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## **Jan Ewangelista Goetz and His Role in the Invention of Modern Lager**

The article discusses the spread of bottom fermentation technology in brewing and the origins of modern lager, which occurred starting in the 1830s. This process has not been fully explained and is still debated by researchers today. The role played by Jan Ewangelista Goetz (1815–1893) has remained unrecognized until now. He is primarily known as the founder of the brewery in Okocim. After leaving his family village, he worked at the brewery in Klein-Schwechat owned by Anton Dreher (1810–1863), a relative of the Goetz family. He described this period of his life in his diaries, which became part of the family archive after his death. During the occupation, the brewery was placed under German administration. The documents ended up in the possession of German historian Joseph König and were taken to Munich at the war's end. In 1982, Jan M. Włodek, a relative of the Goetz-Okocimski family, discovered them, brought them to Poland, and added them to the family archive. The contents of the diaries shed new light on the beginnings of the popularization of bottom fermentation. Although the technology appeared to be a novelty, it had been known to brewers as far back as the Middle Ages. The breakthrough came with implementing temperature control using natural ice, which Goetz proposed and introduced at the brewery in Klein-Schwechat. Out of the combination of scientific inventions, such as the saccharimeter or the thermometer, and new technical advancements, a new style emerged that perfectly catered to consumer tastes. Although modern lager was developed in several places, Klein-Schwechat seems to be the most significant.

**Keywords:** history of brewing, Jan Ewangelista Goetz (Johann Evangelist Götz), Anton Dreher, lager, Klein-Schwechat, Okocim

**Słowa kluczowe:** historia piwowarstwa, Jan Ewangelista Goetz, Anton Dreher, lager, Klein-Schwechat, Okocim

## Introductory remarks

Jan Ewangelista Goetz (Johann Evangelist Götz)<sup>1</sup> is known as the founder of the Okocim brewery, which still exists today. His biography is presented in studies devoted to the history of his family and the brewery he founded.<sup>2</sup> The activity of this remarkable man coincided with a period of significant changes in the brewing industry, leading from craft to factory production. It has been emphasized more than once that he was both a participant and a first-hand witness to these changes. His role in the Galician industry's modernization and his social activism are well appreciated. However, his contribution to the invention of modern beer, brewed using bottom fermentation, remains effectively unknown. Admittedly, this is mentioned by Jan Marian Włodek (who had access to Goetz's diaries), but not being a specialist in brewing, he failed to fully grasp the significance of the source he analyzed.<sup>3</sup> This study aims to draw attention to the significant role played by Jan Ewangelista Goetz in the invention of modern beer, commonly referred to as 'lager'.<sup>4</sup>

## Jan Ewangelista Goetz, his family and the tangled fate of the diaries

The story of Jan Ewangelista Goetz's diaries is no less exciting than their contents. They were completed on 18 February 1873. They are not very extensive, covering the period from his departure from his family home on his journeyman's travels to the end of his work at Anton Dreher's brewery in Klein-Schwechat.<sup>5</sup> Throughout the years, this document was part of the family archive. The diaries were used in the commemorative publication *Ku pamięci potomków Jana Goetza Okocimskiego, 1815–1893 (To the Memory of the Descendants of Jan Goetz Okocimski, 1815–1893)*, published in 1929.<sup>6</sup> Even before the German army

- 1 In English-language literature, variations of the surname's spelling can also be found, such as 'Johann Evangelist Götz' or 'John the Evangelist Götz'. On 21 August 1888, Jan Ewangelista Goetz received from the Emperor the noble title and the coat of arms of his own name (Edler von Okocim). From that moment on, he officially appears as Goetz-Okocimski (notoriously adopted Polish version of the surname). This form of the surname was adopted by the family, which is most clearly confirmed by the anniversary edition of the memoir book *Ku pamięci potomków Jana Goetza Okocimskiego, 1815–1893 (To the Memory of the Descendants of Jan Goetz Okocimski, 1815–1893)*. It should also be observed that the notation of the surname as 'Goetz' is a distinguishing feature of the Okocim branch of the family. Jan M. Włodek emphasizes that after this event Jan Ewangelista used to appear demonstratively in Polish nobleman's attire. Accordingly, the form 'Goetz' is adopted in this article; cf. J.M. Włodek, *Goetz-Okocimscy. Kronika rodzinna*, Kraków 2001, p. 36.
- 2 For example: *Ku pamięci potomków Jana Goetza Okocimskiego, 1815–1893*, Kraków 1929; J.M. Włodek, *Goetz-Okocimscy. Kronika rodzinna*, Kraków 2001; *Rola rodziny Goetzów-Okocimskich w budowie gospodarki, kultury i rozwoju cywilizacyjnego regionu Polski południowej*, ed. by S. Gawlik, Brzesko 2017.
- 3 J.M. Włodek, *Goetz-Okocimscy*, p. 28.
- 4 Nowadays, under the term 'lager' we understand a whole family of beer styles. They all have one thing in common: the *saccharomyces pastorianus* yeast, named after Louis Pasteur. These are yeasts that work in the low temperature range. Their characteristic feature is that they sink to the bottom – hence the term 'bottom fermentation'. Yeasts working in a higher temperature range stay on the surface of the wort (top fermentation). The result of their work is ale-type beers, forming another large family of styles; cf. M. Dredge, *A Brief History of Lager. 500 Years of the World's Favourite Beer*, London 2019, p. 10.
- 5 J. Promintzer, G. Otruba, *Dreher, Anton*, [in:] *Neue Deutsche Biographie*, vol. 4 (Dittel-Falck), ed. by O. zu Stolberg-Wernigerode, Berlin 1971, p. 107–108.
- 6 The memoirs of Jan Ewangelista Goetz were known (in whole or in part) to the author of the monograph prepared for the 300<sup>th</sup> anniversary of the brewery in Klein-Schwechat. The author drew attention to an interesting but not very relevant passage. It was quoted in a monographic study of the history of the Dreher and Mautner families; see J. Promintzer, *Dreihundert Jahre Brauhaus Schwecat: [1632 bis 1932], Vergangenheit und Gegenwart der größten Brauerei Österreichs dargestellt zu ihrem dreihundertjährigen Jubiläum*, Wien 1932;

entered Okocim in September 1939, the archive was hidden under the stairs in the so-called Old Palace. The Goetz-Okocimski family left Poland, and the entire estate was taken over by the Germans. The brewery was managed by an administrator appointed by the German occupation authorities. The place where the diaries were hidden was pointed out to the Germans by one of the Polish employees of the facility. In 1943, the then-manager Karl Schröder handed them over to Joseph König with the idea of compiling a history of the brewery to mark the 100<sup>th</sup> anniversary of its founding.<sup>7</sup> Due to the advancing Soviet offensive, the documents were taken to Munich, where they remained until the war's end. By chance, in 1982, descendants of the Goetz-Okocimski family located Schröder's address in Austria, and he directed them to König's address in Bavaria. Under pressure from Juliusz Komornicki<sup>8</sup> and Manfred Götz of Ostrach in Württemberg, König decided to return the archive in 1983.<sup>9</sup> Among the returned documents were handwritten memoirs of Jan Ewangelista, extracts from documents and an unfinished study by Joseph König.<sup>10</sup> The documents were sorted by Manfred Götz, who brought them to Poland in 1985. The original documents were placed in the hands of Juliusz Komornicki,<sup>11</sup> and the copies remained in the possession of Jan Marian Włodek and are currently held in the Archives of the Zofia and Jan Włodek Foundation in Kraków.<sup>12</sup>

The fate of the company archive was equally unfortunate. Around 1950, the management of the nationalized brewery decided to 'rearrange' the collection, which was intact during the war and almost complete. Some of the records were burned on a stake lit in the brewery's courtyard (some documents were saved from the conflagration by the employees), while others were given to the State Archives in Bochnia.<sup>13</sup>

A. Paleczny, Ch.M. Springer, A. Urban, *Die Geschichte der Brauerei Schwechat. Von den Bierbaronen Dreher und Mautner Markhof in die Gegenwart*, Wien 2021, p. 37.

- 7 The work was not completed, and the jubilee study was never printed. However, a typescript has survived, covering the first chapters of the planned monograph. The greatest value of the study is the numerous quotations from documents that have unfortunately been lost.
- 8 Juliusz Komornicki was the son of Stefan and Maria Pia née Goetz-Okocimska. In 1939, he joined the supervisory board of the family joint-stock company Okocim Brewery as its youngest member. He had a versatile education, for example in food chemistry (brewing technology); he obtained his diploma at the Technical University in Łódź. After World War II, he worked in various positions in the state brewing industry. He died in 1998; cf. J.M. Włodek, *Goetz-Okocimscy*, p. 94; J. Rybowska, *Profesor Anna Maria Komornicka: życie i praca*, "Collectanea Philologica" 1995, vol. 2, p. 5–6.
- 9 J.M. Włodek, *Goetz-Okocimscy*, p. 199.
- 10 A reading of König's study indicates that the returned archive is probably incomplete – as he quotes documents (e.g. letters exchanged between Jan Ewangelista Goetz and his brother Thomas) that were not found in the collection under study.
- 11 According to the description of the documents in J.M. Włodek's hand, this was done at Joseph König's request. The current place of storage of the originals is unknown.
- 12 The Archives of the Zofia and Jan Włodek Foundation were started by Jan Zdzisław Włodek (1885–1940), landowner, legionary, diplomat, specialist in agricultural sciences, professor at the Jagiellonian University, owner of the Dąbrowica estate in the Bochnia district and of the Ostrowy Tuszowskie (Buda Tuszowska) forest estate in the Kolbuszowa district, initially in the manor house in Dąbrowica, then in his home in Kraków at 5 Pędzichów-Boczna St. The Foundation collects testimonies from witnesses to the history of the landed gentry in the form of audio and video files, and accepts the legacies of the landed gentry. It also looks after the legacy of the Sulima-Włodek family of Dąbrowica. It includes, among others, the economic records of the Dąbrowica manor estate, the private correspondence and scholarly works of the Founders and Patrons of the Foundation, the photographic legacy of Jan Z. Włodek and Jan M. Włodek, and documents of the Goetz-Okocimski family.
- 13 A sizeable collection of documents from the occupation period, separated and handed over to the Security Office in Warsaw, was saved by an unusual coincidence. The documents handed over to the archive in Bochnia were sorted out in batches and in the 1970s were transferred to the Wawel Branch of the Archives in Kraków. At the same time, documents from the post-war period were collected in Bochnia. Currently, both sets (the

Jan Marian Włodek wrote the following about the roots of the Goetz-Okocimski family:

The ancestors of the Goetz-Okocimski family lived on the upper Danube, in Württemberg (now Baden-Württemberg). The oldest preserved documents concerning the Goetzes are church records from this area from the 17<sup>th</sup> c. Information about them can also be found in the economic records of the Benedictine abbey in Zwiefalten, located near the town of Riedlingen, as the oldest Goetzes known to us were its fiefs. In addition to farming, they were also involved in brewing, an occupation traditionally passed from father to son. In the villages where they lived, they had small breweries and usually country inns next to them. [...] The Goetz-Okocimskis' ancestors owned an inn, 'Under the Angel' ('Zum Engel'), in the village of Daugendorf, which still exists today. In 1762 it was sold by Joseph Anton IV, who moved to the neighbouring village of Langenenslingen. He and his descendants owned land there, a small farm including a brewery and two inns – 'Under the Eagle' ('Zum Adler') and 'Under the Cross' ('Zum Kreuz') – where they sold their beer. These taverns still exist today in the same locations, but they changed owners long ago. Anton V, son of Joseph Anton IV, had three sons from his second wife: Anton VI (1815–1871), Johann Evangelist (1815–1893) and Thomas (1816–1895). All three brothers learned the brewing trade from their father and became members of the brewers guild. As the eldest, Anton VI inherited, according to Württemberg law, the entire farm from his father (land, brewery and 'Under the Cross' inn) but died childless. Anton V's two younger sons left Württemberg – Jan Ewangelista went to Poland and became the founder of the Polish branch of the Goetz family, i.e. the Okocimskis, while Thomas settled in Austria and gave rise to the Austrian line which exists to this day.<sup>14</sup>

The young Jan Ewangelista Goetz graduated from the schools in Langenenslingen and Wilfingen and then trained as a brewer in his father's brewery. In 1834, he left his home village and began journeyman's travels. He traveled through southern Germany, northern Switzerland and Austria, taking up work in the breweries there. After three years, he arrived in Klein Schwechat, where his cousin Anton Dreher's brewery was located. As he emphasized in his memoirs, he started his apprenticeship with hard physical work. He was quickly promoted to the position of cellarman and then technical manager and deputy brewery owner (from 1 February 1839). According to J.M. Włodek:

At this time, Jan Ewangelista [Goetz] brought Anton Dreher's brewery in Klein-Schwechat to a flourishing state, laying the foundations for its further magnificent development. Over time, the brewery became one of the first in Europe, both in terms of quantity and quality of the beer produced. The Dreher family made a huge fortune in the second half of the 19<sup>th</sup> c. While working at this brewery, Jan Ewangelista increased beer production from 1,800 hL per month to 7,200 hL. He introduced the still little-known method of producing bottom-fermented lager-

Götz-Okocim Archives and the Okocim Brewery) are held in the resources of the National Archives in Krakow; see J.M. Włodek, *Goetz-Okocimscy*, p. 12, footnote 8.

14 J.M. Włodek, *Goetz-Okocimscy*, p. 15–16 (all excerpts from J.M. Włodek's book quoted in the text, as well as quotations from other authors, have been translated by the author of this article).

ing beer there (this method was also responsible for the excellent quality of the Okocim beer and later became the foundation for the brewery's great success in the 19<sup>th</sup> c.). In the days of Jan Ewangelista's youth, this method was diligently and jealously guarded by those brewers who knew it.<sup>15</sup>

Interestingly, the topic of the introduction of bottom-fermentation technology at Dreher's brewery was also touched upon in the family saga of 1929, mentioning Jan Ewangelista Goetz as the one who 'introduce[d] the still little-known production of lager beer with bottom fermentation in Vienna and the surrounding area.'<sup>16</sup> The source of this information, likely in addition to oral family tradition, was the diary of Jan Ewangelista Goetz, which was taken by the Germans at the end of the occupation and fortunately recovered by J.M. Włodek.

### Fermentation – a brief historical overview

Fermentation is an enzymatic process of transforming organic compounds by microorganisms, taking place under anaerobic conditions and resulting in metabolically useful energy for organisms living permanently or periodically under anaerobic conditions.<sup>17</sup> One variation of this is alcoholic fermentation, during which ethanol and carbon dioxide are formed from carbohydrates under the influence of enzymes produced by yeast. In brewing, fermentation begins with the addition of brewer's yeast to the cooled wort.<sup>18</sup> They are unicellular fungi and belong to a group of relatively anaerobic organisms. This means that they derive the energy necessary for growth in the presence of oxygen (aerobic conditions) through respiration and fermentation in anaerobic environments (anaerobic conditions).<sup>19</sup> The yeast species used today have been selected with the development of brewing and microbiological techniques and do not have their counterparts in nature.<sup>20</sup> This is related to the fermentation technology characteristic of brewing, which involves using the yeast from a completed fermentation to initiate the next one. In addition to cultured yeasts, strains called wild yeasts occur in nature. Fermentation results in beer that contains alcohol and carbon dioxide and is characterized by a specific taste (depending on the type) and a thick and persistent foam.<sup>21</sup>

There are two types of fermentation, both induced by the respective types of yeast, namely top fermentation and bottom fermentation, of which each is divided into two phases: primary and secondary fermentation.<sup>22</sup> Top fermentation occurs at temperatures ranging from 10 to 25 °C and is characterized by a rapid and violent course. Yeast accumulates on

15 Ibidem, p. 28.

16 *Ku pamięci potomków*, p. 17.

17 C.J. Lintner, *Technologia browarnictwa*, ed. by H. Lüers, transl. by P. Wojcieszak, Warszawa 1950, p. 119–125; *A Dictionary of Chemistry*, ed. by J. Daintith, Oxford 2008, s.v. Fermentation.

18 D. Rabin, C. Forget, *The Dictionary of Beer and Brewing*, Boulder 1998, s.v. Fermentation.

19 W. Kunze, *Technologia piwa i siodu*, Warszawa 1999, p. 50–51.

20 M.J. Lewis, T.W. Young, *Piwowarstwo*, transl. by K. Stachowiak, K. Wojtaś, Warszawa 2001, p. 144.

21 W. Dylkowski, *Browarnictwo*, Warszawa 1976, p. 200.

22 D. Rabin, C. Forget, *The Dictionary*, p. 110; C.J. Lintner, *Technologia browarnictwa*, p. 147–157; W. Dylkowski, *Browarnictwo*, p. 200–217; F. Hlávaček, A. Lhotský, *Piwowarstwo*, transl. by W. Gutek, Warszawa 1970, p. 245; M.J. Lewis, T.W. Young, *Piwowarstwo*, p. 158.

the surface of the fermenting wort.<sup>23</sup> Bottom fermentation occurs at a lower temperature, with an optimum range of 6 to 10 °C, which is much slower, and the yeast accumulates at the bottom of the liquid.<sup>24</sup> Most of the sugar is fermented during the main (turbulent) fermentation. However, this does not mean that a drinkable product is obtained. Young beer still requires lagering fermentation, during which further, almost complete fermentation of the sugars takes place – the yeast settles, the beer clarifies and is saturated with carbon dioxide.<sup>25</sup>

The widely accepted view is that bottom fermentation originated shortly before the mid-19<sup>th</sup> c. and then spread rapidly across almost the entire European continent. In the literature on the history of brewing, many myths and misunderstandings have grown up around yeast, including the fairly common belief that yeast was not known at all in the medieval and early modern periods and that beers were the product of chance and spontaneous fermentation or, at best, top fermentation was used. The role of yeast in the fermentation process was well understood, although the nature of yeast was unknown. Furthermore, bottom-fermented beers were well-known as early as the Middle Ages.<sup>26</sup> A comprehensive lecture on brewing was given by Tadeáš Hájek in his work *De cerevisia eiusque concienti ratione, natura, viribus et facultatibus opusculum* (Francofurti 1585). Chapters 6 and 10, which deal with adding yeast to beer and its nature, are particularly interesting. The author thoroughly described top-fermenting yeasts, which accumulate near the surface, as well as bottom-fermenting yeasts, which, in contrast, settle to the bottom. He also linked the appearance of carbon

- 23 C.J. Lintner, *Technologia browarnictwa*, p. 125. The lower limit temperature is contentious. D. Rabin and C. Forget state that it is 13 °C (below which fermentation cannot take place). They consider a temperature in the range of 15–25 °C to be optimal, while the maximum overheating (upper limit) is 37.5–39.8 °C; cf. D. Rabin, C. Forget, *The Dictionary*, p. 266. Characteristically, however, older brewing manuals indicate a much lower temperature threshold specific to bottom fermentation. For example, the authors of the manual *Wyrób Piwa* (1923) indicate an optimum range of 8 to 16 °R (10–20 °C), Hans Leberle (1925) indicates a range of 10–25 °C, as does P.M. Malcew (1948) and Carl Lintner (before 1950). According to Max Delbrück's lexicon (1925), the optimum fermentation temperature is between 12–22 °C, but the lower range can be reduced to 9–12 °C. Other textbooks from the turn of the 20<sup>th</sup> c. give similar values; cf. *Wyrób piwa*, ed. by M. Dominikiewicz, Łódź, Katowice 1923 (Biblioteka techniczno-naukowa dla wszystkich – Fiszera, no 2), p. 106; H. Leberle, *Die Bierbrauerei*, part 2, *Enke's Bibliothek für Chemie und Technik unter Berücksichtigung der Volkswirtschaft*, vol. 5, Stuttgart 1925, p. 326; C.J. Lintner, *Technologia browarnictwa*, p. 125; *Illustriertes Brauerei-Lexicon, Begründet von Max Delbrück*, ed. by F. Hayduck, vol. 2: I–Z, Berlin 1925, s.v. Obergärung; P.M. Malcew, *Technologia i aparatura przemysłu piwowarskiego*, Warszawa 1953, p. 381.
- 24 According to classic Czech formulas, the temperature at which fermentation begins is 6–9 °C, and during fermentation it follows a curve (initially rising, then falling): from 9 to a maximum of 10.1 °C, then lowered to 6 °C; J. Faměra, *Kvašení a dokvašování piva*, [in:] *Technologie výroby sladu a piva*, ed. by K. Kosař, S. Procházka, Praha 2003, p. 256. A range of 5 to 10 °C is given in: C.J. Lintner, *Technologia browarnictwa*, p. 125; D. Rabin, C. Forget, *The Dictionary*, s.v. Bottom fermentation. The further part of the process, called lagering or silent fermentation, is carried out under positive pressure at a reduced temperature – down to about 1–2 °C; T. Pazera, T. Rzemieniuk, *Browarnictwo*, Warszawa 1998, p. 167.
- 25 C.J. Lintner, *Technologia browarnictwa*, p. 140.
- 26 The prevailing view today is that *Saccharomyces pastorianus*, which is responsible for the production of bottom-fermented lager beer, is a hybrid species that arose from the mating of the top-fermenting yeast *Saccharomyces cerevisiae* and the cold-resistant *Saccharomyces eubayanus* in the early 17<sup>th</sup> c. A paper has recently been published in which the authors, based on a detailed analysis of brewing records in Central Europe, proposed that the introduction of the top-fermenting yeast *S. cerevisiae* into an environment where *S. eubayanus* was present, rather than vice versa, should be considered the critical event for hybridization. Indeed, bottom fermentation in some parts of Bavaria preceded the proposed hybridization date by several hundred years, and it is highly likely that this was carried out by yeast mixtures that may have contained *S. eubayanus*; cf. M. Hutzler, J.P. Morrissey, A. Laus, F. Meussdoerffer, M. Zarnkow, *A New Hypothesis for the Origin of the Lager Yeast Saccharomyces Pastorianus*, "FEMS Yeast Research" 2023, vol. 23, p. 1–17.

dioxide to yeast (although he derived this in a rather peculiar way).<sup>27</sup> Yeast was traded not only between brewers but also between municipal centres.

The brewing order promulgated by the city council of Lwówek Śląski in 1609 stipulated that yeast from Zittau or Leipe should be added to beers brewed from wheat and yeast from Kamenz, Ortrant or Trutnov to barley beers. The city held a monopoly on the yeast trade.<sup>28</sup> Looking at the great centres of European brewing, we can easily see that fermentation and lagering were carried out in cellars, sometimes deeply sunken and well-insulated. A relatively constant temperature prevailed in them, which can be determined as between 6 and 11 °C. With some caution, it can be assumed that the non-homogenous yeast strains of the time (which, after all, should be considered as being as noble as possible, i.e. cultured) were able to work over a wide range of temperatures, taking up work depending on the external conditions, both bottom and top. Let us also quote the opinion of the eminent Czech technologists František Hlavaček and Alois Lhotski:

For distinguishing top yeast from bottom yeast, neither the higher fermentation temperature nor the floating of the cells towards the surface of the fermented liquid is quite authoritative. The top yeast can gradually become accustomed (adapted) to lower temperatures and may not rise to the surface. A similar phenomenon can occur at higher temperatures if the layer of fermenting liquid is too low.<sup>29</sup>

In other words, Central European<sup>30</sup> brewing developed two trends, or rather two basic styles, as early as the Middle Ages. White beers, made from lightly dry wheat malt<sup>31</sup> and undergoing top fermentation, and black beers, made from more heavily dry barley malt and using bottom fermentation, were widely produced and consumed. Unlike wheat beers, these beers were stronger, lagered for a long time, and often exported. These included those from Swidnica, Opava or Rakovník. March beers are associated with the tradition of black beers, often identified with them (such as Opava beer).<sup>32</sup>

The origins of March beer (*Märzenbier*) are not convincingly documented. It was already known in the Middle Ages. The first Krakow reference to black March beer dates back to 1396, undoubtedly one of the oldest records of March beer in general.<sup>33</sup>

27 T. Hájek, *De cerevisia eiusque conficiendi ratione, natura, viribus et facultatibus opusculum*, Francofurti 1585, p. 29, 31–33; idem, *O pivě a způsobách jeho přípravy, jeho podstatě, silách a účincích* [1588], "Kvas" 1878, vol. 6, p. 295–297, 366; idem, *O pivě a jeho výrobě, povaze, silách a vlastnostech*, ed. by K. Nademlejnský, "Pivovarské Listy" 1884, vol. 2, p. 189–192.

28 E. Braniewski, *Piwowarstwo Lwówka Śląskiego*, Lwówek Śląski 2009, p. 9.

29 F. Hlavaček, A. Lhotský, *Piwowarstwo*, p. 246 (author's translation from the Polish edition).

30 In particular, we have in mind Poland, Silesia, Bohemia and Moravia and German-speaking countries with a developed brewing tradition.

31 The name 'white beer' does not derive from the colour of the beer (which is yellow, with a slightly greenish tinge) but from the colour of the mildly dry wheat malt.

32 Hájek referred to it as a March beer. Waclaw Maciejowski, citing Pedemontanus' opinion, noted: 'The black beer from Opava had its admirers, but it was criticized by doctors, who recommended using Krakow's *dwurażne* (dubelt) beer instead'; W.A. Maciejowski, *Polska aż do pierwszej połowy XVII wieku pod względem obyczajów i zwyczajów*, vol. 3, Warszawa 1842, p. 367–368. Syreniusz, on the other hand, wrote: 'the essence is as thick as Świdnickie beer, but not as dense, very fattening and warming'; Syreniusz, *Zielnik, herbarzem z języka facińskiego zowią. To jest opisanie własne imion, kształtu, przyrodzenia, skutków y mocy ziół wszelakich, drzew, krzewów y korzenia* [...], Cracoviae 1613, p. 947.

33 And perhaps even the oldest; cf. S. Dryja, S. Stawiński, *Mała Encyklopedia piwowarska Krakowa i Kazimierza, w wieku XVI i pierwszej połowie wieku XVII. Studia z dziejów piwowarstwa i Kazimierza, z uwzględnieniem problematyki Kleparza i przedmieść*, Kraków 2018, p. 188–189.

Platocomus wrote about March beer (brewed in March and specific to Prussia) in 1551.<sup>34</sup> It is mentioned by other authors of the early modern period.<sup>35</sup> The Bavarian Purity Law (*Reinheitsgebot*) of 1516, which regulates prices and lists permissible beer ingredients, mentions March beer. According to a widespread interpretation of this regulation, March beer could be brewed between St Michael's Day (29 September) and St George's Day (23 April).<sup>36</sup>

Towards the end of the 17<sup>th</sup> c., and particularly in the 18<sup>th</sup> c., the tradition of brewing beers resulting from bottom fermentation began to disappear.<sup>37</sup> It certainly persisted in Bavaria and some urban centres in Bohemia. There are numerous references to bottom fermentation in brewing manuals dating back to the late 18<sup>th</sup> c. To cite two examples, Gottfried Rupprecht's handbook *Gründliche und praktische Abhandlung von der Malz- Brau- und Gärungskunst*, published in 1791 in Graz, describes in detail the fermentation with bottom yeast (*unterhefen*), as well as the production of long-aging beers (*lagerbiers*). Rupprecht also described the bottom-fermenting yeast as black (*Schwarzhefen*) and falling to the bottom. Naturally, this evokes beers described as black, though their colour was not black at all (as Tadeáš Hájek had already observed). Hájek described their colour as ranging from dark yellow through red to brown. A characteristic feature in the production of lager beers was a long lagering period (up to six months) as well as the fact that they were brewed in March and April.<sup>38</sup> Let us add that this now-unique manual was in the collection of books left behind by Jan Ewangelista Goetz.<sup>39</sup>

Slightly less space was devoted to bottom-fermented beers by František Poupě. He is the author of a three-volume work published in German in 1794 in Prague.<sup>40</sup> An abbreviated version of this work was published in Czech in 1801.<sup>41</sup> The author pointed out that the tradition of beers made by bottom fermentation has almost completely disappeared (except for Bavaria). It has survived in only a few urban centres in Bohemia, including Rakovník and Žatec (a beer called *samec*). Despite this, the catalogue of qualities of a good brewer (point 10) states: 'he is to know how by dual means, i.e. using upper as well as lower yeasts [beer – S.D.] can be made.' When characterising lager beer, Poupě writes that it should remain in the cellar for at least twelve to fourteen weeks and near an ice-cellar.<sup>42</sup>

In summary, bottom-fermented beers were described as black beers, brewed from barley malt (sometimes more heavily dry-hopped, and therefore darker and more intense in colour), lagered for a long time (hence the name *lager* or *lager bier* – both still found

34 J. Platocomus, *De natura et viribus cerevisiarum et mulsarum opusculum*, Wittenberg 1551, p. 85.

35 S. Dryja, S. Sławiński, *Mała Encyklopedia*, p. 286–288.

36 K. Hackel-Stehr, *Das Brauwesen in Bayern vom 14. bis 16. Jahrhundert insbesondere die Entstehung und Entwicklung des Reinheitsgebotes (1516)*, Berlin 1987.

37 In the 18<sup>th</sup> c. there is a clear regression in brewing. Bottom fermentation gradually disappears, wheat is replaced by barley. Probably as a result of this, malting kilns drying malt with warm air (used for light wheat malts) are replaced by primitive smoke constructions. Malt prepared in this way was darker in colour, but had a more or less noticeable smoky aftertaste. See, among others: D. Karst, *Pokus o srovnání středověké pece na sušení sladu z území polských a českých zemí na vybraných příkladech*, "Kvasný Průmysl" 2016, vol. 62, no. 2, p. 35–41.

38 G. Rupprecht, *Gründliche und praktische Abhandlung von der Malz- Brau- und Gärungskunst*, Graz 1791, p. 120–128.

39 The book was saved from being burnt around 1950 and was donated to the archives (then located at Wawel Castle) in 1980.

40 F.O. Poupě, *Die Kunst des Bierbrauens, physisch-chemisch-ökonomisch beschrieben*, Praha 1794.

41 Idem, *Počátkové základného naučení o vaření piva pro učedlníky, tovaryše, sládky, pro každého hospodáře, kterýž té věci dokonale vyučen byti žádá*, Olomouc 1801.

42 Ibidem, p. 34, 117–118, 193–194.



in the 18<sup>th</sup> c.), often the equivalent of March beers (not a necessary condition), and more heavily hopped. The tradition of brewing this type of beer has survived in Bavaria and a few urban centres in Bohemia (and probably also in Poland). Bottom-fermented beers, known as Bavarian beers, gained renewed popularity in the 1820s and 1830s.

As can be noticed, bottom-fermenting yeast and the knowledge of how to use it are part of the traditional canon of brewing, which developed back in the Middle Ages. However, we must draw the reader's attention to one fundamental fact. Until the 1830s, the differences between bottom-fermented and top-fermented yeasts were not associated with temperature. Moreover, there was no equipment to control the degree of cooling of the wort (it depended entirely on the current weather conditions), and the temperature was determined very roughly, as thermometers were not yet available. The use of these devices in brewing was promoted by František Poupě, who (however, without actually using bottom-fermenting yeast at all) failed to recognise this relationship. Nonetheless, he did note the fermentation disruption caused by temperature but (not being able to control it) pointed to the use of an appropriate dose of yeast as a solution. In a way, this was a correct observation (reduced yeast dosage slowed down the rapid fermentation during the summer months), but it did not prevent the adverse effects of what Poupě called '*letinka*'. This was a phenomenon occurring in the warm summer months, involving an undesirable flavour effect (see Table 1).

Table 1. Dosage of top-fermenting yeast according to F.O. Poupě, depending on the wort temperature achieved. The temperature on the Réaumur scale was converted to Celsius degrees. Conversion rates adopted: 1 lot = 16.05 grams, the capacity of 1 barrel = 63.662 liters.

degrees Réaumur	degrees Celsius	weight in lots	weight in grams	grams per liter
15	18.75	24	385.2	6.05
16	20.00	22	353.1	5.54
17	21.25	20	321	5.04
18	22.50	18	288.9	4.54
19	23.75	16	256.8	4.03

Source: F.O. Poupě, *Počátkové základného naučení o vaření piva pro učedníky, tovaryše, sládky, pro každého hospodáře, kterýž té věci dokonale vyučen byti žádá*, Olomouc 1801, p. 197–205; A. Bělohoubek, *O vrchním kvašení mladinek pивních*, Praha 1877, p. 60.

However, the use of bottom-fermenting yeast by brewers in centuries past was not a coincidence. It was customary to use it for strong beers brewed with barley malts, preferably no later than March or April. These beers were aged for a long time in deep, cool cellars. This was the result of years of observation and experience by medieval brewers.

According to current research, it is assumed that in 1839 Anton Dreher, owner of a brewery in Klein-Schwechat (now a district of Vienna), produced a beer with characteristics similar to a modern lager. However, it was not until 1841 that he realised that the key to reproducibility was a suitably low, stable temperature. As a result, he set up ice-cooled cellars. He thus pioneered a beer style known as Vienna Lager.<sup>43</sup> However,

43 S. Dryja, S. Sławiński, *Mała Encyklopedia*, p. 198.

the Pilsen brewery is considered to be the forerunner of the new style. It was there, on 5 October 1842, that the first brew, brewed by the Bavarian-born brewer Josef Groll (1813–1887), was created, which marked the beginning of the Pilsen style.<sup>44</sup> In just a dozen years, the Pilsen brewery found thousands of imitators. A revolution began that changed the image of European brewing. Very rapid changes took place in Bohemia and Moravia, where, around 1875, the technology for making beer using top fermentation almost disappeared. The last brewery to produce beer exclusively using top-fermentation technology was in Žatec, and both types were produced at the Jičín brewery.<sup>45</sup> It should be noted that the changes described coincided with the introduction of several technical and scientific inventions in brewing. In particular, the work of Carl Balling,<sup>46</sup> Louis Pasteur,<sup>47</sup> Emil Christian Hansen<sup>48</sup> and Carl von Linde<sup>49</sup> should be mentioned. The introduction of the steam engine and the spread of rail transport opened the way to large-scale production and distribution over considerable distances. These changes were accompanied by legal reforms and abolishing old privileges that often dated back to the Middle Ages.

It should be emphasized that bottom fermentation was already widespread in the provinces of the Austrian Monarchy by the late 1830s, as statistical summaries attest. In 1841, the total number of breweries (excluding Hungary) was 3165, of which 275 used bottom fermentation only and a further 503 used both (see Table 2). These were significant numbers – Upper Austria and the Tyrol were dominant. Bottom fermentation was natural in these areas and had been practised since the Middle Ages (confirming that it persisted not only in Bavaria). In other areas, it was only just gaining sympathizers. Galicia was the only province that did not have a brewery producing beer using this technique. This remained the case until 1846 when one brewery was recorded using this technique exclusively. It was undoubtedly the brewery in Okocim.

In Galicia, the process of superseding bottom-fermented beers was much slower than in the rest of the Monarchy. As late as the last quarter of the 19<sup>th</sup> c., the proportion of breweries using top fermentation reached almost half of all facilities. This was a result of the technological backwardness of Galician breweries. The proportion of beers made using bottom-fermented technology was growing much faster. It was supplied by less numerous

44 J. Kejha, J. Janouškovec, V. Jurina, *Plzeňský Prazdroj od roku 1842. Příběh, který nepřestává inspirovat*, Plzeň 2012; R. Drasch, *Auf den Spuren der Vilshofener Bräuerfamilie Groll. Zum 200. Geburtstag von Joseph Groll (1813–1887). Begründer der Pilsener Bières*, Vilshofen 2013.

45 A. Bělohoubek, *O vrchním kvašení mladinek pivních*, Praha 1877, p. 4.

46 Balling's work had a significant impact on the development of knowledge concerning fermentation. The saccharometer he perfected is still used today. Based on Balling's work, the most popular method of taxing brewing production to this day was developed; cf. G. Basařová, *Professor at the Prague Polytechnic Carl Joseph Napoleon Balling*, "Kvasný Průmysl" 2005, vol. 51, no. 4, p. 130–135.

47 Among other things, Pasteur devoted himself to the study of fermentation processes. He demonstrated that it is caused by microorganisms. As a result of this research, he developed a method of preserving food by heat treatment (a process also called 'pasteurization' after the scientist); cf. P. Berche, *Louis Pasteur, from Crystals of Life to Vaccination*, "Clinical Microbiology and Infection" 2012, vol. 18, no. 5, p. 1–6.

48 Hansen developed a method for growing pure yeast culture, starting from a single cell; C.J. Lintner, *Technologia browarnictwa*, p. 126–127.

49 Linde discovered a refrigeration cycle and invented the first industrial-scale air separation and gas liquefaction processes, which led to the construction of the first reliable and efficient compressed-ammonia refrigerator in 1876; R.G. Stokes, R. Banken, *Building Upon Air: A History of the International Industrial Gases Industry 1886–2006*, Cambridge 2006, p. 40.

Table 2. Breweries using top and bottom fermentation (and producing *steinbier*) in Galicia and the whole Monarchy (excluding Hungary) between 1841 and 1848.

	Year	Total number of breweries	Top fermentation	Bottom fermentation	Both fermentations	Beer type: <i>steinbier</i>
Galicia	1841	430	430	–	–	–
	1842	404	404	–	–	–
	1843	366	366	–	–	–
	1844	374	374	–	–	–
	1845	414	414	–	–	–
	1846	401	400	1	–	–
	1847	384	383	1	–	–
	1848	390	387	3	–	–
Austrian Monarchy countries	1841	3165	2115	275	503	272
	1842	3077	2076	265	521	215
	1843	3023	1981	288	538	216
	1844	3019	1952	298	562	207
	1845	3070	1948	293	629	200
	1846	3016	1893	204	734	185
	1847	2952	1796	285	714	157
	1848	2933	1794	292	704	143

Source: *Uebersichts-Tafeln zur Statistik der österreichischen Monarchie, zusammengestellt von der k.k. Direction der administrativen Statistik. Besonderer Abdruck des X. und XI. Heftes der "Statistischen Mittheilungen"*, Wien 1850, p. 31; *Tafeln zur Statistik der österreichischen Monarchie für das Jahr 1841*, Wien 1844, p. 406; *Tafeln zur Statistik der österreichischen Monarchie für das Jahr 1842*, Wien 1846, p. 254; *Tafeln zur Statistik der österreichischen Monarchie für das Jahr 1843*, Wien 1847; p. 235; *Tafeln zur Statistik der österreichischen Monarchie für das Jahr 1844*, Wien 1848, p. 149; *Tafeln zur Statistik der österreichischen Monarchie für das Jahre 1845 und 1846*, part 2, Wien 1850, p. 23, 92.

Table 3. Number of breweries geared to production using bottom and top fermentation in Galicia (between 1861 and 1880).

Year	Number of breweries	By fermentation method			Percentage of breweries using top fermentation
		Top	Top and bottom	Bottom	
1861	310	255	35	20	93,85
1864/65	313	219	37	57	81,79
1869/70	262	142	50	70	73,29
1874/75	230	104	35	91	60,44
1879/80	202	62	29	111	45,05

Sources: *Tafeln zur Statistik der österreichischen Monarchie. Neue Folge*, vol. 5, *die Jahre 1860 bis 1865 Umfassend*, Wien 1871, p. 340–343; *Statistisches Jahrbuch für das Jahr 1875*, issue 3, Wien 1877, p. 4; *Statistisches Jahrbuch für das Jahr 1879*, issue 3, Wien 1882, p. 6.

but well-equipped industrial breweries producing significant quantities of beer. Changes in the production method were also taking place in breweries scattered across other Polish lands that remained under partition. Despite the considerable backwardness of Galicia, especially in comparison to Wielkopolska, we do not observe a more rapid transition to bottom fermentation in these areas. In Wielkopolska, as late as the end of the 19<sup>th</sup> c., almost 40% of beer produced was still made using top fermentation. It was no different in the Kingdom of Poland (Russian partition).<sup>50</sup>

There were several reasons for this phenomenon, two of which are crucial. Firstly, beer consumption per capita was relatively low (the inhabitants of Wielkopolska were in the lead). Secondly, new patterns flowed from other directions to Wielkopolska and the Kingdom of Poland. In the Kingdom of Poland, beers of the Bavarian type (produced using bottom fermentation), differing significantly from the later Vienna- or Pilsner-style lagers, gained popularity. They appeared in Warsaw as early as the 1820s and were promoted by the Warsaw industrialist Piotr Steinkeller.<sup>51</sup> Little is known, however, about the appearance of Bavarian beers in Poznań.<sup>52</sup> According to Ryszard Machlejd, one of the forerunners of Bavarian beer on Polish territories was an otherwise unknown Schfer (Schaefer), who set up a brewery in Ciepna Street in Warsaw.<sup>53</sup> In 1839, the four largest breweries in Warsaw (Schaefer, Sommer, Knypl and Ziegler) produced just over a million liters of Bavarian beer. In 1842, Bavarian beer was also produced by Aleksander Lentzki's plant on Ogradowa Street.<sup>54</sup> Thus, bottom fermentation emerged in the Kingdom of Poland somewhat earlier than in Galicia but was linked to the production of dark, heavy Bavarian beer. This also delayed the second wave of the revolution – Vienna- and Pilsner-style beers became widespread in the Kingdom of Poland much later than in Galicia.

### Jan Ewangelista Goetz in Klein-Schwechat and his role in the emergence of Vienna lager

Jan Ewangelista Goetz gained his brewing experience in his father's brewery while also working on the farm. At the age of 18, he was liberated as a journeyman, working for his cousin in Hitzhofen. As a journeyman and a member of the brewers' guild, it was Goetz's duty to undertake so-called journeyman's travels. He left his family village in September 1834 and, at the age of 19, traveled through southern Germany, northern Switzerland and Austria on foot. During his travels, he hired himself out to local breweries as a brewer's assistant. In his diaries, dated 18 February 1873, he wrote the following about this period:

50 With regard to the Kingdom of Poland, the data is more fragmentary. In the 1880s, only bottom-fermented beers were produced in Warsaw. The situation was different in the provinces. In the 1880s and 1890s, eight breweries subject to the excise duty in Piotrków were still producing around 20% top-fermented beers; see W. Wierzchowski, *Tradycje piwowarskie Zagłębia Dąbrowskiego*, Sosnowiec 2016, p. 18.

51 P. Wierzbicki, *Podchmielona historia Warszawy. Warszawskie piwowarstwo od średniowiecza do współczesności*, Warszawa 2018, p. 169.

52 This probably took place in the 1830s; cf. A. Dolczewska, *Browar braci Huggerów i kilka słów o poznańskich browarach w XIX wieku*, "Kronika Miasta Poznania" 2000, vol. 68, no. 4, p. 87–98.

53 R. Machlejd, *Rzut oka na piwowarstwo u nas i za granicą*, "Tellus" 1877, vol. 2, no. 10, p. 300. The article contains the following passage: 'We did not become acquainted with today's Bavarian beer, i.e. bottom-fermented beer, which had already been made throughout Europe in the past, until after the first iron roads were introduced to us. The first brewery for Bavarian beer was established by Schäfer in Ciepna Street in Warsaw.'

54 P. Wierzbicki, *Podchmielona historia*, p. 169.

The author of these lines – Johann Götz,<sup>55</sup> the son of a brewery owner in a Swabian village of the kind there are hundreds of – learned the art of brewing from his father, where, yes, bottom-fermented beers were produced. In addition, he did an apprenticeship at the then-larger brewery owned by Mr Leichtle in Kempten, where only bottom-fermented beers were produced, and stayed for an extended period in Munich for the same purpose. Having a letter of recommendation from his father in his pocket, he came in 1837 to Mr Anton Dreher II living in the town of Klein-Schwechat, introduced himself and was accepted (my father's mother, i.e. my grandmother, was the birth sister of the old Mr Dreher I, who came from Pfullendorf on Lake Constance.)<sup>56</sup>

In writing down his memoirs, Goetz focused on his assessment of the brewing industry of the time, its changes, and his role in improving technology. He perceived the Viennese brewing industry as backward, writing:

At the time when Mr Anton Dreher II started his business in the village of Klein-Schwechat in 1836 in the brewery which he had taken over from his late father Anton Dreher I (d. 1817), or his late mother, the brewery was (like all others in Vienna and the surrounding area) furnished very badly indeed and was set up only – as it is referred to today – for the production of top-fermented beer. The top-fermented beers of the time [produced and sold in Vienna – S.D.], were erroneously called – perhaps to advertise them – as 'Bavarian', but in reality, they were poor. The smoky malt made them tart and pungent tasting, dark brown, cloudy, e.g. at the Leopoldstädter brewery, the memory of which today remains in the street name 'Bräuhausgasse'; I myself was only able to drink this beer if I took something on my tongue at the same time, usually salt. The only exception was the Hütteldorf brewery, to the extent that its then owner, Mr Dingler, produced several hundred barrels of bottom-fermented beer in winter under the name 'Märzen'. However, its production did not spread, and bottom-fermented beer continued to be imported to Vienna from Bavaria in annual portions, the quantities of which today seem ridiculous to us compared to current consumption.<sup>57</sup>

Brewery owner Anton Dreher soon recognized and appreciated Goetz's enthusiasm for his work and skills. He was interested in technical innovations and sought to modernize his brewery. During his travels abroad, he became quite familiar with the issues of malt drying and bottom fermentation, as mentioned by Goetz: 'Mr Anton Dreher II had travelled around England, Belgium and, above all, Bavaria a few years before taking over his brewery (in 1836) in Klein-Schwechat to gather information on brewing and stayed here and there for a long time.' He traveled with František Poupě's handbook, which he valued immensely, although it only discussed top-fermented beers. He recognized a kindred spirit in his relative from the provinces and, after less than two years, entrusted

55 The diaries were written before the Polish spelling of the surname was established ('Goetz'). The document is written in German.

56 Archiwum Fundacji im. Zofii i Jana Włodków, Archiwum rodziny Goetz-Okocimskich (Archive of the Zofia and Jan Włodek Foundation, Archive of the Goetz-Okocimski family) [AFZJW],teczka A, AWD-8-33, załącznik 8, p. 162.

57 Ibidem, p. 163.

Goetz with the position of brewery manager: 'Mr Anton Dreher II and I, as the brewery's manager and right hand in the trade, began from then on to make efforts to introduce reforms in every possible area.'<sup>58</sup> Undoubtedly, the collaboration between Dreher and Goetz resulted in unprecedented development of the brewery. In Goetz's words:

In everything entrusted to me – namely the brewery, brewing, and cellar service – I can take pride in the fact that on my initiative, I introduced new reforms, which over time were implemented in almost all breweries as beneficial optimizations, though it was often not even known that I was their initiator.<sup>59</sup>

Indisputably, the main thrust of the changes introduced was the implementation of bottom fermentation, with which Goetz had had the opportunity to become acquainted in his father's brewery and during his journeyman's wanderings. One might even hypothesize that he did not value top-fermented beers and saw no potential in their development. This is confirmed in his records:

Our efforts were now focused on the production of bottom-fermented beers. The drop in temperature in autumn (to 0 degrees Réamur) was therefore eagerly awaited. Always in autumn, early after the beer dispatch, I often ran to the garden to ascertain by hand and eye, based on observation of the grass, whether the beer had already reached maturity [passage unclear, most likely referring to the point at which bottom-fermented beer could be brewed – S.D.], because at that time it was not yet in fashion for the brewery manager to have a thermometer outside his window on which he could read the temperature outside. So, in the winter of 1840, bottom-fermented beer began to be brewed, which was poured from the brewing vats into larger than today's mobile casks, which were then left in the hams. There, once enough barrels of beer were stocked, they were put away in the cellar. With the arrival of spring, only top-fermented beers were brewed again, and one of the best was the so-called 'imperial beer'. At that time, no one had yet come up with the idea of using chunks of ice to maintain the right temperature [of the fermenting and lagering beer – S.D.].<sup>60</sup>

This observation was the sole credit of Goetz, who persuaded Dreher to buy enough ice and accumulate it in a rented cellar. With the introduction of this groundbreaking innovation, a beer with repeatable parameters was obtained, the production of which was no longer restricted to the winter season. The market success meant that production of the new beer (Vienna lager) grew rapidly. At the same time, demand for top-fermented beers was declining.

Goetz also mentions other innovations introduced during this time. Notable among these is the work on extracting draughts (which were previously transferred to the distillery after the descent of the so-called first wort), involving the introduction of flushing with hot water. The results were monitored using an 'English saccharimeter' (presumably

58 Ibidem.

59 Ibidem.

60 Ibidem, p. 164.

a device brought by Dreher from England). The result was a better-performing wort, with significant savings in malt. Another saving was made on hops (imported from Saatz – today's Žatec) by adding them a quarter of an hour before the end of the wort boil. Further innovations introduced by Goetz are also to be commended: 'As early as 1840, I was the first to use quenched lime as a cleaning agent for the brewing vessels with my own hands, a practice which later also spread outside.'<sup>61</sup> The fact that he introduced steam disinfection is astonishing: 'This is how I was the first to steam-clean the beer-conducting tubes in 1843, and there really is no better means, and there is certainly no major brewery in Europe today that has not imitated this method.'<sup>62</sup>

Through persistent work, Goetz accumulated a small amount of capital, but enough to think about his own brewery:

Meanwhile, come April 1845, the opportunity arose for me to build my own brewery with a furnace in Okocim (Galicia) [unclear, probably meant to emphasise that the brewery initially had no steam engine – S.D.]. I announced this to my cousin, Mr Anton Dreher II, and expressed my gratitude to him; we said our farewells and a separation ensued, which was not altogether easy. I will just mention that after I left in 1845, my birth brother Thomas became the manager of the brewery and remained there until 1852, followed by Josef Götz, who remained there for the rest of his life until 1873.<sup>63</sup>

Another thread should also be mentioned, which was of considerable importance for the development of brewing. Dreher's pupil and Goetz's subordinate was the Bavarian Joseph Groll, employed at the brewery in Pilsen in 1842 and the creator of the Pilsen beer, which soon revolutionised the brewing market.<sup>64</sup> Probably this was no coincidence, as Jan Ewangelista Goetz wrote:

Already in 1843–44, the brewing world took notice of the successes in Klein-Schwechat. Even brewers from Munich, who produced bottom-fermented beer, came here or sent their sons to Mr Anton Dreher to learn his techniques and methods.<sup>65</sup>

As a result, the Vienna lager recipe was adopted by the Munich brewer Josef Sedlamayer, who brewed a slightly modified March beer for Oktoberfest in 1872.<sup>66</sup> Due to many similarities, March beer and Vienna beer are sometimes considered synonymous (style descriptions emphasize that Vienna beer is similar to but less intense in flavour than the Oktoberfest beer).<sup>67</sup>

61 Ibidem.

62 Ibidem.

63 Ibidem, p. 165–166.

64 As the market became dominated by bottom-fermented beers, styles began to be distinguished, depending on the differences in production technology, such as Vienna, Bavarian (Munich) and Bohemian.

65 Ibidem, p. 164.

66 S. Dryja, S. Sławiński, *Mała Encyklopedia*, p. 198; W. Behringer, *Die Spaten-Brauerei 1397–1997. Die Geschichte eines Münchner Unternehmens vom Mittelalter bis zur Gegenwart*, München 1997.

67 D. Rabin, C. Forget, *The Dictionary*, s.v. Märzen(bier).

## Summary

The modern lager originated in several locations, including Munich, Pilsen, and Vienna. Although each played an important role, it was at the brewery in Klein-Schwechat that several elements of the brewing art were brought together for the first time. Although they appeared as novelties, they were mostly known to brewers in the Middle Ages (for instance, bottom fermentation, long lagering at low temperatures, gentle drying of malts with warm air). Combined with scientific inventions such as the saccharimeter and thermometer, as well as technical advancements like progressive mechanization (culminating in the introduction of the steam engine), a new brewing style emerged that was ideally suited to consumer tastes. Key to this development were the new malting procedures Dreher had adopted from England, which produced a light-colored malt free of smoky flavors, along with the controlled fermentation process using natural ice, credited to Jan Ewangelista Goetz.

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### Jan Ewangelista Goetz i jego rola w wynalezieniu współczesnego lagera

Artykuł podejmuje tematykę upowszechnienia w piwowarstwie technologii dolnej fermentacji i początków współczesnego lagera, co nastąpiło poczynając od lat trzydziestych XIX w. Proces ten nie został do końca wyjaśniony i do dziś jest przedmiotem dyskusji badaczy. Rola odegrana przez Jana Ewangelistę Goetza – założyciela browaru w Okocimiu – pozostawała dotąd nieznana. Po opuszczeniu rodzinnej miejscowości Goetz pracował w browarze w Klein-Schwechat należącym do Antona Drehera, spokrewnionego z rodziną Goetzów. Ten okres życia Goetz opisał w pamiętnikach, które po jego śmierci w 1893 r. stały się częścią rodzinnego archiwum. W okresie okupacji browar znalazł się w zarządzie niemieckim. Dokumenty trafiły w ręce niemieckiego historyka Josepha Königa i pod koniec wojny zostały wywiezione do Monachium. W 1982 r. na ich ślad natrafił prof. Jan M. Włodek (krewny rodziny Goetz-Okocimskich), który sprowadził je do Polski i włączył do rodzinnego archiwum. Treść pamiętników rzuca nowe światło na początki upowszechnienia fermentacji dolnej. Choć technologia ta wydaje się być nowinką, była znana piwowarom już w okresie średniowiecza. Przełomowym momentem okazała się kontrola temperatury za pomocą naturalnego lodu, którą Goetz zaproponował i wprowadził w browarze w Klein-Schwechat. W połączeniu z wynalazkami, takimi jak sacharymetr czy termometr, oraz środkami technicznymi powstał nowy styl, który idealnie trafił w gusta konsumentów. I choć współczesny lager ma źródła w kilku miejscach, Klein-Schwechat wydaje się najistotniejszym z nich.