

1 **Mendel's journey to Paris and London: context and significance for the origin of**  
2 **genetics.**

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22 **Abstract**

23 From a letter Gregor Mendel wrote to his brother-in-law, and a photograph of a large group of people in  
24 Paris, it is known that Mendel visited the International Exhibition in London in August 1862. There has  
25 been speculation about the status and composition of this travel group; for example, whether it was an  
26 official delegation from the city of Brünn. There has also been speculation on whether Mendel visited  
27 Charles Darwin on that occasion. We have now found a partial list of participants of the second 1862  
28 pleasure train (*Vergnügungszug*) from Vienna to Paris and London, which includes Mendel's name. The  
29 names of 158 participants make a partial reconstruction of the travel group possible. Digital newspapers  
30 were researched to get more insight into the status, residence, and profession of the participants. Most  
31 belonged to the upper-class of the Austrian Empire, among them several citizens of Brünn. Such  
32 luxurious all-inclusive pleasure trains were a new phenomenon in Vienna at the time and received much  
33 attention in the newspapers. Gregor Mendel was one of the first to participate in this expensive new  
34 trend. The person next to Mendel in the photograph shows a clear resemblance with Johann Nave in the  
35 photograph of the founding members of the Natural Science Society of Brünn the same year (see Figs. 1  
36 and 5). The newspaper lists of arrivals in Viennese hotels shows that Johann Nave, was in Vienna when  
37 the pleasure train departed. Johann Nave was an internationally acknowledged algae expert with  
38 interest in plant reproductive processes. In 1858 Mendel had nominated Nave as a new member of the  
39 scientific section of the Agricultural Society. A scientific connection between Mendel and Nave has been  
40 conjectured previously; however, evidence was lacking so far. After his early death in 1864, Nave's  
41 scientific library was acquired by the Natural Science Society. It contained books about the latest insights  
42 on plant fertilization, and since Mendel's 1866-paper contains a lengthy footnote about this topic,  
43 Mendel and Nave likely discussed this area of Mendel's research. This may also have been the case  
44 during their journey to Paris and London because it was in 1862 that Mendel conducted the final  
45 crossing experiments to test his hypothesis about the composition and the random union of pollen and  
46 egg cells. (376)

47

48

49

50 **What was known about Mendel's travel to Paris and London?**

51 Hugo Iltis (1882-1952), Mendel's first biographer, collected information about Mendel's life through  
52 interviews with people who had known Mendel. By then, Mendel had already been dead for 20 years so  
53 the memories of the interviewees were inevitably distorted and faded. One of those memories was that  
54 Mendel had made a journey to England. Iltis (1924) wrote "Mendel now traveled a good deal.....His  
55 nephews tell me that he used often to speak of England and English conditions with such familiarity that  
56 they believe he must have crossed the Channel. Thus we form a false picture of Mendel if we think of  
57 him only as a scientist and a recluse. He did not spend all his days behind convent walls, and was familiar  
58 with a wider world. Unfortunately, however, we know little about these journeys" (English translation,  
59 Iltis 1966, p 246-247).

60

61 Oswald Richter (1878-1955), professor of Botany at the technical university in Brünn (today Brno, Czech  
62 Republic), tried to find out more about Mendel's travels abroad. Through his contacts in the monastery  
63 in Altbrünn, Richter acquired the large group photograph at the end of the 1920s (Richter 1931, 1943).  
64 There are 174 travelers on the photo (Fig. 1), including Gregor Mendel, in the center, towards the back.  
65 The caption reads: "Travel to Paris and London 6th August 1862" (Richter 1943).

66

67 Fig 1. The photograph of the pleasure train group in front of the Grand Hotel in Paris, taken by Pierre Petit on  
68 August 8th, 1862, at 10.20 AM (see clock). One-hundred and seventy-four persons are counted. An enlargement of  
69 the center part with Gregor Mendel is shown in Figure 5.

70

71 Richter searched the 1862 volume of local newspaper *Neuigkeiten* for more information about the  
72 group trip but found nothing. However, in the "Passprotokollbuch" (passport-book), Richter found that  
73 on July 8th, 1862, Mendel received a 2-months valid passport to visit the "German Confederation,  
74 France and England." Shortly after that, a letter from Mendel to his brother-in-law Leopold Schindler  
75 dated July 14th, 1862, was found in which he wrote about his intended trip to Paris and England and it  
76 became clear that the destination was the International Exhibition of 1862, also known as the Great  
77 London Exposition (Richter 1943). "Thursday the 24th of this month [July] I will make a somewhat bigger  
78 journey. The way leads this time over Vienna, Salzburg, Munich, Stuttgart, Karlsruhe, Strasbourg, and  
79 Paris to London to the great industrial exhibition. In Paris, I will stay for a week, and as long in London.  
80 By the middle of August I hope to be in Brünn again. The journey on the railway from Vienna to Paris  
81 lasts uninterrupted from the 24th 6 a.m. to the 26th 9 a.m., which means 51½ hours. From Paris I then

82 use the railway again and over the sea a steamer. - I hope to return happily and to be able to tell you a  
83 lot at our next meeting."

84

85 Richter (1943) wondered in whose company Mendel traveled because, according to the passport-book,  
86 he had no companions from Brünn. His attempts to find something out about the other traveling  
87 companions in the group photo, however, remained fruitless. Robin Marantz Henig (2000) writes in her  
88 (partly fictional) Mendel biography that Mendel was part of a delegation of teachers from the  
89 *Oberrealschule* led by director Joseph Auspitz. Richter (1943) had discovered that the *Oberrealschule*  
90 had made 29 wall plates of crystallographic structures for the London exhibition, although he could not  
91 prove Mendel's involvement in this. Henig's suggestion was later presented as a fact by others (*e.g.*,  
92 Williams (2003) and Galton (2017)). Vítězslav Orel (1926-2015), the author of the most complete and  
93 authoritative Mendel biography to date, described the group as "A large party of enthusiasts traveling  
94 from Brno to see the exhibition... (Orel 1996, p197)".

95

96 Online search functions of digitalized historical Austrian, Czech, and German newspapers (ANNO, MKZ,  
97 DIFMOE, and DigiPress) made it possible to retrieve many details about Mendel's journey. It turned out  
98 that Mendel participated in an all-inclusive group tour by train to Paris and London. Such pleasure trains  
99 ("*Vergnügungszüge*") were new in Vienna in the summer of 1862 and received much attention in the  
100 newspapers. A published partial list of the participants of the second pleasure train contains Mendel's  
101 name. We can partially reconstruct the travel group from this list. According to us, the person next to  
102 Mendel in the group picture shows a clear resemblance to Johann Nave, a fellow member of the Natural  
103 Science Society (NSS; *Naturforschenden Vereines Brünn*) seen in another picture and we provide  
104 additional evidence that Mendel and Nave traveled together. Their shared scientific interest in  
105 reproductive processes in plants suggests that Nave had a significant influence on Mendel's thinking at a  
106 critical stage in his experimental work. We discuss Johann Nave's scientific views making use of some  
107 new sources of information.

108

### 109 **New details of the journey**

110 Gregor Mendel's name is on a sign-up list for a gift to the Stuttgart Chamber of Commerce made by the  
111 participants of the second pleasure train to Paris and London (see Fig. 2, Table 1). The special pleasure  
112 train to Paris and London was organized by the Viennese entrepreneurs Neumeyer and Mihailovič and  
113 costed 250 Austrian guilders (Fig. 3). The unique attraction in London was the large Industrial Exhibition,

114 in which many countries showed their abilities and achievements to the general public. The exhibition  
115 was also known as the third International Exhibition, after London (1851) and Paris (1855).

116  
117 The first pleasure train to Paris and London left with 200 participants on June 5th from the *Westbahnhof*  
118 and returned to Vienna two weeks later on June 19th. "A locomotive decorated with flowers and flags  
119 led the curious Pilgrims first to the Mecca of Pleasure - to the French capital", The *Wiener Zeitung* (7-06-  
120 1862) wrote. The great success of this train made Neumeyer and Mihailovič decide to organize two  
121 more pleasure trains to Paris and London, with scheduled departure dates July 21st and 30th (*Fremden-*  
122 *Blatt* 16-07-1862). Mendel signed up for the second and wrote to his brother-in-law about his travel  
123 plans on July 14th. However, due to unforeseen incidents, Neumeyer and Mihailovič were forced to  
124 merge the second and third trains into one, which would leave on the July 30th, so six days later than  
125 Mendel had written (*Fremden-Blatt* 20-07-1862). The advertisement (Fig. 3) shows the program of  
126 Mendel's train. It was the same as that of the first train, except that the stay in Paris was extended with  
127 two more days and a relaxing day in Stuttgart was inserted. Six days were set aside for London, two of  
128 which were reserved for a visit to the International Exhibition. The time schedule is shown in Table 2.

129  
130 Fig. 2. The upper part of the submitted article with the sign-up list, published in *Die Presse* of August 29th, 1862.  
131 Mendel's name is printed at the right end of the third line from the bottom. The donation for the gift to the  
132 Stuttgart Chamber of Commerce is indicated in fl. (Austrian guilders). The English translation is given in Appendix I.  
133 Table 1 lists the subscribers and their donations.

134  
135 Fig. 3. The advertisement for the then second and third pleasure trains to Paris and London (*Tagespost Graz* 04-07-  
136 1862). For the English translation, see Appendix II.

137  
138 Table 1. The extended list of participants, published in *Die Presse* and *Der Zwischen-Act*. The fourth column shows  
139 the donation in Austro-Hungarian gulden. The fifth column (Ha) indicates hotel arrival before the departure of the  
140 pleasure train. The sixth column (Hb) indicates hotel arrival after the return of the pleasure train in Vienna. Mendel  
141 is number 43.

142  
143 Table 2. The time schedule of Mendel's journey. "Original program" refers to the program that Mendel described  
144 in the letter to his brother-in-law. The days that the "arrivals" section appeared in the *Fremden-Blatt* are marked  
145 with an "x". The row below indicates the number of people who are on the sign-up list as well as in the arrivals  
146 section. The bottom row indicates on which days Johann Nave (presumably) and Gustav Niessl are listed in the  
147 arrivals section.

148

149 The experiences of the travelers of the first and second pleasure trains were regularly reported in the  
150 newspapers. Mendel's train departed from Vienna on July 30th at 6 a.m. The *Fremden-Blatt* (31-07-  
151 1862) described the departure as follows: "Neumeyer's pleasure train departed yesterday at 6 o'clock  
152 from here to Paris and London. The special train consisted of twenty wagons in first and second class  
153 and had assembled 340 participants in the local Elisabeth station, whose number will still increase at the  
154 intermediate stations. As regards the organisation, everything was initiated with exemplary order, and  
155 the travelers left their residences in the brightest mood. There were also twenty ladies in the group. For  
156 the provision of care, a doctor accompanies the train with a travel pharmacy provided at the expense of  
157 the company. More than a thousand people, friends, and acquaintances of the travelers were gathered  
158 in the stations despite the early morning hour, and this time it was exceptionally permitted to board the  
159 platform to the wagon hall. The railway directorate had sent a senior official to oversee and supervise  
160 the train's traffic."

161 The travel group arrived at Paris on August 1st, where it was divided between the Grand Hotel du  
162 Louvre (400 rooms) and the Grand Hotel de Paris, which was opened only two months earlier, on the  
163 Boulevard du Capucines (700 rooms). The group photo with Mendel was taken in front of the Grand  
164 Hotel de Paris, probably of the travelers who stayed at this hotel. According to the advertisement (see  
165 Fig. 3), the program in Paris consisted of the following parts: visit to the opera, pleasure trains to St  
166 Cloud (The chateau had been the residence of several French rulers) and Versailles, Bois de Boulogne,  
167 the tomb of Napoleon, the Tuileries Palace with the art collections, etc. Omnibus transport and use of  
168 porters were included.

169

170 Towards the end of the year, the *Wiener Zeitung* published several articles with observations and  
171 impressions from Mendel's journey, written by BB, most probably the journalist Bruno Bucher (1826-  
172 1899; "Bucher", without initials, is on the sign-in list). Although BB wrote mainly about Paris and London  
173 in general, at places he described the company ("the new Argonauts") and the journey: "Since it is not  
174 difficult to find your way around Paris, groups and individuals soon set off to stay longer than the  
175 schedule allowed, or to undertake independent discovery tours. The opportunity was given to see  
176 everything, and most of them did not leave it unused." (*Wiener Zeitung* 08-01-1863)

177

178 Neumeyer and Mihailovič arranged the famous Parisian photographer Pierre Petit to take the large  
179 group photo as a souvenir of the journey, something unprecedented and characteristic of their entire

180 organization. On September 20th, 1862, a month after the pleasure train had returned to Vienna, the  
181 company L.T. Neumann from Vienna placed an advertisement in the *Oesterreichische Buchhändler*  
182 *Correspondenz* about the group photo: “The participants of the second pleasure train to Paris and  
183 London, Grand Hotel, August 6th, 1862; Portrait group photographed after nature by Pierre Petit. Large  
184 oblong folio [33x21 cm], fl. 6; cash payment: fl.5. Upon commission.” Thus the photograph was not  
185 included and had to be ordered and paid for separately.

186  
187 On the evening of August 6th, the same day that the photograph was taken, the group departed from  
188 Paris by train to arrive at Boulogne-sur-Mer in the morning. The crossing of the Channel was very  
189 stormy, and most travelers got seasick<sup>i</sup>. BB writes about the stay in London: “The Viennese travel group  
190 had its headquarters in the London Pavilion, Music Hall and Dining saloons, Tichborne Street, between  
191 Regents Street and Haymarket, where breakfast and dinner were served for the whole group. Additional  
192 sleeping arrangements were in furnished rooms in the surrounding area. This location was chosen  
193 perfectly, right at the heart of metropolitan traffic, on the mainline from the city to the exhibition  
194 building.”

195  
196 In London the program included (Fig. 3): a tour of the Arsenal Museum, the Thames tunnel (first and  
197 then only tunnel underwater), the Docks, an Omnibus tour with free entrance for the famous Cremorne  
198 Gardens, a pleasure train with free admission to Crystal Palace, a day for the viewing of the Bank of  
199 England, Stock market, Guildhall, St Paul’s Cathedral, Monument, Newgate, Hyde Park, Houses of  
200 Parliament, Westminster Abbey, British Museum and the Zoological gardens. The trip included two days  
201 to visit the International Exhibition. A Thames cruise to Greenwich (Royal Observatory) and the docks  
202 were also included.

203  
204 The Crystal Palace of the first world exhibition from 1851 had been moved to Sydenham and harbored a  
205 series of courts that provided a narrative of the history of fine art<sup>ii</sup>. A new building had been erected for  
206 the major industry exhibition adjacent to the gardens of the Royal Horticultural Society in South  
207 Kensington. The exhibition opened on May 1st and closed its doors on November 1st by which time 6.1  
208 million visitors had been counted. A total of 28,000 entries from 36 countries were on display. The  
209 London Industry exhibition was a recurring topic in the Austrian newspapers. The *Mährischer*  
210 *Correspondent* (17-08-1862), for example, reported that on August 12th, at 5 pm, 67,400 visitors had

211 been counted. At 3 o'clock at least 60,000 visitors were present at the same time, which led to the  
212 hustle and bustle.

213  
214 The return journey began on Tuesday evening, August 12th, with, this time, a quiet crossing of the  
215 Channel. After an afternoon in Paris the next day, the train left again in the evening to arrive in Stuttgart  
216 on August 14th, at 10 p.m., with a rest day in prospect. In those days, the so-called *Zollvereinsfrage* was  
217 topical about the abolition of tolls at the borders between the many German states. The southern  
218 German states of Bavaria and Württemberg spoke out for a customs union with Austria, much against  
219 the wishes of Prussia (*Gemeinde-Zeitung* 18-08-1862)<sup>iii</sup>. The Stuttgart Chamber of Commerce had  
220 organized an extensive entertainment program for Austrian travelers, and there was a close fraternity  
221 between the south Germans and the Austrians<sup>iv</sup>. For political exploitation, the Stuttgart day was  
222 extensively covered in the state-censored Austrian and Southern German newspapers<sup>v</sup>.

223  
224 On the train to Salzburg, it was decided to raise money for a gift to the Chamber of Commerce in  
225 Stuttgart as a lasting reminder of this day. For this purpose, a sign-up list was circulated. The list of  
226 donations was published in *Die Presse* of August 29th, 1862, and contains 142 names including Mendel's  
227 (Fig. 2, Table 1). In a second publication, a week later, eight names were added, bringing the total to  
228 150. The fact that the lists together comprise less than half the number of people who participated may  
229 have different explanations. The hotel registrations (see below) show that some participants traveled  
230 with their families. Furthermore it may have been that, given the explicit German nature of the  
231 reception, minorities (Czechs, Hungarians, and Croats) were less enthusiastic about donating.

232  
233 A total of 210 Austrian guilders was collected, with which a silver cup, more than 30 cm high, in gothic  
234 style, was purchased and was presented by a delegate in Stuttgart at the beginning of October  
235 (inscription: "*Die Mitglieder des zweitem Wien-Londoner Vergnügungszuges zur Erinnerung an den 15*  
236 *August 1862*" (The members of the second Vienna-London pleasure train in memory of August 15th,  
237 1862); *Swäbische Merkur* 08-10-1862). Mendel's pleasure train returned at the *Westbahnhof* in Vienna on  
238 the evening of Saturday, August 16th (*Die Presse*, 16-08-1862).

239  
240 Later in the year, Neumeyer and Mihailovič also organized pleasure trains to the Munich Oktoberfest,  
241 and for the next year, pleasure trains to Paris, the Rhine, Switzerland, and Hamburg were in planning  
242 (*Die Presse* 27-08-1862). Their journeys were distinguished from those of others by their luxury and



243 care. They were the first to organize international multi-day group trips. Such luxury pleasure trips were  
244 a new phenomenon in Vienna and attracted much attention in the Austrian press in 1862. The number  
245 of times that we find the word "Vergnügungszug" in the Austrian newspapers multiplied by a factor 18  
246 in 1862 compared to the year before, as can be seen in Fig. 4.

247  
248 Fig. 4. The number of times per year the word "Vergnügungszug" (pleasure train) occurs in the ANNO digital  
249 newspapers between 1849 and 1870. There is a spectacular increase in 1862, the year of Mendel's journey. The  
250 drop in numbers in 1866 can be explained by the Austro-Prussian War.

251  
252 The columnist Friquet (1862) mocked the Vergnügungszug "mania" in his *Chronique de Vienne*.  
253 According to him, referring to Mendel's train, such group photos were a unique opportunity to be saved  
254 for posterity without having done anything significant<sup>vi</sup>. By the end of the year, the pleasure train to  
255 London was the subject of several theatre plays<sup>vii</sup>. The new phenomenon inspired Johan Strauss to write  
256 the Vergnügungszug polka, commissioned by the Association of Industrial Societies, which was first  
257 performed in January 1864.

258

### 259 **Mendel's likely interests**

260 We can, of course, only guess what particularly appealed to Mendel on the trip to Paris and London. The  
261 world cities, the famous buildings, the exhibition of industrial and technical progress, the great works of  
262 art? That Mendel was interested in art and culture is evident from memberships of various cultural  
263 associations, such as the Austrian Art Association (*Oesterreichische Kunst-Vereins*), the Styrian Art  
264 Association (*Steiermärkischer Kunstverein*), the Brünnner Music Association (*Brünner Musikverein*) and  
265 the Schiller Association (*Schiller Verein*) (Sajner 1971). Mendel must also have been interested in trade  
266 and commerce since he was a member of the Moravian Chamber of Commerce (*Mährischen*  
267 *Gewerbeverein*) in 1865 (Auspitz 1865). In 1873 he visited the Vienna World Exhibition with two of his  
268 nephews, an indication of his interest in technical and industrial progress. These are clearly secular  
269 interests, and it is worth reiterating Hening's comment on Mendel's appearance in the photograph, that  
270 "He does not give himself away as a priest", he is dressed informally in secular attire like the others.

271  
272 We can imagine that three departments of the Industry Exhibition attracted Mendel's particular  
273 interest. The first was Class 3: Substances used for food. Because of his experiments in peas and beans,  
274 he probably was interested in vegetable varieties. "Pulses, the pea and bean family, occupied a place in

275 almost every European collection. Sweden, Germany, and Russia sent samples of peas and beans of the  
276 common kinds" (Preston Shaffner and Owen 1862). Well-known seed trading companies such as Sutton  
277 and Sons from Reading and Vilmorin Andrieux of Paris, as well as the German dealer of ornamental and  
278 vegetable seeds Martin Grasshof from Quedlinburg, were present.

279  
280 The second department that Mendel will have been interested in was Class 9: Agricultural and  
281 Horticultural machines and implements. The St. Thomas monastery had estates that needed cultivation.  
282 In the past, the monastery had been involved in the introduction of new types of plows in Moravia. The  
283 most eye-catching machine was the American self-acting reaper from McCormick, which was described  
284 as "ingenious, exceedingly practical and economical of labor" (Preston Schaffner and Owen, p201).  
285 Mendel's attention could have gone to, for example, plows, glasshouses, steam plows, steam  
286 cultivators, chaff cutters, conservatory boilers, lawn mowing machines, rotary harrow, an observatory  
287 beehive, and apiary, etc., etc. (Anonymous 1862a).

288  
289 Educational Works and Appliances were exhibited in Class 29. The school articles from the Brünner  
290 *Oberrealschule* in which Mendel taught got an honorable mention for the products of the pupils. In  
291 addition to the aforementioned crystallographic wall plates, the school also provided calligraphic  
292 exercises, geometric drawings, and free-hand drawings (*Neuigkeiten* 25-1-1862). The textbook  
293 "Fundamentals of chemistry" (*Anfangsgründe der Chemie*), written by Mendel's colleague Berr, both in  
294 German and in Italian translation, was also selected for the exhibition of Austrian education  
295 (*Neuigkeiten* 28-11-1861).

296

### 297 **The composition of the travel group**

298 The names on the sign-up list provide insights into Mendel's company. The list is non-alphabetical, with  
299 more than half of the surnames with initials or first names. The list seems to reflect spontaneous  
300 registration during the return journey. Due to poor printing quality, some names are difficult to read or  
301 completely unreadable. By online newspaper and address book searches, it was checked whether the  
302 deciphered surnames existed. It was regularly found that even easily readable names did not appear in  
303 ANNO, DIFMOE, or the MZK digital newspapers. This may have to do with transcription and copying  
304 errors or differences in the spelling of surnames in different languages.

305

306 From other sources, some participants that are not on the list can be added. Both speakers in Stuttgart,  
307 Dr. Theophil Pisling and Dr. G. Doleschall, are not on the list. The newspaper *Der Zwischen-Act* (30-07-  
308 1862) mentions six names of participants: Fürsten Joseph Wrede, Grafin Stadium, Baronin Csorich, Dr.  
309 Gernard, Baronin Hayek and Ritter von Lecci. Together this adds eight names, bringing the total number  
310 of names to 158 (Table 2; we refer to this as the extended travelers' list).

311  
312 It is interesting to compare the extended travelers' list with the lists of arrivals ("*Angekommenen*") in the  
313 Viennese newspapers. Hotels, ordered by the police, had to register arriving guests and these were  
314 published in the *Fremden-Blatt* and the *Wiener Zeitung* (except on Mondays). Some participants from  
315 outside of Vienna stayed in hotels before departure or after their return to Vienna and may be found in  
316 the arrivals sections. The residence and profession of the guests are often reported.

317  
318 We found 22 persons of the extended list arriving at hotels before the departure and 29 persons arriving  
319 after the return in Vienna (Table 3). Because the return date of all persons is known (August 16th), there  
320 appears to be a delay of three to five days in publishing. Strikingly absent from the arrival lists is Gregor  
321 Mendel. On previous visits to Vienna, for example, to take his exams, Mendel's name can be found in  
322 the listings (a total of 13 times between 1850 and 1876; Vollmann and Matalova 2016). He may have  
323 stayed with acquaintances or in a hotel that was not included in the arrivals section before leaving, but  
324 on his return, he may also have traveled directly to Brünn by train (18.30 departure; Vienna-Brünn 135  
325 km).

326  
327 We were able to identify names and residence of 81 persons of the extended travelers' list with great  
328 certainty (Table 4). For others, there was ambiguity because of the lack of initials, or too common  
329 surnames, non-verifiable or unreadable surnames. The distribution of the positively identified travelers  
330 among present-day countries is shown in Table 5. Travelers came from nine different modern countries.  
331 About half of the travelers were from Austria and from these more than half from Vienna (26). As BB  
332 wrote: "This time Vienna did not dominate to the same degree as on the first voyage; for this, apart  
333 from Transylvania, each crown land had its quota. Types, language, costumes mark the most diverse  
334 nationalities and regions".

335  
336 Out of the 81 positively identified travelers, the profession or title of 75 could be deduced. Besides, from  
337 10 persons of the extended list, the residence is not known, but their title was given. Thus of 85

338 travelers, the profession or title is known (Table 4); of these, about one quarter belong to the nobility  
339 (12 high nobles, Baron, Count or Fürst, and nine low nobles, Von and Ritter). Together with five  
340 landowners, they represent the 'old money of the upper-class'. The 'new money' is represented by  
341 merchants (16) and factory owners (12). Nine doctors, most in medicine, were present, as well as two  
342 pharmacists and two mayors. The list tells us that there must have been at least three priests and two  
343 *Oberrealschule* teachers, Mendel being both. Table 6 shows that the middle class was also well represented.  
344 The list agrees with what the *Vereinigte Laibacher Zeitung* (02-08-1862) wrote about the 12 travelers  
345 from Laibach (now Ljubljana): three large landowners, five businessmen, and a wallpaper decorator, a  
346 calligrapher, a photographer and an engineer. Some professions are mentioned in several individual  
347 newspaper articles. BB describes a tailor and a country parson (*Wiener Zeitung* 11-12-1862). There was  
348 also one farmer, who came from the Salzburg area, among the travelers (*Salzburger Zeitung* 18-08-  
349 1862). BB characterized the group as follows: "Among the petty-bourgeois of all classes are bearers of  
350 old and proud names, some of whom are even at home in the genealogical books, scholars in abundance  
351 ....., officials and military of higher and lower grades, great and small landowners, priests of German,  
352 Slavic, and Magyar tongues, and the official travel doctor finds so many volunteer colleagues that one  
353 can already look forward to the perils to come with some reassurance "(*Wiener Zeitung* 28-11-1862).

354

355 The *Mährischer Correspondent* wrote that several residents of Brünn traveled on the second pleasure  
356 train without mentioning names: "In the next few days a second pleasure train arranged by Messrs.  
357 Neumaier and Mihailowic will leave Vienna for Paris and London; we learn that several Brünner citizens  
358 will take part in this trip."(29-07-1862). Besides Mendel, there are six more Brünner residents on the  
359 extended list. Eduard Pursch (an owner of a wool goods shop), Franz Illek (a manufacturer of wool  
360 goods), Gustav Umgelter (an owner of a wool dyeing works) and Ernst Frömmel (a coppersmith) are  
361 below each other on the list of arrivals in the *Fremden-Blatt* at the hotel *Weisse Ross* on July 31th. They  
362 are also directly below each other in the sign-up list - an indication that the published list was the  
363 original unordered list - and thus form a group. Dr. Carl Gernath, an army doctor from Brünn, was also  
364 checked in at the *Fremden-Blatt* on July 30th, namely at hotel *Wandl*. Count Daun traveled with his  
365 forest manager Heinrich Albert. They cannot be found in the arrivals section before the pleasure trip,  
366 but they can be found afterward, namely, on August 20th in the *Weisses Ross*.

367

368

369 **Who traveled with Mendel?**

370 To find out whether persons on the extended list were known to Mendel the extended list was  
371 compared with the list of teachers at the *Oberrealschule* (in 1857: 23 names, and 1864: 24 names;  
372 Auspitz 1858, 1865), with the list of members of the Natural Science Society from 1862 (168 names;  
373 Anonymous 1863) and with the list of Augustinian friars (13 names; Klein and Klein 2013) from those  
374 days, but besides Mendel, no matches were found. When we compare the list with that of the Viennese  
375 Zoological-Botanical Society (*Zoological-Botanical Vereins*; in 1862: 807 names; Anonymous 1862b) we  
376 find two matches: Joseph Gobanz and Karl Waginger. Gobanz (1831-1899) was a natural history and  
377 geography teacher at the *Oberrealschule* in Graz and a friend of Professor Franz Unger, Mendel's  
378 teacher at the University of Vienna. Gobanz traveled with colleague *Oberrealschule* geography teacher  
379 from Graz, Franz Ilwof (1831-1916). It is not known if Mendel knew these men personally. Because the  
380 extended list included fewer than half of the participants, it is possible that Mendel's friends were  
381 among the travelers, but not on the list.

382

### 383 **Is Johann Nave in the group photograph?**

384 According to Vítězslav Orel (1996), it would have been interesting to find “out whether or not Mendel’s  
385 friend J. Nave also took part in the trip to London” (p 197). Johann Nave lived in Brünn and was  
386 interested in plant anatomy and physiology, especially in studies of algae (Kalmus 1865) including their  
387 reproductive processes. Orel did not think that it was likely that either Mendel and/or Nave had visited  
388 Darwin, and we agree with Orel that the trip would have provided the opportunity for Mendel and Nave  
389 to discuss Mendel's work in relation to Nave's interests and their relevance to Darwin’s theory.  
390 However, Orel could not confirm Nave’s presence from the group photograph.

391

392 Ittis (1924) contains a photograph of the founders of the NSS from 1862, the same year as the Paris  
393 group photo. This is the only photo of Johann Nave that is known to us. The person to the right of  
394 Mendel in the group photograph shows a resemblance to Johann Nave from the founding photograph.  
395 In the founding photograph, Johann Nave has a trimmed beard and greased hair, making both ears  
396 visible. This is not the case on the Paris photo where the person has longer, non-greased hair. However,  
397 the eyebrows, nose, and mouth are very similar. This becomes more clear when we overlay the photos  
398 (Fig. 7). Other people around Mendel in the group photograph show no similarities with Johann Nave. If  
399 Johann Nave had accompanied Gregor Mendel, it would be logical that they would stand next to each  
400 other.

401

402 **Additional evidence that Nave accompanied Mendel**

403 We checked the hotel arrival lists to find out whether there were any indications that Johann Nave was  
404 in Vienna on the day of the departure of the train. According to the *Fremden-Blatt* "S. Nabe, Brünn"  
405 arrived at the hotel the Goldene Ente on July 31st. On July 1st, November 12th and December 4th, "J.  
406 Nabe" from Brünn also registered in this hotel. It is therefore likely that the "S. Nabe" of July 31st is a  
407 writing error and that this concerns "J. Nabe", the letters S and J can be similar in handwriting from that  
408 time, furthermore the letters b and v are closely related phonetically. Writing errors are widespread in  
409 the lists of persons that have arrived; for example, Mr. Ungelter is mentioned as Umgelder. Also, the  
410 spelling of the names of some people in the *Fremden-Blatt* and the *Wiener Zeitung* is often different. In  
411 contrast to "Nave", the surname "Nabe" does not appear in the Brünn and Vienna newspapers of that  
412 time, nor the Brünner address books of 1853 (Herlth 1853), 1856 (Herlth 1856) and 1862 (Zeckel  
413 1862)<sup>viii</sup>, it is probable that the name "Nabe" does not exist and that this also concerns a false  
414 transcription and that in reality, this concerns J. (Johann) Nave.

415

416 Although the facial agreement or the hotel registration alone may not conclusively prove Nave's  
417 participation in the trip, the combination does, in our opinion. Moreover, Johann Nave's library (see  
418 below) included a new English-German dictionary (Thieme M. F. W. 1862. *Neues vollständiges*  
419 *Wörterbuch der englischen Sprache*), which Nave may have bought for the visit to London.

420

421 Fig. 5. An enlarged central part of the group picture in front of the Grand Hotel. The circles indicate Gregor Mendel (left) and  
422 (presumably) Johann Nave (right). Note Mendel's secular clothing and Nave's cigar.

423

424 Figure 6. A photograph of the founders of the Natural Science Society at Brünn in 1862. Number 4, encircled, is  
425 Johann Nave. Number 10 is Gustav Niessl von Mayendorf.

426

427 Another close NSS friend of Mendel, Gustav Niessl von Mayendorf (1839-1919), was also in Vienna early  
428 August, as evidenced by the section "arrived" in the *Fremden-Blatt* of 3-08-1862: "G. v. Mayendorf,  
429 Brünn" at the hotel *Goldenes Kreuz*. Although the registration is four days after the departure of the  
430 train, one of the identified travelers is registered in the same hotel, on the same day<sup>ix</sup>. It is therefore  
431 likely that Gustav Niessl von Mayendorf was present at the departure of the train. Niessl von Mayendorf  
432 is also on the founding photo of the NSS, but unlike Johann Nave, we were unable to discover him  
433 among the people around Mendel on the Paris photo as would be expected for friends that travel  
434 together. It is conceivable that Niessl did not participate but only said farewell to his friends at the

435 departure, or he may have lodged in the other hotel in Paris (*Grand Hotel du Louvre*) that was used by  
436 the group.

437  
438 Fig. 7. The NSS picture of Johann Nave on top of the image of the person to the right of Mendel, with increasing  
439 transparency from left to right. The portrait from the group photograph was slightly rotated to the left. To remove  
440 the print raster, the half-tone images were first blurred in Photoshop with gaussian blur. The eyebrow, the nose,  
441 the mouth, and the hairline are very similar.

442  
443 **Could Mendel have met Darwin?**  
444 William Bateson (1902) ended his "Mendel's Principles of Heredity" with: "If Mendel's work had come  
445 into the hands of Darwin, it is not too much to say that the history of the development of evolutionary  
446 philosophy would have been very different from that which we have witnessed". The Achilles heel of  
447 Darwin's evolution theory was the lack of a good heredity theory that prevented adaptive variation from  
448 being diluted by blending inheritance. Darwin would have been much helped by the knowledge of  
449 Mendel's discrete inheritance theory. Therefore, Loren Eiseley (1961) poetically called Mendel "the  
450 priest who held the key to evolution." Richter (1931) investigated whether it was possible that during his  
451 stay in London Mendel had visited Charles Darwin, who lived in Down, not far from London. He wrote to  
452 Darwin's son, Leonard, who, 70 years later, remembered that the Darwin's received no visitors at the  
453 time because he had scarlet fever (De Beer, 1965). Orel (1996) argued that such a visit was unlikely  
454 because Mendel had not yet published his results, was a very humble person and did not speak English.  
455 Nevertheless, even if a visit did not take place, it has fueled counterfactual thinking, like Bateson's  
456 above: "what would have happened if?" (e.g., Lorenzano 2011).

457  
458 In the second week of August 1862, Darwin and Mendel came geographically closer than ever. Darwin  
459 lived in Down, and Mendel and Nave probably visited Crystal Palace in Sydenham as part of the pleasure  
460 train program, 13 km as the crow flies. We now know that Mendel was in London from the 7th to the  
461 12th of August 1862, six days later than stated in his letter to his brother-in-law. Darwin wrote letters  
462 from Down between August 4th and 12th, proving that Darwin was in Down during Mendel's stay in  
463 London (Darwin Correspondence project, <https://www.darwinproject.ac.uk/>). However, there was  
464 probably also little reason for Mendel and Nave to visit Darwin. At the time they were interested in  
465 reproduction and inheritance, and not in natural selection and adaptation (Mendel would only elaborate

466 on this later in his *Hieracium* work). Mendel's pea studies were not completed, and he had not yet  
467 bought a copy of the German translation of the Origin (Mendel possessed an 1863 edition).

468

469

#### 470 **The timing and implications of this journey for Mendel's work on *Pisum***

471 Mendel's cross-breeding experiments with peas, which began in 1856, were in the final phase of the  
472 backcrosses to determine the composition of the pollen and egg cells. Based on the outcome of previous  
473 crossings, Mendel had developed a hypothesis that, for a given character, the different kinds of egg cells  
474 and pollen grains of a hybrid were produced in equal numbers and fused at random. The backcross  
475 experiments were performed to test this hypothesis<sup>x</sup>. The crossings for 1862 had been made, and the  
476 seeds were ripening. The size of these experiments was much smaller than those in the previous years  
477 (Orel 1971) and would allow him to leave Brunn for a couple of weeks. The experiments would run for  
478 another year to be presented in early 1865 in two lectures at the Natural Science Society in Brunn. In  
479 August 1862, Mendel's teaching and librarian duties at the *Oberrealschule* that year were over, and the  
480 new semester would not start until October.

481

482

#### 483 **The friendship between Mendel and Nave and their shared scientific interests**

484 Gregor Mendel and Johann Nave, who was nine years younger, probably knew each other as students at  
485 the University of Vienna, where they simultaneously attended botany lectures from Professors Unger  
486 and Fenzl (1851-1853) (Iltis 1924). Nave studied law, but was a keen amateur botanist and spent all his  
487 spare time in the botanical cabinet and gardens of the University (Kalmus 1865). Both men returned to  
488 Brunn in 1854. Mendel became a supplemental teacher at the *Oberrealschule* and started cultivating  
489 pea varieties for his later crossing experiments while Nave became a civil servant at the Moravian  
490 financial department and devoted his leisure to botanical studies. Mendel joined the Scientific Section of  
491 the Agricultural Society (SSAS, *naturwissenschaftlichen Section der mährische schlesischen Gesellschaft*  
492 *für Ackerbau, Natur- und Landeskunde*) of Brunn in January 1855. Whereas in Vienna, Nave was  
493 interested in plant anatomy and physiology, in Brunn, he became more interested in microscopic studies  
494 of algae (Kalmus 1865). In April 1858, Johann Nave was elected as a member of the SSAS, upon  
495 nomination by Gregor Mendel (Anonymous 1859). Mendel did not nominate other candidates, which  
496 emphasizes their special friendship. Out of dissatisfaction with the functioning of the SSAS, several  
497 young science enthusiasts, among them Johann Nave and Gustav Niessl, founded the Natural Science



498 Society (NSS) in late 1861. Nave became the treasurer and librarian of the new society. Mendel became  
499 a member at the foundation of the NSS. In 1864 Nave became seriously ill and had to give up his  
500 activities for the NSS. Confined to bed, he completed his highly successful handbook "A Manual to the  
501 Collection Preparation and Study of plants, especially concerning Cryptogams" („Anleitung zum  
502 Einsammeln, Präparieren und Untersuchen der Pflanzen mit besonderer Rücksicht auf Kryptogamen"),  
503 which was published in German in 1864 (Nave 1864) and translated into English in 1867 (with four  
504 successive editions). He died at the age of 33, in November 1864 from tuberculosis. According to Iltis  
505 (1924), it was his friend Mendel who gave him the last sacraments.

506

507 Only a month after his election to the SSAS, Nave gave a lecture in the May 1858 meeting "On the  
508 development and reproduction of algae" (Nave 1859). In this lecture, he summarized the most recent  
509 findings of sexual reproduction in algae, mainly referring to the latest "brilliant" discoveries made by  
510 Nathanael Pringsheim (1823-1894). In the introduction, Nave stated that research on these microscopic  
511 organisms was of significant importance for the entire field of plant physiology. "The research on algae  
512 has achieved important results in a short time. From it, knowledge was gained about those basic  
513 developmental laws of more complex plants. Research on algae allowed researchers to observe events  
514 clearly that would probably never have been discovered due to the complexity of higher organisms and  
515 the inevitable necessity of anatomical preparation or disruption of context." Nave described the process  
516 of fertilization as observed by Pringsheim in the freshwater alga *Vaucheria sessilis*: ".....The rod-shaped  
517 bodies penetrate, swarm around the green content, gradually trying to break through the mucus wall  
518 that surrounds it until it is *likely* that one succeeds to penetrate the green content, on which a larger  
519 colorless body becomes visible. *Now the spore is fertilized* and is encapsulated by a cellulosic membrane.  
520 The other swarming rod-shaped bodies gradually die outside the newly formed spore cell" (original  
521 italics). *Vaucheria* is a mat-forming genus of yellow-green algae, well known to Nave and Mendel  
522 because it was studied by Unger, who discovered the movement of resting spores by cilia. Thus  
523 according to Nave, a single spermatozoid fertilized the spore and an analogous situation could be  
524 envisioned in higher organisms. The analogy meant that an egg cell would be fertilized by a single pollen  
525 grain, which was essential for Mendel's theory of inheritance. No doubt Mendel was aware of Nave's  
526 ideas when he nominated Nave a month earlier and, given their close friendship and shared interests,  
527 Mendel and Nave would have discussed this. Johann Nave was interested in broad biological questions,  
528 as is illustrated by his lecture at the NNS in May 1862 about "Limits and points of contact between the  
529 animal and plant kingdoms" (*Grenzen und Berührungspunkte des Thierreiches und der Pflanzenwelt*;

530 *Brünner Zeitung* 21-05-1862)(Nave 1863) concerning the fundamental differences between animals and  
531 plants, an interest that he shared with his professor Franz Unger (Unger 1852).

532

533 After Johann Nave's death in November 1864, his scientific books were bought by Franz Czermak and  
534 donated to the NSS (*Brünner Zeitung* 24-01-1865). These books are listed in the meeting report of  
535 January 1865 (Anonymous 1866). Knowing that they belonged to Johann Nave, gives a unique insight  
536 into the scientific questions which interested Johann Nave. Amongst the many books on cryptogams,  
537 there were works on fertilization in lower and higher plants, including Pringheim's groundbreaking 1855  
538 paper about the act of fertilization (*Über die Befruchtung und Keimung der Algen, etc.*).

539

540 There were two more papers by Pringsheim in Nave's library and two publications by Ludwig Radlkofer.  
541 In his dissertation in 1856, Radlkofer (1829-1927) had provided undeniable proof that in flowering  
542 plants, the embryo originated from the fertilized egg and not, as his teacher Matthias Schleiden initially  
543 claimed, solely from the tip of the pollen tube. Radlkofer's work convinced Schleiden, and this ended a  
544 fierce controversy that had lasted for more than a decade. The first of the two Radlkofer books that  
545 Nave possessed was "The fertilization process in the plant kingdom and its relationship to the animal  
546 kingdom" (*Der Befruchtungsprocess im Pflanzenreiche und sein Verhältniss zum Thierreiche*, 1857). From  
547 the specific phrases that Nave used in his May 1858 lecture, it is clear that he had read this book by that  
548 time<sup>xi</sup>. On p81 Radlkofer concludes: "so much is certain that the content of the pollen tube is the analog  
549 of the spermatozoids, the vesicle is the analog of the egg, that the fertilization process of the  
550 phanerogams corresponds entirely to that of the cryptogams and that of the animals<sup>xii</sup>". This reflects the  
551 introductory remarks that Johann Nave made in his lecture.

552

553 Eight years later, in a lengthy footnote in his 1866 article, Mendel wrote that his crossing results could  
554 only be explained by the union of a single egg cell and a single pollen cell. "According to the opinion of  
555 famous physiologists, in phanerogams, one germ and one pollen cell respectively unite to form a single  
556 cell\*) that is able by absorption of matter and formation of new cells to develop itself further into an  
557 autonomous organism". Mendel added a footnote to this passage: "\*) In *Pisum* it is surely beyond doubt  
558 that a complete union of the elements of both fertilization cells has to take place for the formation of  
559 the new embryo. How else would one want to explain that among the progeny of the hybrids, both  
560 parental forms reemerge in the same quantity and with all their peculiarities? If the influence of the  
561 germ sack on the pollen cell was only external, if the role of a wet nurse was only assigned to the same,

562 then the success of each artificial fertilization could be nothing else than that the developed hybrid  
563 resembled the pollen plant exclusively, or at least came to stand close to it" (Mendel 1866, 2016, p41;  
564 BSHS translation). This is the only footnote in the article, which indicates its importance for Mendel.  
565 This footnote should not be interpreted as a contribution to the dispute about the role of the pollen  
566 tube in the formation of the embryo of the flowering plants since this had already ended a decade  
567 earlier. Mendel stresses that his theory is consistent with the cytological understanding of the  
568 reproduction process to date. The act of fertilization itself however, remained a mystery. It was  
569 generally assumed that a fertilization fluid would diffuse from the tip of the pollen tube into the egg cell  
570 (Radlkofer 1857). The fusion of pollen and egg cell nuclei was discovered more than two decades later  
571 by Eduard Strasburger (1884).

572

573 Equally interesting is the second book by Radlkofer that Johann Nave possessed: "On the relationship  
574 between parthenogenesis and other types of reproduction" (*Ueber das Verhältniss der Parthenogenesis*  
575 *zu den anderen Fortpflanzungsarten*, 1858). Radlkofer summarized theory of Johann Dzierzon (1811 –  
576 1906) about hybridization between yellow (Italian) and dark (German) honey bees, which mentions not  
577 only parthenogenetic drones but also equal (1:1) ratios and recessiveness of traits:

578

579 "Queen bees of the yellow Italian variety always produce yellow drones, even if fertilized by a drone of  
580 the black German variety. In contrast, the influence of the father is clearly recognizable in the worker  
581 bees, less so in the individual bees, but rather in the offspring as a whole; these do not correspond to a  
582 distinct intermediate form, *but half of the bees resemble the father, while the other half resembles the*  
583 *mother*. When the bees resembling the mother reproduce parthenogenetically, they produce partly  
584 Italian and partly German drones, demonstrating that the qualities of the father *were not erased but*  
585 *only hidden*. A similar pattern is observed, only in reverse, when a German queen is mated with an  
586 Italian drone" (our italics, p21).

587

588 The analogy with the segregation and recessiveness of traits in Mendel's pea crossings will not have  
589 escaped Mendel's and Nave's minds. The fact that his friend Johann Nave knew about Dzierzon's  
590 findings, from 1858 onwards, makes it likely that Mendel also knew this before he completed his pea  
591 experiments and completed the text of his lectures in spring 1865. Conway Zirkle (1951) also suggested  
592 that Dzierzon's findings in bees in 1854 might have inspired Mendel to think in terms of discontinuous  
593 variation and ratios. However, Weiling (1994) considered it very unlikely that Mendel knew about

594 Dzierzon's results before the second half of 1865 (by which time Mendel had already presented his  
595 experiments) and also argued that Dzierzon's initial findings were less convincing and only later were  
596 confirmed. Radlkofer however, gives a very clear summary, which Mendel will have known before he  
597 gave his lectures early in 1865. The demonstration of Italian and German bees and their hybrids at the  
598 NSS meeting of July 1864 also suggests that Dzierzon's findings of hybridization were known by that  
599 time (Anonymous 1865).

600

601 That Johann Nave's interest went further than fertilization processes in algae, and that he, like Mendel,  
602 also took an interest in the hybridization of flowering plants is evident by the fact that he possessed a  
603 copy of Wiegmann's "Hybrid formation in the plant kingdom" (*Die Bastarderzeugung im Pflanzenreiche*,  
604 1828). In this pamphlet, Wiegmann describes the results of 36 experimental crosses in nine different  
605 crop genera, including pea and bean. He confirmed Kolreuter's findings of sexuality in plants which had  
606 been criticized by others and describes increased variation in offspring from hybrids and the occurrence  
607 of dominance in certain crosses. Wiegmann's publication is mentioned in books on the history of  
608 genetics (Roberts 1929; Stubbe 1965; Olby 1966). Roberts (1929) characterizes his work "as the work of  
609 a man....willing....to dispute freely the authority of other investigators, such as Linnaeus, Kölreuter and  
610 Gärtner and withal, a man with a practical bias for and sympathy with agriculture". Mendel himself  
611 owned a copy of Gärtner's 1849 masterpiece "Experiments and observations about hybrid formation in  
612 the plant kingdom" (*Versuche und Beobachtungen über die Bastarderzeugung im Pflanzenreich*), which  
613 was published more than 20 years later and much more comprehensive than Wiegmann's publication.

614

## 615 **Conclusions**

616 Our investigations substantiate Ittis' opinion that we form a false picture of Mendel if we think of him  
617 only as a scientist and a recluse. He did not spend all his days within the monastery and was familiar  
618 with a broader world. In fact, he was one of the first to join a new international all-inclusive group tour,  
619 which later became very popular. These pleasure trains were expensive (fl 250, for comparison: about  
620 half of the year income of a full teacher at the *Oberrealschule*; Mendel, as a supplement teacher, will  
621 have earned considerably less). Since Richter could not find the trip in the financial books of the  
622 monastery, it seems that Mendel could afford it privately.

623

624 From his artificial hybridizations, which had begun in 1856, probably aiming to develop better pea  
625 varieties (Van Dijk *et al.* 2018), Mendel had deduced a theory of non-blending inheritance. In 1862 and

626 1863, Mendel was conducting backcrosses to test his hypothesis that the hybrids formed equal numbers  
627 of kinds of fertilization cells and that the segregation ratios were determined by random union of the  
628 fertilization cells (Fisher 1936; Orel 1971). The summer of 1862 must have been a very exciting time for  
629 Gregor Mendel since the first results of the seed traits (color and shape) must have become available,  
630 no doubt he would have discussed this topic with Johann Nave during their trip together. Therefore this  
631 journey was probably of significance in the origin of genetics.

632  
633 Mendel's fertilization hypothesis was the main subject of his second lecture according to the *Brünner*  
634 *Zeitung* (20-03-1865): "After a clear presentation of the most recent findings of the research on the  
635 genesis and development of the plant germ [i.e., the embryo] in general, the lecturer sought to utilize  
636 them in the formation of the hybrids, and *developed a hypothesis concerning the factors involved in this*  
637 *process*, confirmed by a large number of meaningful and highly successful experiments, which could  
638 significantly contribute to the elucidation of this hitherto inaccurately observed process" [our italics].  
639 The newspaper *Neuigkeiten* (10-03-1865) also stated that Mendel spoke about "cell formation,  
640 fertilization and seed development in general and in hybrids in particular".

641 Scientific interaction between Gregor Mendel and Johann Nave has been suggested (Iltis 1924; Orel  
642 1996) without much substantiation. Our study has now provided clear evidence for their close friendship  
643 and common scientific interests. The highly relevant books that were donated to the NSS by Franz  
644 Czermak in January 1865 previously seemed to have only become available to Mendel too late to have  
645 influenced his experimental design. We now know that they belonged to his close friend Johann Nave  
646 and were available halfway through his pea experiments and it is hard to believe that the friends did not  
647 discuss them. Together with his patron abbot Cyrill Napp and his professor Franz Unger, his friend  
648 Johann Nave has to be seen as one of the three people who most influenced Mendel's thinking about  
649 heredity.

650

## 651 **Acknowledgments**

652 We are grateful to the members of the Society for Amsterdam retired policemen (SPA) for their  
653 judgment of the two photographs of Johann Nave. Franjo Weissing improved our English translations of  
654 some German texts. We thank Charlie Underwood for his comments on a draft version of the  
655 manuscript.

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754 **Appendix I**

755 Translation of the article with the sign-in list, published in *Die Presse* (29-08-1862) (Fig. 2).

756

757 **Submitted.**

758 The city of Stuttgart has created through the very warm and genuinely fraternal welcome to the  
759 participants of our second pleasure train, a glorious remembrance for all times in all our hearts. The  
760 whole group and each person individually expressed this feeling in heartfelt words of thanks on the spot  
761 and on the way back from Salzburg. Equally unanimous, however, was the wish of the Austrian travelers  
762 to present some tangible token in their remembrance to the Stuttgart Chamber of Commerce, to whom  
763 they owed this unforgettable day. With this, we present the result of the first signup list for this aim,  
764 which already opened during the trip, and add the following request: No decision was taken about the  
765 form of the remembrance, and due to the dispersion of participants over the *Kronländer* we can no  
766 longer consult all. We ask the participants from Vienna to contact us to discuss the next steps and, if  
767 necessary, to form a committee. [The 142 names are listed in Table 1]

768 The entrepreneurs,

769 Joseph Neumeyer & Mihailovičs.

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775 **Appendix II**

776 Translation of the advertisement for the originally planned second and third pleasure trains (Fig. 3).

777 **Second and third**

778 **Pleasure train**

779 **To Paris and London**

780 For the on July 24th and July 30th this year from Viennese Western Station departing **Pleasure train** to  
781 **Paris** and **London** certificates with detailed travel program will be issued from the **ticket office** at the  
782 **Western Station** only till (and including) **July 15th**. The **fare** is determined to **fl 250** Austrian Viennese  
783 banknotes and the journey is generally carried out in wagons of the 2nd class; For this the travel period  
784 is extended with 3 days and the participants are offered new pleasures and points of interest, like: **7**  
785 **days stay in Paris, 6 days in London, 1 day and night in Stuttgart, accommodation, boarding, Grand**  
786 **Opera in Paris** (parterre and loge), **Omnibus travel, porters, pleasure trains to St. Cloud and Versailles,**  
787 **Bois de Boulogne, Napoleon's tomb, the Tuileries and their art collection,** and so on. **1 Thames cruise**  
788 **to Greenwich and Woolwich,** visit of the **museums, the arsenal, the Thames tunnel, the docks,** etc. etc.  
789 An **omnibus trip** and free entrance of the famous **Cremorne Garden**. A **trip** with a **pleasure train** to the  
790 **Sydenham Cristal Palace,** 2 days free entrance to the **Industry Exhibition,** 1 day tour for **Bank, Stock**  
791 **Exchange, Guildhall, Tower, St. Paul's Cathedral, Monument, Newgate, Hyde-Park, Houses of**  
792 **Parliament, Westminster quarter, British museum,** and the **Zoo,** etc, etc.

793 The number of participants for each train is restricted to 300 persons, because only 600 certificates will  
794 be made available for the two trains. For the train that departs on July 24th **white** certificates, for the  
795 train that departs on July 30th **red** certificates will be issued; Therefore certificates for the third train will  
796 only be made available **before** the second train is completed upon urgent request.

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<sup>i</sup> *The Klagenfurter Zeitung* (20-08-1862) describes the crossing as follows:

“According to reports from London about Neumeyer's pleasure train, the entire travel company is well and uninterrupted in the best mood. The sea passage was very rough this time. The English ship "Prince Eugene" took the travelers up in the port of Boulogne; at the embarkation part of the luggage was loaded on another ship, but the mistake was noticed early enough, and a few telegraphic telegrams from Mr. Neumeyer sufficed. The ship sailed out of the harbor at 6 o'clock in the morning, the sea became restless, and three or four times the waves made their way over the foredeck, the greater part of the travelers became seasick, but the company as such never lost its good humor. During the sea journey and disembarkation at Folkestone, most travelers lost their headgear as a result of the intense storm.”

“The weather reports of August 7, 8 a.m., speak of strong winds in Yarmouth and storm and rain in Portsmouth. Chimneys, roof tiles, and gutters came down in London, injuring several people. It was even worse on the Thames, ships crashed, and barges overturned. Three people died” (*Algemeen Handelsblad* 11-08-1862).

<sup>ii</sup> Wikipedia ([https://en.wikipedia.org/wiki/The\\_Crystal\\_Palace](https://en.wikipedia.org/wiki/The_Crystal_Palace); consulted 11-03-2020)

<sup>iii</sup> The struggle between Prussia and Austria for hegemony within the German League led four years later, in 1866, to the Prussian Austrian war which was won by Prussia. The Prussians also occupied Brünn and the St. Thomas monastery had to provide housing for the Prussian army. Gregor Mendel wrote about the Prussian occupation in a letter to his brother-in-law (August 31st, 1866) and talked about the enemy (*der Feind*) and about the cholera epidemic that the Prussians brought with them.

<sup>iv</sup> BB in the *Wiener Zeitung* (19-08-1862): “When crossing the Franco-German border at Rastatt, the Austrians were welcomed with music by the Federal German troops. Around 10 p.m., they reached Stuttgart, where a large crowd had gathered. Here too, the reception was with music, including the Austrian Radetzky March and the German patriotic song "*Was ist des Deutschen Vaterland?* (What is the German fatherland?)". At the station, Dr. Oskar Fraas, the president of the Stuttgart Chamber of Commerce, addressed the Austrian travelers. The next day was a day of rest, and the travelers were

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again awakened with music. Representatives of the Chamber of Commerce guided the travelers to interesting sights. In the afternoon, they first shared coffee and then went to the beer garden, where great fraternization occurred between the travelers and the Stuttgarter population. Dr. Th Pisling spoke on behalf of the Austrians, shedding some light on the commercial, political situation, and emphasizing the unifying power of German labor. "Dr. Doleschal of Debrecen [Hungary] praised in warm words the merits which the German nation had acquired for culture and freedom and expressed the conviction that this nation could never have the intention of suppressing foreign individuality. Merchant Gutbrod of Stuttgart celebrated trade as the power to which we also owe this joyful meeting, and welcomed the imminent customs union. So it continued, with interruptions by a few rain showers, until the leader of the pleasure train finally urged to hurry up. The assembly moved arm in arm towards the city. All the windows were densely occupied, farewell greetings waved to each other, and from the guesthouses decorated with German, Austrian, and Württemberg flags, a massive crowd of people escorted us to the platform of the station. New friends said goodbye with firm handshakes and promising a reunion in Vienna parted. The cheers could be heard for a long time, as we drove under thunder and lightning into the night. From Salzburg, the travelers sent telegraphic greetings and thanks to their friends in Stuttgart on entering the home soil."

<sup>v</sup> *Salzburger Zeitung*: 16-08-1862 and 19-08-1862; *Das Vaterland*: 19-08-1862; *Ost-Deutsche Post*: 17-08-1862 and 18-08-1862; *Wiener Zeitung*: 17-08-1862 and 19-08-1862; *Fremden-Blatt*: 18-08-1862; *Süd-Deutsche Zeitung*: 18-08-1862; *Nürnberger Abendzeitung*: 19-08-1862; *Isar-Zeitung*: 20-08-1862; *Kemptner Zeitung*: 21-08-1862; *Neue Frankfurter Zeitung*: 21-08-1862; *Passauer Zeitung*: 23-08-1862).

<sup>vi</sup> "The pleasure trains have not stopped yet, a new one is announced [to the October fest in Munchen].....One has photographed the people who were part of the pleasure train from Vienna to Paris, why not take a picture of those who travel on the pleasure train from Vienna to Munich? The idea of photographing people who, either because of their economy or because of their fortunate position.....has always seemed to me supremely ridiculous..... I understand that we are photographing a group of the rulers of Europe, the famous artists, the famous writers, the famous generals, but what I cannot understand is that the public has to admire a party who traveled in a pleasure train. So, in a hundred years or more, assuming that photographs do not deteriorate too much, the future generation may find the photographs of our days, and when asked what are these heads, the answer will be: They are persons who, in the year 1862, the year in which the constitution was given to

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Austria by Emperor Francis Joseph, made the journey from Vienna to Paris in the pleasure train! And the people would laugh, seeing persons pass this way to posterity.”

The new pleasure trains were the subject of discussion in the Viennese *Bierhallen* and *Kaffeehäuser*. “it seems that nowadays having been on a pleasure train has a little merit, because the other evening at the Daum cafe, I saw two gentlemen raise their heads when they saw a small, thin, dry man, his nose adorned a binocle. ‘Who is that gentleman?’ said one. ‘He has been to Paris and London with a pleasure train’ replied the other.”

<sup>vii</sup> On November 23th a large concert with music by Offenbach and Straus Jr was staged in the Diana hall in Vienna with a large military tableau entitled: "*Der Vergnügungszug nach Paris und London*". (*Fremden-Blatt* 23-11-1862). At the end of December 1862, the play "1862" was staged at the Carl theater in Vienna with a scene entitled "*Der Vergnügungszug nach London*", complete with a decor of the interior of a train wagon (*Der Zwischen-Act*, 27-12-1862). "*Vergnügungszug*" became such a well-known concept that it was also used figuratively. For example, the Treumann Theater (Theater on Franz Josef Quai) presented the musical / revue "*Wiener Vergnügungszug durch das Jahr 1862*" with highlights of the past theater year (*Fremden-Blatt* 28-12-1862).

<sup>viii</sup> The Brünner address book from 1862 only contains the name of "Nave, Johann, k. k. Finanz-Landes Directions-Concipist, Unterzeil 50". In 1853 it reads: "Nave, Katharina, k.k. Rechnungs Rathwitwe, Ledergasse 34" (in also in 1858, but in 1862: "Nawe, Katharina, Ledergasse 34; another example of inconsistent spelling). Katharina Nave is probably the mother of Johann Nave. These are the only persons with the surname "Nave" in Brunn.

<sup>ix</sup> On the same day, one of the participants, "S. Bals", is listed in the same hotel. The name Bals, without initials, can be found on the sign-up list, and on August 19th, a "Bals" can be found again in *das Goldenes Kreuz*, only now with "J" as the initial. Because this is a rare surname, this is probably the same person, and this S - J confusion reflects that for S. Nab[v]e for J. Nab[v]e mentioned earlier.

<sup>x</sup> "It is indeed possible to demonstrate along theoretical lines that this assumption would suffice to explain the development of hybrids in each individual generation, if at the same time one were allowed

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to presuppose that the different species of germ- and pollen cells are formed in equal quantity on average on the hybrid.

In order to put these presuppositions to test by way of experiment, the following trials were selected: Two forms that were constantly different with respect to seed shape and colouration of the albumen were conjoined through fertilisation.” (Mendel 1866b)

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Words identical in the publications of Nave and Radlkofer are underlined. This suggests that Nave had read Radlkofer’s publication.

*Nave p98:*

“Erst die Beobachtungen Areschougs an den Zygnemeen haben in der Neuzeit so befriedigende Aufschlüsse gebracht , dass die Copulation als ein wirklicher Befruchtungsakt angenommen werden darf.“ (Recently Areschoug's observations on the Zygnemeen have provided such satisfactory facts that copulation can be assumed to be a real act of fertilization.)

*Radlkofer p25:*

Ueber die Bedeutung der Copulation der Algen hat uns gleichfalls die Neuzeit befriedigende Aufschlüsse gebracht. Areschoug ist durch seine Beobachtungen hierüber bei den Zygnemeen zu dem Resultate gelangt.

*Radlkofer p82:*

Die Beobachtungen Areschougs haben jede Schwierigkeit hinweggeräumt, welche uns hindern könnte, denselben als einen wirklichen Befruchtungsact anzusehen.

<sup>xii</sup> „so viel steht fest, dass der Pollenschlauchinhalt das Analogon der Spermatozoiden, das Keimbläschen das Analogon des Eies ist, dass der Befruchtungsprocess der Phanerogamen durchaus dem der Kryptogamen, dem der Thiere entspricht“.