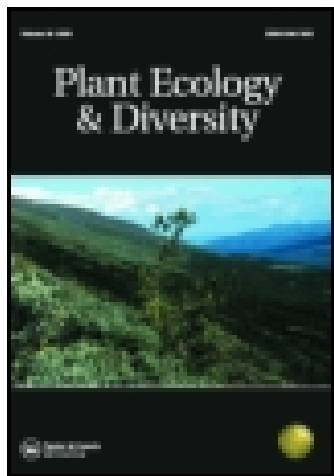


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Transactions of the Botanical Society of Edinburgh

Publication details, including instructions
for authors and subscription information:
<http://www.tandfonline.com/loi/tped18>

On Contact Negatives For The Comparative Study Of Woods

R. A. Robertson M.A. B.Sc.
Published online: 01 Dec 2010.

To cite this article: R. A. Robertson M.A. B.Sc. (1899) On Contact
Negatives For The Comparative Study Of Woods, Transactions
of the Botanical Society of Edinburgh, 21:3, 162-165, DOI:
[10.1080/03746609909469083](https://doi.org/10.1080/03746609909469083)

To link to this article: <http://dx.doi.org/10.1080/03746609909469083>

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between the mucilage and the cellulosic wall may be due to a great concentration of sensitive salt in that region, or it may be due to the presence of some specially sensitive salt not existing in other parts of the plant. The fact that gaslight is enough to cause reduction of the silver salt, points to this latter theory as being the more probable. It also suggests the likelihood of halogens being held in rather complex molecules in the tissues, in addition to their existence therein, as simple salts derived from the sea, and not yet further elaborated by the metabolic processes due to the plant's activity.

ON CONTACT NEGATIVES FOR THE COMPARATIVE STUDY OF WOODS. By R. A. ROBERTSON, M.A., B.Sc. (With Plate.)

(Read 12th January 1899.)

The object aimed at was to devise a method by which several large sections of woods might be obtained on a single sensitive plate, which could be used either as a lantern slide directly, or as a negative for giving, by exposure, ordinary prints. The following conditions had to be fulfilled:—the sections must be large enough to show the diagnostic characters of the wood; the magnification, if any, must be uniform; and there must be enough detail so as to permit of projection or examination directly with a two-inch objective. The difficulties to be overcome are fairly obvious to all workers in photography.

It may be well to recapitulate here some of the various ways by which an image, capable of development as a sensitive plate, may be obtained—

(a) The photo-chemical process, in which the plate is exposed to light, and the chemical processes thus started are carried on by further treatment with certain chemical substances.—Unique preparations of the retina in the shape of contact negative prints on paper by an application of this process are described by Musgrove, in "Proc. Scot. Mic. Soc.," 1891-92.

(b) The mechanical pressure method.—By sufficient mechanical pressure an invisible image can be produced on the sensitive plate capable of development in the ordinary

way. This has been shown to be possible for iodised and bromised collodion plates, and also for gelatine emulsion plates, by Carey Lea, Eder, Warnerke, Abney, and others.

The origin of the image in this case is difficult of explanation. Meldola ("Chemistry of Photography") suggests that as it has been proved possible to produce minute chemical changes in compounds by mechanical pressure, so it is "not improbable that the silver haloids in presence of sensitisers should undergo a minute amount of decomposition by strong mechanical pressure, the decomposition being so infinitesimal as to be revealed only on application by that most sensitive of micro-chemical tests—the photographic developer."

(c) The purely chemical method.—By alkaline solutions of glucose and lactose, as well as alkaline hypophosphites, a developable image may be obtained on the sensitive plate.

By these methods, negatives may be obtained.

(d) Direct positives can be prepared by solarisation.—In 1859, Poitevin showed that it was possible to obtain direct positives on glass, instead of negatives, by using potassium iodide as an artificial solarising agent. An iodised collodion plate is sensitised and exposed to diffuse daylight for a few seconds, a film of "reduction product" (Meldola) is formed on the surface of the unaltered haloid. After washing to remove the silver nitrate, the plate is coated with a film of potassium iodide, and a long exposure is given.

"The most strongly illuminated portion of the film becomes rehalogenised, while the deep shadows remain as unaltered reduction product, and the intermediate shades get partially rehalogenised. On development, the high lights therefore come out white, the shadows dark, and the intermediate shades of an intermediate tint; in other words, we get a positive instead of a negative."—(Meldola, "Chemistry of Photography.")

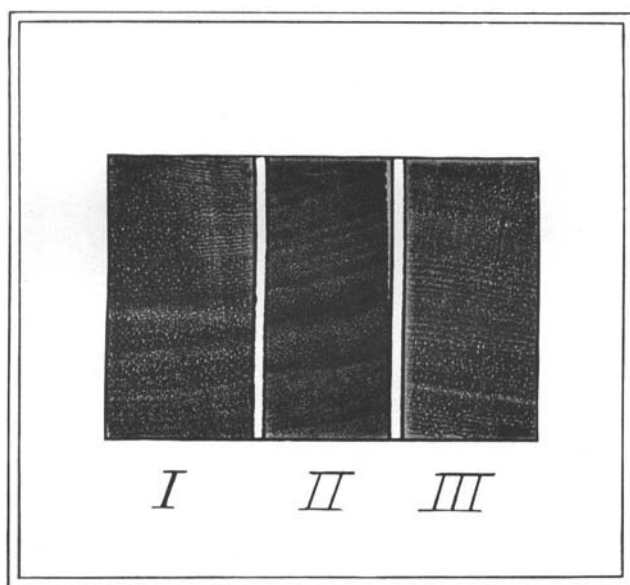
Of these four methods, I propose to give in the present paper a résumé of my experiments and results in the first two—the mechanical and photo-chemical. From the former method, I have as yet obtained no results. Whether my plates were not sensitive enough, or whether the pressure applied was not sufficient, I cannot say, but, at all

events, I was unable to get the developable image. Further experiments are in progress with this method.

The photo-chemical process gave, for the work in hand, quite satisfactory results, and my method of using it is as follows :—

Preparation of the Sections.—The material from which the sections were cut was in most cases typical blocks of wood, which had been seasoned ten, fifteen, or more years ago, and which had been used as museum specimens. From these, hand-plane sections were prepared, as large and as thin as possible. Naturally, these sections were extremely brittle, and betrayed a tendency to curl up, which rendered manipulation difficult. The largest of these, in some cases six inches long and two to three inches broad, were immersed for twenty-four hours or more, according to the character of the wood, in a flat dish containing a mixture of absolute alcohol and glycerine, about half and half, and kept flattened by a glass plate. This treatment got rid of the air, flattened the sections, and removed the brittleness to a workable extent. Thence they were transferred to the staining fluid. In the choice of this last, one had to be guided by various considerations, more especially a stain had to be selected that would give good contrasts and differentiation, not merely in the actual section, but which would show as such on the developed plate. A series of experiments made on these lines with various stains, alcohol or water soluble, proved that, of all, Bismarck Brown or Orange G. in saturated watery solutions gave the best results. After prolonged staining, the sections were toned with spirit, dehydrated with absolute alcohol, and left in oil of cloves for a day or two if intended ultimately for mounting in balsam. If to be mounted in glycerine-jelly, the sections were transferred from absolute alcohol to absolute and glycerine, half and half, and then into pure glycerine.

Printing.—The sections thus cleared are used as negatives, so to speak, for direct contact printing with lantern plates. A plate of glass is fitted into the ordinary printing frame, and on this the series of wood sections is arranged, in a thin layer of oil of cloves, or of glycerine, as the case may be. In the dark room an ordinary lantern-



EXPLANATION OF PLATE

Three Contact Photographs on one Plate of Micro-Sections of Bauhinias—I. *B. Variegata*; II. *B. Racemosa*; III. *B. Malabarica*.

slide is placed in contact with these, and clamped down very firmly, so as to ensure the expulsion of all air-bells and to have the surfaces uniformly in contact. The plate was exposed to the light of an ordinary gas-burner; the time of exposure was varied, so as to ascertain what gave best results—a long exposure to a weak light, or a short exposure to a strong light. After exposing, the plate was washed—in the case of clove-oil preparations, in alcohol, followed by water; in the case of glycerine preparations, in water merely. The plates, which were Ilford, were developed with hydroquinone, and experiments showed that, if anything, better results in the way of finer detail were got with a weak or used developer than with a developer of full strength. The interesting researches of Forgan, in "Proc. Brit. Astron. Assoc.," and Carrier, in "Proc. of Scot. Mic. Soc.," 1896–97, were very suggestive in this connection.

The general results varied—the variation depending on the ordinary factors, as exposure and developer, and on the additional ones of thinness and staining. The necessity of cutting sections of large size from the material described, prevented the minimum of thinness being obtained, and therefore precluded the best results being made of the method.

In other work, where serial sections smaller in area, and therefore capable of being cut thinner, serve the purpose, much better results are possible. As it is, the advantages may be summarised as follows:—Serial sections can be obtained on one slide,—being contact preparations, they are all of the natural size; the plate can be used as a lantern slide directly, or as a negative to give paper prints,—for comparative work, such as described above, it gives enough detail; it stands examination and projection under an ordinary two-inch objective, the thickest sections giving at least the medullary rays, annual rings, pores of the wood, and part of the intervening tissues, the thinner ones showing the intermediate tissue more or less distinctly, and capable of standing examination, in some cases, with a one-inch objective. Beyond this magnification, the difficulty becomes technical, and concerns the emulsion itself and the grain of the plate.