When Did Carl Correns Read Gregor Mendel's Paper? A Research Note
Author(s): Hans-Jörg Rheinberger
Source: *Isis*, Vol. 86, No. 4 (Dec., 1995), pp. 612-616
Published by: The University of Chicago Press on behalf of The History of Science Society
Stable URL: https://www.jstor.org/stable/235380
Accessed: 08-02-2024 14:00 +00:00

When Did Carl Correns Read Gregor Mendel's Paper?

A Research Note

By Hans-Jörg Rheinberger*

> It was in a sleepless night in November [1899], toward morning, when the explanation for the observations on *Pisum* and *Zea* suddenly dawned upon me. But it was only when I was in the process of preparing the publication that I screened the literature systematically. Now I realized—with the help of Focke's *Pflanzenmischlinge*—that Mendel had found and published all this already thirty-five years ago. . . . If I had found the explanation earlier, I would have published a preliminary note, despite the work on my book on mosses. For the significance of the results was quite clear to me at once.[1]
>
> The date of the day upon which, in the autumn (October) of 1899, I found the explanation, I no longer know; I do not make note of such matters. I only know that it came to me at once "like a flash," as I lay toward morning awake in bed, and let the results again run through my head. Even as little do I know now the date upon which I read Mendel's memoir for the first time; it was at all events a few weeks later.[2]

Carl Erich Correns (1864–1933) studied with the botanist Carl von Nägeli in Munich. After completing his dissertation in 1889, he continued his scientific career, working with Gottlieb Haberlandt in Graz, Simon Schwendener in Berlin, and Wilhelm Pfeffer in Leipzig. In 1892 he obtained his *venia legendi* in Tübingen, and for the next ten years he stayed there as *Privatdozent.* He was appointed extraordinary professor in Leipzig in 1902 and in 1909 became professor of botany and director of the Botanical Garden in Münster. In 1913 he agreed to serve as director at the Kaiser-Wilhelm Institute for Biology in Berlin-

* Institute for Genetics and General Biology, University of Salzburg, A-5020 Salzburg, Austria.

I thank the Institute for Advanced Study in Berlin, where a fellowship for the academic year 1993/1994 gave me the time to do an extended archival search on the Correns papers. Let the team of the Archive for the History of the Max-Planck Society—including Marion Kazemi, Georg Herrmann, Andreas Walter, and its director, Eckart Henning—be acknowledged for their steadfast help; and Gerhard Czihak (University of Salzburg) and Peter McLaughlin (University of Konstanz) for their advice.

[1] Carl Correns, typewritten autobiographical sketch, undated, 7 pages, Archive for the History of the Max-Planck Society, Berlin, Abteilung III, Repositorium 17, Nummer 1, pp. 4–5 (my translation). Correns's earlier co-worker Emmy Stein received this short account from Elisabeth Correns when she was working on the papers of Carl Correns shortly after World War II. See Emmy Stein, "Dem Gedächtnis von Carl Erich Correns nach einem halben Jahrhundert der Vererbungswissenschaft," *Naturwissenschaften,* 1950, *37:*457–463.

[2] Carl Correns to H. F. Roberts, 23 Jan. 1925; quoted in Roberts, *Plant Hybridization before Mendel* (Princeton, N.J.: Princeton Univ. Press, 1929), p. 335.

Isis, 1995, 86: 612–616

0021-1753/95/8401-0001$01.00

Dahlem. It has been widely accepted that he interpreted his crossing experiments with *Pisum,* performed in Tübingen (1896–1899), in a manner consistent with Mendel's rules, and that he reached his conclusions independently and before he learned of Mendel's paper "Versuche über Pflanzen-Hybriden."[3] Correns is known always to have tried to give due historical credit to Mendel. Of course, as Onno Meijer has shown, his early acknowledgments of Mendel can also be read as a means of diverting the priority claims of his fellow rediscoverer Hugo de Vries.[4]

The protocols of Correns's experiments with peas are preserved in the Archive for the History of the Max-Planck Society in Berlin. Besides a few small notebooks specifying sowing times and crop location, the protocols comprise some 330 pages, including a detailed description of results, drawings, calculations, preliminary drafts for the publication, and excerpts of pertinent literature. In a bundle labeled "Crosses with Pisum," together with remarks on "Experiments of Gaertner with *Pisum*" and a note on "Rimpau, Verh. Vers. Deutsch. Nat. u. Aerzte in Magdeburg, 1884, XI. Sect. f. landw. Vers.wesen, Landw. V. Stat. Bd. 31, p. 179. Die Kreuzung als Mittel z. Erzeug. neuer Var. von landw. Culturpflanzen," is a page with the following entry:

16. IV. '96.

Mendel (66) distinguishes:

	dominant and recessive characters. For our cases is	dominant:	recessive:
—	form of seed	round	wrinkled
—	seed coat: ("Albumen")	grey to brown	*white*
—	cotyledons:	yellow	pale-yellow, *green*
—	pod:	inflated	constricted
	:	green (unripe)	yellow (unripe)

The dominant and recessive characters are expressed already in the first generation in such a way that the former are present in 3, the latter in 1 individual, respectively.

The hybrid form of seed shape and cotyledons develops immediately and directly through fertilization

[3] Gregor Mendel, "Versuche über Pflanzen-Hybriden," *Verhandlungen des Naturforschenden Vereines Brünn,* 1866, *4:*67–111. Robert Olby has remarked: "Of the three so-called rediscoverers and the several other plant breeders who published Mendelian ratios in and around 1900 there are good grounds for believing that only one established the connexion independent of reading Mendel's paper—Carl Correns." Robert Olby, *The Path to the Double Helix* (London: Macmillan, 1974), p. 390. A decade later he was more cautious: "whether he [Correns] had arrived at the Mendelian explanation independently of reading Mendel remains uncertain." Olby, *Origins of Mendelism,* 2nd ed. (Chicago: Univ. Chicago Press, 1985), p. 119. See also Peter Bowler, *The Mendelian Revolution* (London: Athlone, 1989).

[4] Carl Correns, "G. Mendel's Regel über das Verhalten der Nachkommenschaft der Rassenbastarde," *Berichte der Deutschen Botanischen Gesellschaft,* 1900, *18:*156–168; Correns, "Gregor Mendels 'Versuche über Pflanzenhybriden' und die Bestätigung ihrer Ergebnisse durch die neuesten Untersuchungen," *Botanische Zeitung,* 1 Aug. 1900, no. 15, pp. 229–238; and Correns, "Etwas über Gregor Mendels Leben und Wirken," *Naturwissenschaften,* 1922, *10:*623–631. Correns also unearthed and published Mendel's letters to Nägeli; see Correns, ed., "Gregor Mendels Briefe an Carl Nägeli 1866–1873," *Abhandlungen der Mathematisch-Physikalischen Klasse der Königlich Sächsischen Gesellschaft der Wissenschaften,* 1905, *29*(3):189–265. See also the detailed paper by Ilse Jahn, "Zur Geschichte der Wiederentdeckung der Mendelschen Gesetze," *Wissenschaftliche Zeitschrift der Universität Jena: Mathematisch-Naturwissenschaftliche Reihe,* 1957–1958, *7:*215–227; Hans Stubbe, *Kurze Geschichte der Genetik bis zur Wiederentdeckung der Vererbungsregeln Gregor Mendels,* 2nd ed. (Jena: Fischer, 1965); and Olby, *Origins of Mendelism.* For Meijer's suggestion see Onno G. Meijer, "Hugo de Vries No Mendelian?" *Annals of Science,* 1985, *42:*189–232, esp. pp. 190–193.

Cot. (therefore) yellow♀ + green♂ = yellow♂ + green♀ = 3/4 yellow + 1/4 green
Form. round♀ + wrinkled♂ = wrinkled♀ + round♂ = 3/4 round + 1/4 wrinkled

The seed coat, the form and the colour of the pods
are not *changed.*

But later *Mendel* notes, e.g., that A (seed round, Cot. (p. 19) yellow) pollinated with B (seed wrinkled Cot. green), *exclusively* yielded *yellow* seeds which were *round.* [See Figure 1.][5]

Close inspection of Correns's handwriting leaves no doubt that this page carries the date 16 April 1896. He must, therefore, have read Mendel's paper at the outset of his crossing experiments with peas, rather than after their completion. But it can reasonably be assumed that Correns initially disregarded his note on Mendel, and possibly even forgot about it, because he did not realize its potential significance. Although Correns notes Mendel's offspring ratio of 3:1 with respect to dominant and recessive characters, he appears to have concentrated his immediate attention on the characters of the seeds, a question connected to the xenia problem he was already pursuing in *Zea mays.*[6] This is suggested by his emphasis on the following sentence: "The hybrid form of seed shape and cotyledons develops immediately and directly through fertilization."

Upon reading the note more closely, we cannot exclude the possibility that Correns was misled by Mendel's terminology. Mendel speaks of the second generation of crosses as the "first generation of hybrids."[7] Correns's summary reads: "The dominant and recessive characters are expressed already in the first generation in such a way that the former are present in 3, the latter in 1 individual, respectively." But then he points to an apparent contradiction: "But later *Mendel* notes, e.g., that A (seed round, Cot. (p. 19) yellow) pollinated with B (seed wrinkled Cot. green), *exclusively* yielded *yellow* seeds which were *round.*" This statement is also interesting in that Mendel's symbols are not rendered here in the way Mendel uses them: Mendel uses the letters (*A* and *B*) for the dominant characters, whereas Correns designates the two plants to be crossed as *A* and *B,* respectively.

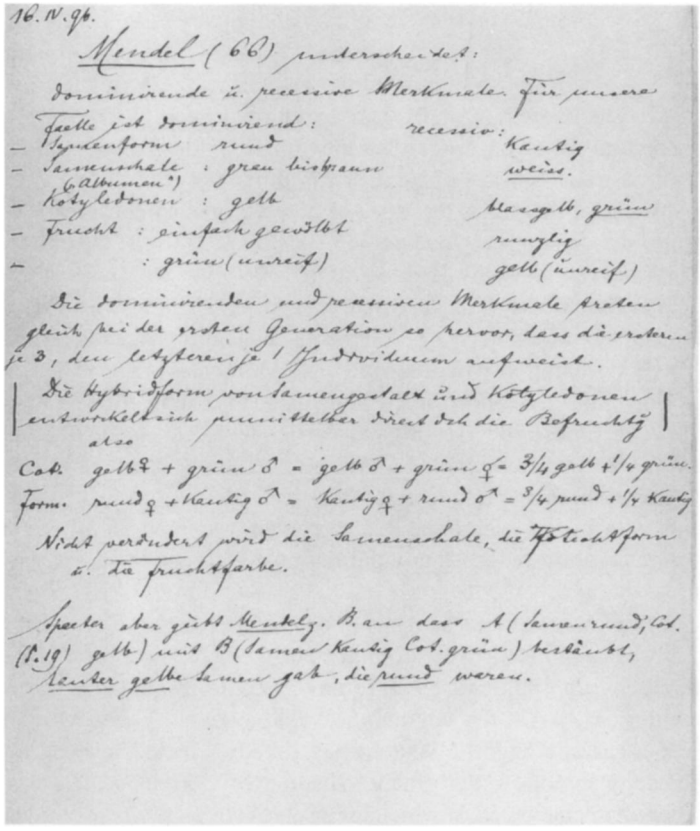
All in all, Correns does not seem to have regarded Mendel's paper as containing revelations that would have justified his treating it more seriously than the other things he was reading at the time, such as Rimpau's and Gärtner's works. "It is a weakness of mine," he noted later, "that I take a close look at the literature only in the end."[8] Meijer has suggested, as have Alain Corcos and Floyd Monaghan, that this first contact with Mendel's work was a cursory reading whose significance dawned upon Correns only after some time. Such an interpretation could also explain the tone of his later written statements. As he told H. F. Roberts, "I do not lay too much weight upon the re-discovery itself. According to my opinion, it was important that the Mendelian laws should finally be known and verified. Whether it happened by their being independently found anew, or through the fact that

[5] For the protocols see Archive for the History of the Max-Planck Society, Abt. III, Rep. 17, Nr. 115. "Experiments of Gaertner with *Pisum*" in all probability refers to Karl Friedrich Gärtner, *Versuche und Beobachtungen über die Batarderzeugung im Pflanzenreich, mit Hinweisung auf die ähnlichen Erscheinungen im Thierreiche* (Stuttgart: K. F. Hering, 1849). For Rimpau see W. Rimpau, "Die Kreuzung als Mittel zur Erzeugung neuer Varietäten von landwirthschaftlichen Culturpflanzen," *Tageblatt der 57. Versammlung Deutscher Naturforscher und Ärzte* (Magdeburg: Faber, 1884), pp. 179–186.

[6] Xenia are characters of the pollen-giving plant that become visible in the seeds and fruits of the mother plant.

[7] Gregor Mendel, *Versuche über Pflanzenhybriden (1865),* ed. Erich Tschermak (Ostwalds Klassiker der Exakten Wissenschaften, 121) (Leipzig: Wilhelm Engelmann, 1901), p. 11.

[8] Correns, autobiographical sketch (cit. n. 1), p. 4.



16. IV. 94.

Mendel (66) unterscheidet:

dominirende u. recessive Merkmale für innere Theile ist dominirend: recessiv:

- Testaform rund — Kantig
- Samenschale: grau braun (Albumen) — weiss.
- Kotyledonen: gelb — blassgelb, grün
- Frucht: einfach gewölbt — runzlig
- : grün (unreif) — gelb (unreif.)

Die dominirenden und recessiven Merkmale treten gleich bei der ersten Generation so hervor, dass die ersteren je 3, den letzteren je 1 Individuum aufweist.

Die Hybridform von Samengestalt und Kotyledonen entwickelt sich unmittelbar direct bei der Befruchtung

also

Cot. gelb ♀ + grün ♂ = gelb ♂ + grün ♀ = 3/4 gelb + 1/4 grün.

Form rund ♀ + Kantig ♂ = Kantig ♀ + rund ♂ = 3/4 rund + 1/4 Kantig

Nicht verändert wird die Samenschale, die Testaform u. die Fruchtfarbe.

Später aber gibt Mendel z. B. an dass A (Samen rund, Cot. gelb) mit B (Samen Kantig Cot. grün) verbindet, lauter gelbe Samen gab, die rund waren.

Figure 1. *Carl Correns, note on Gregor Mendel's "Versuche über Pflanzen-Hybriden," Archive for the History of the Max-Planck Society, Abt. III, Rep. 17, Nr. 115. Reprinted with the permission of the Archive.*

someone first read the memoir of Mendel, and then repeated the experiments, is, however, at bottom, an indifferent matter *for science.*"[9]

If we look at the context of Correns's work in Tübingen, as reflected in the protocols, we find him busy with a plethora of observations and experiments on the morphology and growth of the cell membrane, on the physiology of movement in plants, on the systematics of algae (*Oscillatoria*), on the vegetative reproduction of mosses, and on alpine floristic issues. In general, the technical notes, drawings, and calculations are connected with his teaching obligations as a *Privatdozent* at the university. When, after receiving his *venia legendi* in 1892, he was entitled to use the university's botanical garden, he also undertook some breeding experiments, which came to include *Funkia* and, later on, *Zea mays, Mat-*

[9] Correns to Roberts, 23 Jan. 1925; quoted in Roberts, *Plant Hybridization before Mendel* (cit. n. 2), p. 336 (Correns was responding to a question from Roberts). Meijer's guess, although not based on archival evidence, pointed in the right direction. He hypothesized "that Correns did read Mendel's paper before that inspired night, that he failed to recognize Mendel's importance on the first reading of his paper, and that it may have worked in his mind subconsciously to reappear 'like a flash' ": Meijer, "De Vries No Mendelian" (cit. n. 4), p. 194. See also Alain F. Corcos and Floyd V. Monaghan, "Correns, an Independent Discoverer of Mendelism? I: An Historical/Critical Note," *Journal of Heredity,* 1987, *78*:330.

thiola, Phaseolus, Pisum, and *Lilium.* At the beginning the crossing experiments appear to have had little direct impact on his overall physiologically oriented activity, at least as far as their extent and systematicity is concerned. They originated as research trials connected to problems of developmental physiology, such as the formation of adventitious embryos in *Hosta.* His interest in maize had arisen upon reading Darwin's observations on xenia. Correns himself characterized his breeding experiments as "Allotria"—that is, rather unsystematic trials—in the context of his other projects during his time at Tübingen.[10] However, over the years questions of heredity gained considerable momentum, and by the turn of the century they had come to dominate Correns's work.

The records on maize and *Pisum,* beginning in 1894 and 1896, respectively, appear to be fairly complete. Essentially Correns listed the results of the various crosses; he added almost no explanatory or summarizing statements. Thus the protocols are difficult to interpret for anybody not familiar with this kind of experimental practice. This might be one of the reasons why they have been neglected for such a long time. Many pages were worked over several times after the original entries had been made. The results of the crossing series in some years prompted Correns to rearrange the data from the previous year. In the course of these rearrangements, statistical calculations make their appearance. His experiments with maize, where the xenia problem rendered the interpretation of the results much more complicated, certainly did not push Correns to an early recognition of Mendelian ratios.

I am now carrying out a detailed analysis to determine whether Correns's early reading of Mendel in any way influenced the arrangement or the evaluation of his experiments during the years between 1896 and 1899. In any case, it does not seem to have induced him to work with peas, for at the beginning of his notes he relates Mendel's character distinctions to "our cases," suggesting that he had already selected his experimental plants. It will be interesting to follow the gradual shaping of Correns's ideas along with the progress of his experiments on peas, which themselves were only part of a whole network of parallel investigations whose mutual reinforcement or interference will have to be reconstructed. If we assume that in 1896 Correns was not yet prepared to recognize the significance of Mendel's work, it remains to be seen how that recognition came about. Was Mendel's paper completely forgotten for a time, then suddenly remembered when, having performed a critical mass of breeding experiments, Correns realized that he could now make sense of a bit of information he had come upon some years earlier? Or did it loom in the background while he accumulated his data—not forgotten, but apparently insignificant—until, "like a flash," its importance became clear? Thus it remains to be seen whether—and, if so, how—the chapter "Correns" in the history of the "rediscovery" of Mendel's work will have to be rewritten.

[10] Correns, autobiographical sketch (cit. n. 1), p. 4.