

# Bright new colours; the history and analysis of fluorescein, eosine, erythrosine and some of their derivatives

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## Abstract

Throughout centuries, natural dyes from animal and vegetable sources were used for textile dyeing. Nowadays, a lot of information is known about the history and the identification of these dyes. From the mid 19<sup>th</sup> century, new, synthetic dyes were developed. Three developments in the second half of the 1850s led to structural research, resulting in the discovery of hundreds of synthetic dyestuffs at the end of the 19<sup>th</sup> century:

1 - The discovery and production of the violet dyestuff mauve by William Henry Perkin in 1856.

2 - The discovery and production of the red dyestuff fuchsine, in the period 1856-1858, by Jakub Natanson, August Wilhelm Hofmann and François-Emmanuel Verguin.

3 - The discovery of the diazo reaction, which can be used for preparing acid dyestuffs, in 1858 by Johann Peter Griess.

The knowledge obtained lead to more insight in the organic chemistry. Especially, the discovery of synthetic alizarine in 1868 by Carl Graebe, Carl Liebermann and Heinrich Caro and at the same time by William Henry Perkin was a milestone. The first natural dyestuff was produced synthetically!

In 2002, the Netherlands Institute for Cultural Heritage started a project on synthetic organic dyestuffs from the period 1850-1900. Dyes from this period are particularly known for their instability and are now sometimes severely faded. The research project have two main goals. First, present techniques have to be evaluated and new techniques have to be developed for the identification of these dyes. This part of the project is carried out in collaboration with the Royal Institute for the Study and Conservation of Belgium's Artistic Heritage. A selection of sixty-five well-known synthetic dyes was analysed, covering all dye-classes from this period. The results of this project will be presented elsewhere. The second part of the project is to obtain historical information. Therefore, the original historical sources, included the patent literature, is studied.

The present paper focus on the so-called hydroxy-phthaleins. This new chemical groups of dyestuffs was discovered by Adolf Bayer. In 1871, he prepared fluorescein by mixing phtalic anhydride with resorcinol and zinc chloride, which acts as a condensing agent. The dye-class was extented some years later by eosine (tetrabromo fluorescein, 1873/1874), erythrosine (tetraiodo fluorescein, 1876) and, for example, the derivatives phloxine and rose bengal.

The history, the chemical constitution, the production and the (fantasy) names of the different dyestuffs will be discussed. In addition, the dyeing recipes and the use on

artists' objects will be presented. Some examples of the identification of these dyestuffs on both textiles and in paintings, used as organic pigments, will be given.

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