

**POLLEN**

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Pollen by M. Pakenham Edgeworth

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**M. PAKENHAM EDGEWORTH**

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# POLLEN

BY

M. PAKENHAM EDGEWORTH, F.L.S. F.A.S.

*ILLUSTRATED WITH 438 FIGURES*



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## P R E F A C E.

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LAST YEAR I laid before the Linnæan Society a Paper on Pollen, with drawings of the various kinds. But it having been brought to my notice that several German botanists had written on the subject of late years, and also that HASSALL had published an important paper on it, I withdrew mine from before the Society.

Since then I have altered it considerably; having added new matter, and omitted from the plates what had been figured previously by HASSALL and ROMANOFF, except where I differed from them.

I also take notice of the drawings by Mr. WORTHINGTON SMITH, which were published by him after my paper had been laid before the Society; and have added to the list all that have been figured and noticed by former botanists on the subject; so that it may be viewed immediately in detail.

I trust that, thus altered, this paper may prove a not unimportant addition to our knowledge of the subject.



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# POLLEN.

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Two years ago Mr. Airey published some interesting facts about the dust collected on smeared plates of glass, and mentioned that some of the dust was pollen. I began accordingly to enquire into the forms of pollen likely to be found in such places, and from this went on to discover all that I could about pollen. I had many years ago drawn a number of specimens, but I now took to examining them more closely, and drawing them to scale.

The principal papers already published on this subject are by

1. Purjinke, in Latin. His illustrations of the cells of the anther are very interesting, but unfortunately, the pollens drawn have been treated with water, so as to lose most of their distinguishing marks.
2. By Mirbel, in French. Accurate as far as they go, but on too small a scale. ('*Elémens de Physiologie végétale*,' 1815.)
3. By Fritzsche, in German (1832). Most beautifully drawn both in the simple form and under oil, and under the effects of weak sulphuric acid. He examined almost all the natural families.
4. By Hugo Mohl, in German, translated into French in the '*Annales des Sciences Naturelles*.' He goes most thoroughly through all the families in the natural state of the pollens, or as they appear under olive oil or water; drawn to scale. I have followed in his footsteps; and now I wish to point out a few inaccuracies into which he has fallen, and to carry on the examination of the other plants.
5. Hassall reviewed Mohl, showing some differences, and

- going through all the natural families in detail, with numerous plates drawn to scale, and published in the 'Annals of Nat. Hist.' 1842, vol. viii. ix.
6. Lindley published figures of pollen after some of the above authors; and
  7. A further republication of them in the 'Micrographical Dictionary.'
  8. Since that time Herman Schacht has published some beautiful drawings in the 'Jahrbuch der Botanik,' Berlin, 1860, ii. p. 109. I agree very much with what he has published, except about the Pinus family, of which his descriptions differ from what I have observed, and from the drawings of Mohl, and Hassall, and Dr. Hooker.
  9. Nagili has also a paper in the same publication, vol. iii. Rosanoff has a paper in the same publication (1865), vii. p. 34, principally on the pollen of the Acacia.
  10. Leursen, in vol. vii. p. 34 of the same publication, reviews a paper by
  11. M. Pollenden, Bonn, 1867;
  12. A paper by Mr. A. W. Bennett in the 'Popular Science Review,' April, 1875; and lastly,
  13. Some woodcuts by Mr. Worthington Smith in the 'Gardener's Chronicle' in October last; republished in the 'Microscopical Journal,' January, 1877.

The pollen forms are often noticed by Dr. Hooker in his large works, and also by some foreign botanists in the Brazil Flora.

It is remarkable, that while in some families the species vary greatly, in others they are almost always the same. Some may therefore be considered normal; others as having only a specific value. The different size of the grains is also marvellous: some very large, and visible to the naked eye, as in Stachytarpheta, the Malvaceæ, Cobæa, Pan-craticum, and some species of Iris, reaching as much as  $\frac{1}{100}$  th of an inch; while others, as many Boragineæ, Primulaceæ, Melastomaceæ, and Saxifrageæ, are as small as  $\frac{1\frac{1}{2} \text{ to } 2}{5000}$  ths of an inch. In colour also they are very various, but usually some shade of yellow or white; but I have observed blue, red, brown, or rarely green, which has been denied by Lindley.

Mr. Bennett would divide the pollen into those which are wind-borne, or anemophilous, and those which are not so scattered, or entomophilous; but the grains are by no means all globular, as he there asserts. The Gramineæ and Cyperacæ are usually prismatic. The *Populus* has globular pollen, while the *Salix*, in the same family, is somewhat cylindric, as is that of *Rheum*, which is probably anemophilous, and the dioecious *Rumices*, with three slits.

*Plantago*, which appears to be also anemophilous, varies from a polyhedric to the simple form, while the wind-borne pollen of the *Coniferæ* is very different.

The *Urticæ* are very small and elliptic, with three slits, withering into a prismatic form.

The Grasses and *Cyperacæ*, and perhaps the *Plantaginæ*, are without the sticky nature of the outer coat, which obtains through all other pollen grains.

Some grains throw out a quantity of tubes, by which they are hung together, as in *Richardia ægyptiaca*, *Strelitzia regina*, and the *Rhododendron*, &c., but more usually they are quite distinct. I omit any account of the peculiar pollen of the *Asclepiadæ* and *Orchidæ*, which have not common loose grains of pollen, but joined together in a coherent mass. I also do not intend to make any remarks as to the structural nature and function of the fovilla and the pollen grains.

I have found but three or four instances in which the same anther produces two or three forms of pollen; usually they are all similar, often with some small or imperfect grains; but in the *Mimulus luteus* I have found the simple form, common in the *Scrophulariaceæ*, mixed with the coiled form, which H. Mohl pointed out in the *Mimulus moschatus*. I have not been able to find this coiled form myself in the latter, and Mr. W. Smith considers it an error of H. Mohl's; but in this he is doubtless mistaken, for I have found it in the next species, *M. luteus* (No. 138). I have also found many forms of pollen in the *Browallia elata* (No. 146), in the same anther, but not in the coiled form; and H. Mohl mentions others also which I have not had the opportunities of examining.

I find also two forms in *Thalictrum flavum* and *glaucum* (Nos. 429-432), probably also in *Ranunculus auricomus*, as remarked by Hassall and myself in the *Anisogeisoes*.