LBP, series 3, box 13, folder 7) (translation mine).

55. It has often been claimed that Charles F. Chandler of Columbia College brought Baekeland in contact with Anthony & Co. On this error, cf. JORIS MERCELIS, *Baekeland as Scientific Entrepreneur*, p. 118. 56. RICHARD ANTHONY, “The Discovery of Dr. Baekeland”, in *Journal of Industrial and Engineering Chemistry*, 1916 (8), p. 182-183. 57. Cf. WILLIAM MARDER, ESTELLE MARDER & ROBERT G DUNCAN, *Anthony, the Man, the Company, the Cameras : An American Photographic Pioneer : 140 Year History of a Company from Anthony to Ansco, to GAF*, [Plantation, Fla.], 1982, 270-271. 58. Richard Anthony to Frederick Anthony, 10 September 1889 (George Eastman Legacy Collection, Eastman House).

time⁵⁹. Hence, it is understandable that he was eager to secure Baekeland's services, even though his company was experiencing unprecedented financial difficulties⁶⁰. Cossitt expected Baekeland to sign up for approximately \$1,500 a year. This would have represented an increase over his earnings in Belgium, yet would still have made him "a very cheap man" from Anthony & Co.'s point of view⁶¹. The figure was probably a slight underestimation, as Swarts recollected in 1891 that her husband had been ready to join the firm "for \$2,000 or even for \$1,750"⁶². However, she had evidently pushed him to bargain hard, for eventually he had been granted a salary of \$3,000 a year – about 20,000 Belgian francs – a royal sum for an industrial chemist in those days⁶³.

The comparatively high American wages are one factor that possibly lured Baekeland to the United States and encouraged him to build up a new life there; as his wife "always repeated", Baekeland certainly had plenty of reasons to try to make "a lot a lot [*sic*] of money"⁶⁴. According to estimates that Céline made in September 1890, Leo would likely be able to cover his living expenses and support his parents with about half of his \$3,000 salary, thus allowing her to repay Lechat, the rubber manufacturer to whom she seemed to be "forever" in debt, with the remainder⁶⁵. However, in the next month Céline left her parental home in Ghent for a place of her own, and the money that she needed to rent and furnish it, as well as to run a household with a servant, had not yet been factored

59. *Idem* : "He is a very hard worker. I asked him when he would be ready to begin with Cossett showing him about his emulsion and he said at seven o'clock in the morning. I asked him when he would get his breakfast and he said he would get it before that, as he always rose early. He is very quick in his movements and has a great deal of push and energy". Similarly, when Céline's mother announced to a Dr Librecht that her daughter was going to marry Leo, Librecht remarked "[c]'est un travailleur elle sera heureuse!" Afterwards, Céline had "*souvent pensé à cette phrase et aujourd'hui je suis fière et heureuse d'avoir épousé un pauvre garçon qui par lui même et tout seul en est arrivé là où tu es*". See Swarts to Baekeland, undated (probably late 1890 or early 1891). On American "go-aheadism", see SCOTT A. SANDAGE, *Born Losers : A History of Failure in America*, Cambridge (MA), 2005.

60. REESE JENKINS, *Images and Enterprise : Technology and the American Photographic Industry, 1839-1925*, Baltimore, 1975, p. 86; WILLIAM MARDER, ESTELLE MARDER & ROBERT G DUNCAN, *Anthony...*, p. 277. 61. Richard Anthony to Frederick Anthony, 10 September 1889. 62. Swarts to Baekeland, 7 March 1891 (LBP, series 3, box 13, folder 8) (translation mine). 63. Swarts to Baekeland, 27 January 1891 (erroneously dated 1890) and 25 September 1890 (LBP, series 3, box 13, folders 4 and 5). For comparative data, see, e.g., THOMAS REIMER, *Bayer & Company in the United States : German Dyes, Drugs, and Cartels in the Progressive Era*, Ph.D. dissertation, Syracuse University, 1996, p. 88; and TERRY S. REYNOLDS, "Defining Professional Boundaries : Chemical Engineering in the Early 20th Century", in *Technology and Culture*, 1986 (27), p. 694-716 (here 702). 64. Swarts to Baekeland, 19 and 25 September 1889 (LBP, series 3, box 13, folder 5) (translations mine). See also Swarts' letters of 29 August 1890, 5 September 1890 (erroneously dated 1889); 29 November 1890; 3 January 1891 (erroneously dated 1890); and 21 January, 5 February 1891, and 7 March 1891 (all LBP, series 3, box 13, folders 3, 4, 5, 7, or 8). 65. Swarts to Baekeland, 5 and 25 September 1890 (LBP, series 3, box 13, folder 5). According to Swarts' calculations, Baekeland needed \$264 per year for his rent, \$240 to support his parents, \$420 for his assurance, and \$10 a week to cover his other living expenses.



Administrator-inspector Auguste Wagener, who represented the Belgian government at the University of Ghent. In this capacity, Wagener was an influential mentor to Baekeland in the 1880s.
(Ghent University Archives)

in⁶⁶. Moreover, after his resignation from Anthony around late November, Baekeland failed to secure an equivalent source of income for a prolonged period of time, forcing him to accept short-term jobs incommensurate with his qualifications. In this context, Céline reasonably suggested that “it is better to have a decent position of 8 to 10,000 fr [francs] [a year] here [in Europe] than to become a worker in America, where life is very expensive”⁶⁷. Leo himself had previously pointed to the high cost of living in the U.S. Yet, he nevertheless disagreed: in an embittered letter he countered that he would “in no way return to Europe for a miserable petty position of 5 to 6,000 francs”⁶⁸. The discrepancy in wage level expectations is significant, for Baekeland did seem ready to move to just about anywhere in the world if only he were duly remunerated. For example, previously unnoticed comments show that he had considered participating in a scientific and colonial mission to Congo shortly after having earned his Ph.D.⁶⁹ In addition, in early 1891 Baekeland came very close to relocating to Paris or Valparaiso, Chile, for professional purposes. At the same time, though, he war-

ned his wife that, if his assignment in France would be confirmed, he would try to return to the U.S. as quickly as possible so as to avoid unpleasant reunions with European acquaintances. Thus, while rational considerations of income maximization certainly were a more important determinant of Baekeland’s professional trajectory than has been recognized in earlier studies, they do not tell the whole story.

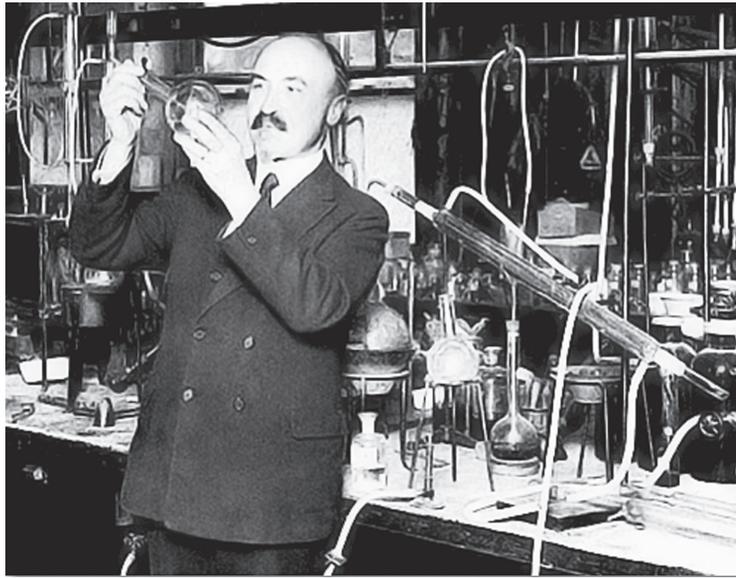
In fact, to his wife’s chagrin, another of Baekeland’s arguments was the sweeping generalization that “a few exceptions aside, all Europeans are more or less morons” – an attitude also expressed in later letters to his friend Edouard Remouchamps, as well as in travel notes, in which Baekeland made it a game to reveal the “general mentality of nations”⁷⁰. Most of the examples that Leo gave to demonstrate Europe’s “backwardness” did not directly concern his own career. To the chemist’s relief, for instance, the works of Emile Zola and other “decadent”, “demoralizing” European writers were being censored in the U.S.; and women seemed to be treated decently there – a point to

66. Cf. SWARTS, letter to Baekeland, 1 October 1890 (LBP, series 3, box 13, folder 5). In a letter fragment from around this period, Baekeland reminded her of the fable of the ant and the grasshopper. See BAEKELAND, undated letter to Swarts (ca. early 1891) (LBP, series 3, box 13, folder 10). 67. Swarts to Baekeland, 25 February 1891 (translation mine). 68. Baekeland to Swarts, undated (ca. early 1891) (translation mine). Baekeland referred to the cost of living in the U.S. in, for instance, F.A. Lidbury et al., “Discussion on ‘Water Power and Defense’ (Whitney), ‘The Water Power Situation, Including Its Financial Aspect’ (Dunn), Washington, D.C., April 26, 1916”, in *Transactions of the American Institute of Electrical Engineers*, 1916, (35), p. 457-77 and 1145-65 (here 1150); Baekeland to Guequier, 8 September 1889. 69. BAEKELAND, journal 58, 20 June 1937 (LBP); Dean of Faculty of Sciences to Auguste Wagener, 22 August 1885 and Wagener to Joseph Thonissen, 3 July 1885 (Ghent University Archives, 4 A2/4, box 39, folder 21). 70. BAEKELAND, journal 12, 22 March 1913 (LBP); Swarts to Baekeland, 25 February 1891 (translation mine). See also Swarts’ letter of 19 November 1890 (LBP, series 3, box 13, folder 6).

which his wife was receptive⁷¹. Likewise, until he grew disillusioned with politics and became a staunch technocrat, Baekeland favorably contrasted America's republican democracy to Europe's monarchies, among other political regimes. Still, it seems fair to connect Baekeland's complaints about the "permanent exhibitions of stupidity, weakness of character, greed, selfishness, brutality, petty conceit and general lack of efficiency ... [hidden in] ... the cloak of art" that he observed in Western Europe in general, and his home town in particular, to his own socio-professional situation and interests and to his entrepreneurial personality⁷². Most relevantly, a case could be made that Baekeland had partly been drawn to the U.S., a country known for its business dynamism, by a sense that the incentive structures prevailing in his home region were a hindrance to his scientific entrepreneurship. To be sure, in view of Belgium's educational legislation, Baekeland had little reason to complain: at his alma mater, Ghent, the legal provision of 1849 that obliged professors of state universities to obtain governmental permission before engaging in remunerated activities outside of their academic duties was barely enforced during the

1880s⁷³. Indeed, it is doubtful whether Joseph Devolder, the Minister of the Interior and of Public Education from 1887 until 1890, had ever heard of Dr Baekeland et Cie. Someone who could have informed him about the enterprise was Auguste Wagener (1829-96), the administrator-inspector (*administrateur-inspecteur*) representing the Belgian government at the University of Ghent. Yet Baekeland had a good personal relationship with Wagener, dating back to at least the beginning of his academic studies in 1880⁷⁴. Wagener, perhaps Baekeland's most powerful mentor, limited himself to praising Baekeland as a gifted scientist who, in addition, had "the stuff to be an inventor, which is rare"⁷⁵. In November 1889, Wagener notified the minister that Baekeland was offering his resignation as *agrégé spécial* because he had been given the opportunity to commercially develop his photographic invention in the U.S., thus repeating the (misleading) explanation that Baekeland had given Wagener shortly before. It is significant that Wagener, when advising Devolder to allow Baekeland to retain an honorary affiliation to the university, referred to the chemist's "exceptional entrepreneurialism in scientific matters"⁷⁶. Yet,

71. Swarts to Baekeland, 2 September 1890 (LBP, series 3, box 13, folder 5); Baekeland to Remouchamps, 30 August 1898 (published in JAN GILLIS, *Leo Hendrik Baekeland...: "Earnest of purposes is de diapason van 't amerikaanse volk even in zijne litteratuur is het zoo gestemd, geene verrotte decadent litteratuur en dergelijke fantasien, geene morbiede gedemoraliseerde romans zoals in Frankrijk, Duitschland, Italie etc. voortbrengt. Even Zola wordt slechts gelezen nadat de vertaler het goed geacht heeft er de ziekelijke deelen uit te laten. Toen ik verleden jaar in België was zag ik in Brussel de groote plakaten voor de vertooning van een zekere 'Pétomaneé' [a performing flatulist], the very idea is nauseating! Maar nu schijnt het dat gij eene Mad. Pétomane hebt!!*"). 72. BAEKELAND, journal 12, 24 March 1913 (LBP). 73. In the following decade, it was more closely monitored, so as to nip perceived abuses in the bud. See Ghent University Archives, 4 A2/4, box 66, folder 20, and box 72, folder 20. I would like to thank Ruben Mantels for sharing his archival research notes on this topic with me. 74. JORIS MERCELS, *Baekeland as Scientific Entrepreneur*, chapter 2. 75. Wagener to Devolder, 31 May 1889 (published in Jan Gillis, *Leo Hendrik Baekeland ...*): "Il a en lui – ce qui est rare – l'étoffe des inventeurs". 76. Wagener to Devolder, 21 November 1889 (published in JAN GILLIS, *Leo Hendrik Baekeland...*, p. 41-42) (my translation from the French).



Leo Baekeland at work in his laboratory. He set up this laboratory on his estate in Yonkers, where, in 1907, he invented the first fully synthetic plastic, 'Bakelite'. (Ghent University, Museum for the History of Sciences)

while Wagener seems to have been favorably impressed with Baekeland's inventiveness and entrepreneurial attitude, there are indications that other people in Baekeland's environment disapproved of entrepreneurial risk-taking. For instance, after having been informed that Leo had dissolved his contract with Anthony & Co., Céline indicated that "I won't mention it to anybody, as you know how cautious, conservative etc. people are", even though the financial impact of her husband's decision thus remained veiled and her uncommunicativeness forced her to take on debts from outsiders⁷⁷. In 1898, Baekeland himself wrote to Remouchamps, a friend from Ghent with whom he corresponded extensively, noting that Europeans could hardly grasp that a professor could make for a good industrialist, perhaps suggesting that he had personally met with prejudice on account of his involvement in Dr Baekelandt et Cie⁷⁸.

In this connection, the claim that Théodore Swarts disapproved of his son-in-law's commercial endeavors because he would have liked him to fully concentrate on his academic pursuits is important. This interpretation is

supported by Swarts' lobbying efforts to have Leo promoted to the position of *agrégé spécial* – a function partly modeled after the German *Privatdozent* – prior to the marriage of his daughter to Baekeland in August 1889. It is also in accordance with the higher social status of Belgium-based academic chemists in comparison to their professional colleagues in industry⁷⁹. It is further confirmed by a letter in which Céline paraphrased her father saying that it had "always been his goal and intention before your settling down in the U.S." to help Leo make a career at the University of Ghent⁸⁰. However, on the other hand, when Céline finally informed her parents about her husband's departure from Anthony and his difficulties in finding an equivalent source of income, Théodore seemed eager to try to arrange for Leo "a decent position worthy of you and me here in Europe in whatever industry"⁸¹. Indeed, he had previously recommended Baekeland to the *Société Générale de Maltose*, a Brussels-based enterprise which had acquired the rights on a fermentation process patented by chemist Jean Effront, the founder of the *Institut des Fermentations*, also in Belgium's capital⁸².

77. Swarts to Baekeland, 10 December 1890 (LBP, series 3, box 13, folder 6) (translation mine); Swarts to Baekeland, 3 January 1891 (LBP). 78. Cf. BAEKELAND, letter Remouchamps, 2 August 1898 (published in JAN GILLIS, *Leo Hendrik Baekeland...*). 79. Gustave Wolters to Frans Schollaert, 23 July 1896, Ghent University Archives, 4 A2/4, box 66, folder 20 (1895-1896) (referring to the high social status of state university professors); PIETER DHONDT, *Een tweevoudig compromis. Discussies over universitair onderwijs in het negentiende-eeuwse België*, Ph.D. dissertation, KU Leuven, 2005, p. 279-94; GEERT VANPAEMEL & BRIGITTE VAN TIGGELEN, "The Profession of Chemistry in Nineteenth-Century Belgium," in DAVID KNIGHT & HELGE KRAGH, *The Making of the Chemist : The Social History of Chemistry in Europe, 1789-1914*, Cambridge/New York, 1998, p. 191-206 (here p. 203). 80. Swarts to Baekeland, 24 January 1891 (LBP, series 3, box 13, folder 7) (translation mine). 81. Swarts to Baekeland, 18 February 1891 (LBP, series 3, box 13, folder 7) (translation mine). 82. HENDRIK DEELSTRA, "De scheikunde aan de universiteiten en hogescholen", in ROBERT HALLEUX et al., *Geschiedenis van de wetenschappen in België 1815-2000*, Brussel, 2001, p. 159-178 (here 178).

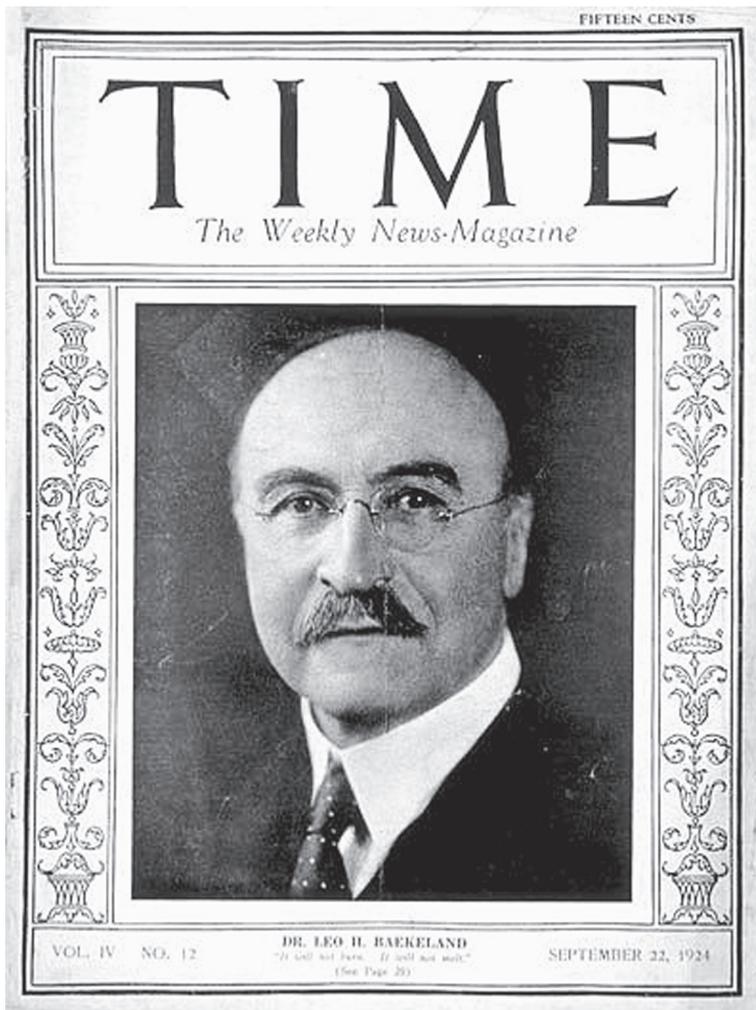
The case of Maltose was typical for Baekeland the entrepreneur in that it concerned a truly transnational endeavor. It was Théodore Swarts who heard in the fall of 1890 that the firm was trying to make arrangements for the exploitation of its U.S. intellectual property rights⁸³. Leo confirmed that he would like to get involved, but was informed that Maltose would not make a decision before the end of the year. Then, on 12 January 1891, Théodore met again with representatives of the enterprise, and upon his return Céline was able to extract the following account of late nineteenth-century ‘technoscience’ from her tired, incommunicative father. According to Céline’s letter, “[t]hey [Maltose] were in contact with an Englishman who wanted to exploit [the invention] in England and the United States, but as he did not seem to be in a hurry, and only had an option until the middle of January[,] there was talk of dropping him. But in Paris there is an American ambassador or consul Du Thilly is his name, I believe, who got in touch with American financiers who would buy the process for 1 million, + 100,000 [which] would have to be paid to this gentleman. These investors ask an option for 4 months, but today it was found that 4 months was a long period of time and if one had to give 100,000\$ to this gentleman that would be a complication. In brief, a discussion on this started and here *le patron* [Prof. Swarts] talked about you, saying that you had gained a foothold in scientific circles there [in the U.S.], that you knew people and that you could be approached. To which they responded that a

pure chemist was not exactly what they were looking for, that plainly someone to manage affairs and finances was needed, but that the combination of the two would be even better and they urged *le patron* to write you to bring you in contact with Carez (the engineer) so that you could get together with the capitalists whom I mentioned above⁸⁴.

Théodore Swarts’ recurrent get-togethers with the *Société Générale de Maltose* and his intention to involve his son-in-law in the project put into question the anti-business attitudes that have been ascribed to him. At the same time, though, the outcome of the affair points to the risks of having to depend on Swarts’ goodwill. The University of Ghent’s chemistry professor continued to meet up with Maltose negotiators during the remainder of January and in early February, and his son-in-law was impatiently looking forward to hearing further details. But, to Leo’s unpleasant surprise, Théodore seemed not to have sent him a letter – a fact which confirmed Céline’s view that her father was “the most negligent and selfish being that I know of⁸⁵.”

From Céline’s letters, Théodore, a popular teacher⁸⁶, appears as an authoritarian, disloyal, and unbearable husband and father, who contributed to his daughter’s low esteem for Belgian husbands other than her own. Ironically, around the same period in which Théodore was elected into the Order of Leopold⁸⁷ – perhaps the highest public honor

83. Swarts to Baekeland, 12 December 1890 (LBP, series 3, box 13, folder 6). **84.** Swarts to Baekeland, [dated 7 January 1891, but written over several days] (LBP, series 3, box 13, folder 7) (translation mine). **85.** Swarts to Baekeland, 14 February 1891 (translation mine). **86.** Joris MERCELIS, *Baekeland as Scientific Entrepreneur*, chapter 2. **87.** Swarts to Baekeland, 29 October 1890 (LBP, series 3, box 13, folder 5).



Leo Baekeland on the cover of Time Magazine. (Time, The Weekly News-Magazine, 22 September 1924)

in Belgium – Céline and her siblings had been assisting their mother in her efforts to obtain a divorce. Their preference was to arrange this by mutual consent, as detailed evidence of misconduct would have been needed in case of a judicial divorce “and mother has never taken much fun in following or watching this monster”⁸⁸. But Théodore, assisted by legal advisors of his own, informed the lawyer of his family members that he would: “not at any price accept a divorce by mutual consent, that if mom persisted in this idea [of divorcing] that he would on his part request a divorce in the tribunals on the ground of debts and suicide, that he would send Bibi [Céline’s then fifteen-year-old sister] to a boarding school and ruin the career of Frederic [Céline’s brother Frédéric] by forcing him to resign [from the University of Ghent]”⁸⁹.

I have seen no indications that Baekeland directly entered the dispute, but he doubtlessly advised his wife by letter and in person on a brief return to Belgium in the summer of 1890. Moreover, already before his departure to New York he had indicated to Wagener that he did not get along well with his father-in-law, therefore suggesting that he was unlikely to side with “the *patron*”. Additionally, if he had relocated to his native country, Théodore could have intimidated him, just as he was intimidating his own son Frédéric, who had been working under his direction since September 1885⁹⁰.

As if this were not yet enough, Leo’s relationship with Frédéric, “who does not possess an easy character”, risked becoming equally explosive as his relationship with Théodore⁹¹. For instance, in December 1890, a date by which Théodore’s attempts to reconcile himself with his family had met with some success, Céline anticipated that Frédéric was “predestined” to succeed his father as a chemistry professor at the University of Ghent. And “for that as well it is a good thing that you have left the university because such situations are so delicate and cause so much trouble, and it is easy to say that the son always comes first and that would have created irreparable scars”⁹².

Still, in a sense, to claim that Baekeland primarily desired to leave Belgium far behind because of the Swarts – or even the Guequiers – would be to overrate the importance of these families. In effect, Baekeland appears to have been entirely fed up with his social surroundings in the “bunch of rubbish which one calls Belgium and where everyone is an idiot”, and unwilling to forego his newly acquired sense of liberty and independence⁹³. According to a letter to his wife, for example, “[t]he mere idea of having to return to Belgium and being once again in the company of ‘friends and acquaintances’ is already giving me a sense of malaise. Visits and visiting cards and straitjackets and everyone meddling in your affairs no no no I know too well that

88. Swarts to Baekeland, 22 August 1890 (translation mine). **89.** Swarts to Baekeland, 5 September 1890 (erroneously dated 1889) (translation mine). **90.** See “Frédéric Swarts (1891)”, in *Université de Gand : Liber memorialis*, vol. 2, Gand, 1913. **91.** Swarts, letter to Baekeland, 9 January 1891 (LBP, series 3, box 13, folder 7) (translation mine). **92.** Swarts, letter to Baekeland, 10 December 1890 (LBP, series 3, box 13, folder 6) (translation mine). **93.** Swarts to Baekeland, 19 November 1890 (translation mine). See also Swarts’ letter of 25 September 1890 (referring to “les sots gantois”) (both in LBP).

my life of boredom and mutual annoyances would then start all over again. My character is not social enough for that anymore. The fewer people I see the better. ... do not believe ... that because of my present difficulties I have become tamable or could be turned into the banal, domestic animal which constitutes a society man⁹⁴.

Whereas Leo had previously apologized somewhat playfully for his pessimism “à la Schopenhauer”⁹⁵, the tone of the above-quoted letter was truly embittered, suggesting that he was suffering from depression. But Baekeland’s message to his wife certainly was consistent with what he had written before; in fact, two recurring themes in the couple’s correspondence had been the different social dispositions and backgrounds of each partner and their dissimilar opinions as to what constituted the basic necessities of life. For instance, Leo repeatedly grumbled that Céline expected him to be working for “a good, well-furnished house with servants and your parents and this delightful city of Ghent with all your girlfriends”; whereas a life like that did not at all appeal to him⁹⁶. In response, Céline on the one hand admitted that in her social circles the view that “happiness was impossible where money was lacking” had been only

natural and that she could barely stand the thought of her husband having to make up his bed himself⁹⁷. She also agreed that their characters differed, as “[y]ou are a little bear who knows how to live by himself and enjoys this solitude, but I am not like that”⁹⁸. On the other hand, though, she charged Leo with attempting to create an emotional gulf between them, in addition to the already existing physical one, by focusing on what separated them instead of what they had in common, as well as by exaggerating actual dissimilarities.

Céline also expressed concern that her husband would permanently develop into the kind of antisocial loner which he depicted himself as in the above-quoted letter. To Leo, however, this certainly was no incentive for returning to Europe. By contrast, he countered that: “Living two years in a free and independent country without being bothered constantly by friends and relatives has made me appreciate the advantages of this kind of life. Here at least if I don’t care about people they don’t care about me and I do not have the smallest interest in involving myself in the chicaneries and annoyances of ‘society’ again”⁹⁹.

94. Baekeland to Swarts, undated (ca. early 1891) (translation mine). On Baekeland’s dislike of “society”, see, for instance, his journal 1, 27 April 1907 (LBP). **95.** Cf., for instance, BAEKELAND, letter to Swarts, 3 March 1889 (LBP, series 3, box 13, folder 2). **96.** Baekeland to Swarts, undated (ca. early 1891) (translation mine). **97.** SWARTS, letter to Baekeland, 20 October 1890 (LBP, series 3, box 13, folder 6) (translation mine). See also, for instance, Swarts to Baekeland, 27 January 1891 (erroneously dated 1890) (LBP) in which she muses that she and Leo would later, “installés dans des beaux fauteuils”, look back on their material discomfort. **98.** Swarts to Baekeland, 5 September 1890 (LBP, series 3, box 13, folder 5) (translation mine). See also Swarts’ letter of 19 November 1890 in folder 6 in the same box. **99.** Baekeland to Swarts, undated (ca. early 1891) (translation mine).

The notion of entrepreneurs as “strangers” or outsiders has a long history in entrepreneurship research, and there can be no doubt that Baekeland considered himself alien to his academic milieu in Ghent¹⁰⁰. As he liked to emphasize in later autobiographical reflections, his social background had been more modest than that of most of his colleagues and friends and his pre-university education in industrial chemistry at the bilingual Industrial School of Ghent (*École industrielle* or *Nijverheidsschool*) had been far more practically oriented. Clearly, Baekeland’s feelings of estrangement in connection to this background facilitated his choice to settle down abroad, in opposition to his wife’s preferences. They also go a long way in explaining why he did not appear to focus as much on making a career in academia as might be expected of someone seeking to gain social standing and prestige. In September 1885, as an example, the Faculty of Sciences of the University of Ghent unanimously proposed to promote Baekeland to the position of assistant to the course in general chemistry. Yet the professors present at the meeting were under the impression that Baekeland – who had actually been considering moving to Congo – would rather accept a job abroad. Furthermore, these personal background factors almost certainly contributed to the fact that Baekeland reached life-changing decisions in a relatively

autonomous and sometimes individualistic manner.

In the opinion of Carl Kaufmann, author of a comprehensive biographical profile of Baekeland, the scars caused by Céline and Leo’s quarrels and prolonged separation never fully healed¹⁰¹. Yet their marriage did not collapse and Céline, together with Jenny, the daughter to whom she had given birth on 5 November 1890, finally rejoined Leo in New York around May 1891.

Relatively little is known about what happened between this reunion and the foundation of Baekeland’s second photochemical start-up, the Nepera Chemical Co., in the second half of 1893. Baekeland surely attempted to hedge his bets by working on different potential inventions, including an antiseptic compound for food preservation, for which he filed a patent application in June 1892¹⁰². It is also noteworthy that Baekeland promoted a process invented by Effront, the fermentation chemist who had assigned his patent rights to the *Société Générale de Maltose*, to American alcohol manufacturers and “biological chemists” in an article in the *Journal of American Chemistry*¹⁰³. This might suggest that Baekeland still had ambitions to become the U.S. representative of the Brussels-based enterprise. Additionally, Leo seems to have taken to heart Céline’s earlier advice to actively participate

100. E.g., GEORG SIMMEL, “The Stranger”, in *The Sociology of Georg Simmel*, New York, 1950, p. 402-408. **101.** CARL KAUFMANN, *Grand Duke...*, p. 32. **102.** Cf. LEO H. BAEKELAND, “Address of Acceptance of Perkin Medal,” in *Presentation of Perkin Medal to L.H. Baekeland, s.l.*, 1916 (reprint from *Metallurgical and Chemical Engineering*), 17-38 (here 19) (referring to “several half-baked inventions, the development of which would have required a small fortune”); and U.S. patent no. 500,549. **103.** LEO H. BAEKELAND, “The Use of Fluorides in the Manufacture of Alcohol”, in *Journal of the American Chemical Society*, 1892 (14), p. 212-220.

in photographic clubs and societies. In April 1892, for example, he presented an introductory paper on carbon photography to the Society of Amateur Photographers¹⁰⁴. Finally, it is undisputed that Leo conducted further photochemical experiments until he was struck by appendicitis later that year or early in 1893 and “barely escaped the clutches of death”¹⁰⁵.

With hindsight, it is evident that Baekeland’s encounter with Leonard Jacobi (1850-1931), a German-Californian Jew, constituted a key event that helped break the downward spiral in which he was finding himself. Baekeland and Jacobi got to know each other in Europe, where Jacobi, a former stockbroker with an international network of professional contacts¹⁰⁶, is said to have been spending a fortune earned in finance on no less than fourteen years of “travel and recreation”¹⁰⁷. Then, in June 1893, while Baekeland was recovering from his illness, they met again in Yonkers, the New York City suburb in which Jacobi’s family had rented a mansion for the summer. Baekeland had just relocated from Manhattan to Yonkers and, apparently not deterred by the

severe economic depression that would keep unemployment rates at above ten percent until 1898, he and Jacobi went into business later that year¹⁰⁸.

Unlike Baekeland and Jules Guequier, Jacobi had no background in science. But his thoroughness and common sense approach to the day-to-day running of a business proved indispensable, as Baekeland would later recollect¹⁰⁹. This is not to say that Baekeland himself had drawn no lessons from his previous problems and failures. Perhaps most importantly, the chemist now seems to have almost single-mindedly dedicated himself to company affairs : there is considerable evidence that he worked long hours, limited his vacation time – particularly during the firm’s crucial first four years of existence – and did not engage in any other occupation¹¹⁰. This, I would suggest, indicates that he had obtained a more detailed understanding of what it takes to turn an initial invention or discovery into a commercial success and, this time around, fully committed himself to this process. The invention concerned – Velox photographic paper – was occasionally promoted as a gift

104. See LEO H. BAEKELAND, “The Carbon Process”, in *The American Amateur Photographer*, 1892, (4), p. 204-06; Swarts to Baekeland, 29 November 1890 (erroneously dated 1891) and 15 April 1891 (both in LBP). **105.** BAEKELAND, journal 54, 19 June 1934 (LBP). See also his “Laboratory Notes : 1889-94”, 17 and 38 (LBP). **106.** FRANCES DINKELSPIEL, *Towers of Gold: How one Jewish Immigrant Named Isaias Hellman Created California*, New York, 2008. **107.** “Leonard Jacobi”, in *Biographical History of Westchester County, New York*, vol. 2, Chicago, 1899, p. 494-496 (here 495). According to Baekeland, Jacobi’s investment in Nepera “proved the very best investment he ever made and made him rich again”. See his journal 46, 14 June 1929 (LBP). **108.** Cf. DAVID O. WHITTEN, “The Depression of 1893”, in ROBERT WHAPLES, *EH.net Encyclopedia*, 2001, available at <http://eh.net/encyclopedia/article/whitten.panic.1893> (accessed 3 May 2012). **109.** LEO H. BAEKELAND, “Address of Acceptance of Perkin Medal”, 20. **110.** Cf., for instance, BAEKELAND, journal 41, 30 June 1925 (LBP). Statistics often cited in the field of entrepreneurship research suggest that “over half of all new ventures will fail within their first four years of existence”; see BRIAN NAGY & FRANZ LOHRKE, “Only the Good Die Young ? A Review of Liability of Newness and Related New Venture Mortality Research,” in HANS LANDSTRÖM & FRANZ LOHRKE, *Historical Foundations of Entrepreneurship Research*, Northampton (MA), 2010, p. 185-204 (here p. 185).

to the United States by Baekeland, Jacobi, and their collaborators. Needless to say, as with his later invention, Bakelite, the benefits to the economy of Baekeland's country of birth were comparatively small.

III. Concluding Remarks

This article has shown that institutional arrangements and attitudes in Baekeland's European home environment were an important reason behind his migration to the United States and his related decision to dissolve Dr Baekelandt et Cie at the earliest possible moment. In view of the rise of academic biotechnology entrepreneurship from the late 1970s onward, which cannot be properly understood without considering legislation regarding intellectual property and venture capital finance, it is significant that informal institutions clearly mattered more than formal ones¹¹¹. For instance, there are no indications that Belgium's patent system was a constraint, although it offered relatively weak incentives to invent, particularly in comparison to the U.S. system. As for the rules against State university employees accepting outside work without government permission, my analysis points to the importance of the informal, *de facto* implementation of regulations, in contrast to the formal, *de jure* rules. In this respect, Baekeland's timing was fortunate. In the 1890s, such extra-academic engagements

by professors and other faculty members came under scrutiny and were sometimes forbidden. In the late 1880s, by contrast, the legal provision on the basis of which "the door was closed to abuses" in the next decade had essentially remained a dead letter¹¹². There are even indications that Wagener, the then government representative at the University of Ghent, had personally encouraged Baekeland to bring his photographic invention to market. Arguably, the financial side of the history of Dr Baekelandt et Cie provides an exception to the relative unimportance of formal institutions. From a present-day perspective, the absence of formal seed and venture capital industries could be considered a heavy constraint. Baekeland and his partners did get a loan from the *Banque de Flandre* and were able to raise considerable sums from a few wealthy individuals, but the Guequiers were desperately searching for additional funding by the summer of 1890 and Baekeland's wife concluded that Dr Baekelandt et Cie had mainly lacked money. However, even if the availability of venture capital had been stipulated by formal rules and regulations, it would not have automatically followed that the academic inventor's start-up would have effectively received the much-needed funding.

The impact of informal institutions certainly was more tangible. These included the aversion to risk that Céline Swarts observed in

111. ELIZABETH P. BERMAN, *Creating the Market University : How Academic Science became an Economic Engine*, Princeton (NJ), 2011, chapter 4; PHILIP MIROWSKI, *Science-Mart : Privatizing American Science*, Cambridge (MA)/London, 2011; DAVID C. MOWERY et al., *Ivory Tower and Industrial Innovation : University-Industry Technology Transfer Before and After the Bayh-Dole Act*, Stanford (CA), 2004. 112. Ghent University Archives, 4A2/4 (Rectorial Archives) (quotation from box 72, letter of Minister of Education to administrator-inspector, 20 January 1898).

her social surroundings in Ghent as well as the (perceived) lack of occupational mobility to which her husband referred. Yet, above all, the expectation to behave as a “society man” represented a major burden to Baekeland, an independence-seeking outsider of a relatively modest background. As demonstrated, this argument is supported not only by the Baeke-lands’ correspondence from around 1890 but also by later evidence. On a return to Ghent in 1913, for instance, Baekeland fulminated against the idolization of “[a]rt – art !! Art !!!” – as opposed to science, technology and industry – a cultural hierarchy which he connected with “stupidity and ignorance and arrogance !”¹¹³. He made similar observations elsewhere in Europe; but contrary to his early-twentieth-century efforts to reform the U.S. patent system, at the stage of his career examined in this article Baekeland had preferred to reinvent himself on the other side of the Atlantic rather than dedicate himself to institutional change back home. In other words, he was not yet an institutional entrepreneur.

To say that informal institutions influenced Baekeland’s decision-making is not to say that institutional theory provides the most appropriate framework for analyzing his early entrepreneurship. As a case in point, on the basis of the evidence presented, one could equally argue that the *culture* of Baekeland’s home environment did not reward entrepreneurialism as strongly as a more individualistic American culture, shaped by an ideology of

“self-made manhood” to which Baekeland was receptive¹¹⁴. Furthermore, while research on the social backgrounds of entrepreneurs and their personality traits has, to an extent, gone out of fashion¹¹⁵, I would suggest that studies in this tradition provide a better basis from which to interpret some of Baekeland’s basic drives and motivations than the perspective offered by the institutional literature. It would, for instance, be worthwhile to more thoroughly analyze Baekeland’s sense of being an outsider from a socio-psychological point of view. Another potentially crucial drive concerns Baekeland’s troubled relationship with his father, a shoemaker with alcohol problems. Important comparative information on this feature is provided by a 1978 article entitled “American Entrepreneurs and the Horatio Alger Myth”. The study’s author, economic historian Bernard Sarachek, found that 56 percent of the 187 entrepreneurs in his research sample had lacked a supportive father¹¹⁶. Finally, a solely institutional perspective would also fall short in explaining the link between the professional backgrounds of Baekeland and the Guequiers and the unsatisfactory performance of Dr Baekelandt et Cie. As this article has demonstrated, the lack of business experience, and commitment, of the partnership’s founders constituted a major stumbling block. In order to appreciate the importance of this fact, it was necessary to look beyond rules, norms, and incentive structures.

113. BAEKELAND, journal 12, 20 March 1913 (LBP). **114.** MERCELS, *Baekeland as Scientific Entrepreneur*, chapters 1 and 2; SANDAGE, *Born Losers*. **115.** COLIN MASON & CHARLES HARVEY, “Entrepreneurship : Contexts, Opportunities and Processes”, in *Business History*, no. 1, 2013 (55), p. 1-8 (here p. 1). **116.** BERNARD SARACHEK, “American Entrepreneurs and the Horatio Alger Myth”, in *The Journal of Economic History*, 1978 (38), p. 439-456.

Taken together, these qualifications suggest the desirability of incorporating findings from various strands of entrepreneurship research into hybrid theories, rather than relying on the institutional approach to entrepreneurship as a single paradigm. An example of such a synthesis is provided by a 2013 article in *Business History*. Drawing on life histories of Indian entrepreneurs, the authors show that a stress on historical complexity need not exclude the development of valuable theoretical concepts and arguments¹¹⁷. In this way, biographical research on entrepreneurs truly adds to entrepreneurship theory.

JORIS MERCELIS is a BOF Postdoctoral Fellow at the Department of History and the Sarton Centre for History of Science, both of Ghent University. In May 2013 he completed a Ph.D. project on Leo Baekeland and the relations between science and industry, supervised by Christophe Verbruggen and Danny Segers and financed by the Fund for Scientific Research – Flanders.

Abbreviations

ABP		Association Belge de Photographie
LBP		Leo Baekeland Papers

117. AJIT NAYAK & MAIRI MACLEAN, “Co-Evolution, Opportunity Seeking and Institutional Change : Entrepreneurship and the Indian Telecommunications Industry, 1923–2009”, in *Business History*, no. 1, 2013 (55), p. 29-52.