

Arthur John Doherty, 1860 – 1906

by Brian Stevenson, Kentucky, USA

A professional microscope slide maker, Arthur J. Doherty opened the College Microscopical Depot in Manchester, England in approximately 1884. The shop was adjacent to Victoria University (now the University of Manchester), where he likely did good business with the students. Doherty began making slides while in his teens, opening the business while in his early twenties. He continued slide making and selling until about 1900. Doherty mounted a wide variety of specimens, animal, vegetable and mineral. His slides are generally of very high quality, both in specimen preparation and finish (Figure 1). Doherty also wrote authoritatively on aspects of specimen preparation and slide making, including injecting animals and tissues with dyes. His widely-cited protocol for double-staining plant tissues is reproduced at the end of this essay.



Figure 1. Representative microscope slides produced by Arthur J. Doherty. He mounted a wide range of materials. Illustrated specimens include human histology, a sectioned sea urchin spine, plant sections and polycistina.

Arthur John Doherty was born during July, 1860, in Chorlton on Medlock (now part of Manchester), Lancashire, England. He was the second child, and eldest son, of Joseph and Mary Doherty. Arthur did not marry until late in life, and appears to have lived with his parents for much of their lives. The 1895 *Slater's Manchester and Salford Directory* recorded that father Joseph operated a tailoring business from the same location as Arthur's microscopy shop.

The Doherty family lived at 26 Leamington Street from at least 1871 until the early 1880s. The 1881 census reported that Arthur worked as a "shorthand writer".

The earliest identified records of A.J. Doherty's microscopical interests date from 1881 (Figure 2). However, a note he published that March in *The Northern Microscopist*, on making ringing varnish for slides, stated that he had been using his recipe "for about fifteen months" (Figure 2B). Thus, Doherty was experimenting with microscopy since 1879, possibly earlier. By 1881, Doherty was actively involved with the Manchester Microscopical Society, displaying "sections of wood double stained" to the Society on March 12 of that year. Quite likely, the combination of Doherty's enthusiasm for microscopy and the Society's encouragement led to his early development of expertise in the field. Arthur Doherty's skills had reached a state where he could write an authoritative protocol for double-staining botanical materials by 1881, and which was cited as state-of-the-art for several years thereafter. A reproduction of Doherty's "Double Staining" can be read at the end of this essay, as Figure 12.

The 1881 records indicate that, while Doherty had developed skills in staining specimens and making varnish from scratch, he was only just getting serious about microscopy. In February of that year, he asked for advice on cleaning diatoms (Figure 2A). Later that year, he sought a microscope and other equipment. As a working-class shorthand writer and son of a tailor, it is not surprising that Doherty offered microscope slides in exchange for equipment, rather than money. In May he requested a ringing table (Figure 2D). He offered "carefully finished slides of diatoms" in exchange, suggesting that he already had access to a ringing table, probably through the Microscopical Society. That also suggests he was successful in his quest for information on cleaning diatoms. In September, Doherty requested a lamp for his microscope, which would allow him to study and work after sunset (Figure 2E). Doherty also asked that year for a modern microscope, offering up his olden-style microscope in exchange (Figure 3).

A. Feb.

CLEANING DIATOMS.—I should be glad of the information how to obtain diatoms perfectly free from earth and other impurities. I have frequently succeeded in cleansing them; but have almost always failed in separating them from the muddy and siliceous particles by which they are generally surrounded.—*Arthur J. Doherty.*

C. April

DOUBLE-STAINED sections of stem of dog-rose (*Rosa canina*) and blackberry (*Rubus fruticosus*), in exchange for other stained vegetable sections, or for parasites.—*Arthur J. Doherty, 25 Leamington Street, Manchester.*

E. Sept.

WANTED, a good microscopic lamp, such as Collins's Bockett lamp. Will give in exchange four dozen first-class objects, well mounted and finished, in polished pine cabinet with trays.—*A. J. Doherty, 26 Leamington Street, Manchester.*

B. March

WHITE VARNISH for ringing slides may be prepared as follows:—one ounce of benzine, half ounce of gum damar, and white oil paint q.s.; dissolve the gum damar in the benzine, and filter; then add a sufficient quantity of the paint to produce a good white. I have used this varnish for about fifteen months, and find that it answers quite as well as that which is sold by the regular dealers, while the cost is less than a third of the price charged by them. The white paint may be procured at any artists' colourman's.—*Arthur J. Doherty.*

D. May

WANTED, a good ringing table, will give in exchange twelve well-mounted and carefully finished slides of diatoms, double-stained sections of exogens, &c.—*A. J. Doherty, 25 Leamington Street, Oxford Road, Manchester.*

Figure 2. 1881 magazine postings from Arthur Doherty, requesting microscopy equipment and information, and also offering specimens and information. The requests for a ringing table and a microscope lamp suggest that Doherty was beginning to get serious about microscopy at that time. (A and B) from 'The Northern Microscopist'. (C, D and E) from 'Hardwicke's Science-Gossip'.

A COMPOUND achromatic microscope by Crichton on firm brass tripod stand, with 6-inch, 5-inch, 4-inch, 3-inch, 2-inch, 1-inch, $\frac{1}{2}$ -inch and $\frac{1}{4}$ -inch in objectives, stage forceps, live box, bull's-eye condenser, spherical silver reflector, &c. and 100 best-mounted objects in exchange for a good microscopic stand (monocular or binocular) by any good English maker; address, in reference—Arthur Doherty, 26 Leamington Street, Oxford Road, Manchester.



Figure 3. In April, 1881, Arthur Doherty offered to exchange his old-style Crichton microscope for a good (modern) microscope. Shown below Doherty's 'Science-Gossip' exchange offer is a microscope produced by John Crichton, fitting the "tripod" description that Doherty provided for his early microscope. John Crichton worked in London from 1831 to 1865. Image is from the Golub Collection, <http://golubcollection.berkeley.edu/d2010/pages/231.html>

In October, 1882, and March, 1883, Doherty published requests for *Popular History of British Lichens*, by W. Lauder Lindsay, MD. In the January issue of *Hardwicke's Science-Gossip*, he requested "Wanted, lichens, mounted or unmounted; also a first-class section-cutter; liberal exchange in slides or material". The January, 1884, issue of *The Journal of Microscopy and Natural Science* carried Doherty's article on the lichen *Solorina saccata*. Arthur drew the accompanying figure (shown here as Figure 4).

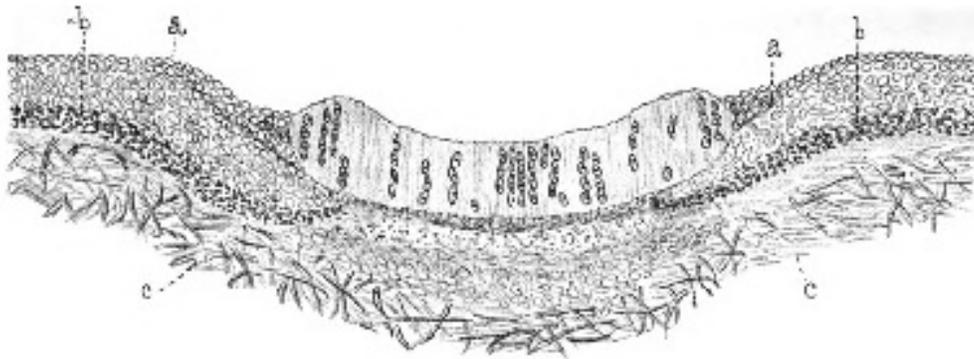


Figure 4. Drawing of the lichen *Solorina saccata*, by Arthur J. Doherty. From *The Journal of Microscopy and Natural Science*, 1884.

A Mounting Class of the Manchester Microscopical Society was held on December 13, 1882. *The Microscopical News and Northern Microscopist* reported, "In the senior division Mr. A.J. Doherty, whose slides we have often had occasion to admire, went carefully through the various processes of decolorization, washing, preparing, staining in carmine, then in aniline green and mounting in balsam, and was very successful with several slides of the sugar cane. He also explained the various tissues acted upon by the different colouring media, and supplied those present with the formularies he has found from experience to give the best results. Exceedingly instructive and interesting are double-stained sections, and when we consider that they offer no very great difficulties to the microscopist, it is a matter of surprise that individual mounts are not more general. For those who care to follow out this beautiful process, an exhaustive paper by Mr. Doherty will be found in the *Northern Microscopist*, vol. 1., page 128."

December, 1882, also found Doherty advertising from 21 Barton Street, in the Moss Side area of Manchester. He stayed at that location only briefly. Within a month, he moved up the street to number 25. A January, 1883, exchange ad in *Hardwicke's Science-Gossip* gave the address of "25 Boston Street", an obvious typographical error. The May issue of that magazine printed the correct address of 25 Barton, as did also the January issue of *The Microscopical News and Northern Microscopist*.

By January, 1884, the Dohertys had moved to 33 Burlington Street, where Arthur opened his College Microscopical Depot. This was close to Oxford Road, and adjacent to Victoria University. At approximately the same time, microscopist Edward Ward moved from 29 Burlington Street to 249 Oxford Road. Ward also sold slides and supplies to the University students. Both Ward and Doherty were members of the Manchester Microscopical Society, and would have been very familiar with each other. It is possible that the two men cooperated to some degree with their shops and wares. It is also possible that Doherty jumped into the opening left by Ward when he moved from Burlington to Oxford. Noting that Ward's business succeeded into the 1920s, while Doherty made plans to quit the business by the end of the 1890s, it looks like Ward made out the better.

EDUCATIONAL SLIDES, Of the Highest Class and most Elaborate Finish.

FOOD ADULTERATION.

The following exquisite preparations for the microscope, showing the adulteration of food, are now ready; accompanied by autotyped descriptions and drawings. Price, set A, 15/-; set B, 27/6; post free.

SET A.	SET B.
Long. Sec. Coffee-Berry, double-stained	Consists of Set A and the following:
Tr. Sec. Petiole of Tea-Leaf, stained	Tr. Sec. Black Pepper-Berry, double-stained
Cuticle, ditto ditto	" White Pepper-Berry, ditto
Adulterated Coffee	" Mustard-Seed, stained
" Chicory	" Rind of Orange, unstained
" Cocoa	Adulterated Arrowroot
" Rice-Flour	" Curry-Powder
" Pea-Powder	" Cayenne
" Mustard	" Ginger
" Pepper	" Oatmeal
" Spice	Vitaroborant
" Marmalade	Cuticle of Hawthorn
	Acarus sacchari, the Sugar Insect

SLIDES OF POND-LIFE.

Cyclops vulgaris, Daphnia pulex, etc., mounted as permanent objects for the microscope, each 1/8 per slide.

Desmids (several species on a slide), 1/6 each.

DISSECTING INSTRUMENTS, &c.

Knives, Scalpels, Scissors (curved or straight), Bone Forceps, &c.

Thin Glass Circles, 4/- per ounce, post free.

Best flatted crown slips, 6/6 per gross, post free.

Best Steel Wire Mounting Clips, 1/6 per dozen, post free.

Labels, 6d. per 100.

STAINING & MOUNTING MEDIA.

Carmine	Pure Opal Blue	Farrant's Solution
Picro-Carmine	Bismarck Brown	Brown Cement
Analín Green	Violet	Gold Size
Rosein	Hæmatoxylin	Matt Black
Blue	Balsam & Benzole	Picrate of Ammonia
Eosin	Glycerine Jelly	White Zinc Varnish

Coloured Varnish for Finishing Slides.

These Stains, etc., are prepared with the purest chemicals and products, and their quality can be absolutely relied upon. All prices, 1/-, post free, 1/2.

A large and increasing stock of slides of stained and injected Animal Tissues, double stained Vegetable Sections; Sections of Lichens, Stems and Leaves of Mosses, Diatoms, Polariscopes Objects, etc., price 1/- each.

ARTHUR J. DOHERTY,

THE COLLEGE MICROSCOPICAL DEPOT,

33, BURLINGTON STREET, OXFORD ROAD, MANCHESTER.

Figure 5. Advertisement from the inside cover of the January, 1884 issue of 'The Journal of Microscopy and Natural Science'.

Early in 1884, Doherty entered into a partnership with J. Ernest Ady, to provide a series of 24 microscopical specimens, plus lithographs and details on preparation (Figure 6). *Hardwicke's Science-Gossip* announced in April that "Mr. Ady's 'Popular Studies in Comparative Histology,' in which he is assisted by Mr. A.J. Doherty, of the Victoria University, Manchester, commenced on March 10th". The *Illustrated Science Monthly* reported, " 'Popular Studies in Comparative Histology' is to be the title of a new series of essays, accompanied by lithographed illustrations and mounted preparations for the microscope. The series is under the editorship of Mr. J. Ernest Ady, favourably known by his studies in petrography, assisted by Mr. A.J. Doherty, of Victoria University, and will be commenced, we understand, on the 10th of March. The issues are proposed to be fortnightly".

This project did not last long. The July, 1884, issue of *Hardwicke's Science-Gossip* included this note, "Mr. A.J. Doherty requests us to inform our readers that he has withdrawn from his connection with Mr. J.E. Ady, and that none of the slides accompanying the 'Popular Studies in Comparative Histology,' with the exception of the sections of *Physcia stellaris* and *Rosa canina*, will be prepared by him". At about the same time, Ady had a short-lived partnership with mineralogist Heinrich Hensoldt, which also promised to supply a series of microscope slides. The address given in the advertisement shown in Figure 6 is Hensoldt's.

POPULAR STUDIES IN COMPARATIVE HISTOLOGY.
EDITED BY J. E. ADY (of Edinburgh University),
Assisted by ARTHUR J. DOHERTY (of Victoria University).
A series of 24 exquisitely prepared Microscopical Specimens, each one of which will be profusely illustrated with accurately etched lithographs, and fully described, with methods of preparation, and all collateral information, in simple terms, thereby forming a practical and most attractive introduction to comparative Histology, or the varied minute structure of organised beings.
To be issued Fortnightly, FROM MARCH 10th, 1884. Terms of Subscription (in advance):—Twelve Numbers 14s. Twenty-four Issues, £1 6s. 8d.
For full particulars, with Lists of preparations, apply to—
THE EDITOR, 7, MACHELL ROAD, NUNHEAD, LONDON, S.E.

Figure 6. Advertisement for Ady and Doherty's microscope slide series on comparative histology, from 'Hardwicke's Science-Gossip', 1884.

As did other professional slide makers of the time, Doherty sent free samples to popular scientific magazines such as *Hardwicke's Science-Gossip*. The April, 1884 issue reported, "Mr. A.J. Doherty has kindly sent us two slides, one showing the annular rings (stained) in section of lime; and the other a cross-section of the ovary of *Rhododendron ponticum*. Both are exquisitely neat, tasteful, and beautiful objects."

The November, 1884, issue of *The Microscopical News and Northern Microscopist* published a paper "On Injecting" by Arthur J Doherty.

Doherty's reach extended to the U.S.A. by 1886. That year, and for several years afterward, he advertised slides and unmounted specimens in U.S. microscopy magazines.

UNMOUNTED SECTIONS FOR THE MICROSCOPE.

- SET A. 20 SINGLE AND DOUBLE-STAINED SECTIONS showing the minute structure of plants from the lowest to the highest order. Post free - \$1 50
- SET B. 20 DOUBLE-STAINED SECTIONS of the roots, stems, petioles, and leaves of plants specially selected for showing structure of great beauty. Post free - - - - - \$1 50
- SET C. 20 STAINED AND INJECTED PREPARATIONS from man and the lower animals. Post free - - \$1 50

N. B.—All the above sections are sent out named, and ready for mounting direct from the tubes. Each preparation is guaranteed to be a chef-d'œuvre of section cutting and staining.

ARTHUR J. DOHERTY,
The College Microscopical Depot,
33 Burlington St., Oxford Road,
Manchester, Eng.

Figure 7. 1886 advertisement from Arthur J. Doherty, from 'The American Monthly Microscopical Journal'.

In 1886, Arthur Doherty announced that he was planning a trip to Australia and the U.S.A. (Figure 8). To raise funds for the trip, Doherty held a massive clearance sale and reduced his prices for slides. His advertisements gave the address of 19 Blossom Ave. That was the home of his elder sister, Fanny, and her family, located around the corner from the Doherty's former Leamington Street home. This suggests that Doherty closed down the 33 Bloomington Street microscopy shop in preparation of his trip, providing the permanent home of his sister for communications.

similar project of demonstrations before the American Society of Microscopists will be very profitable to those who can be present at the meeting. Of the ability of Mr. Doherty to conduct such demonstrations we are fully assured from the character of the work we have seen from his hands. The expense of such a project would not be excessive if distributed among a number of societies”.

The June 21, 1887 meeting of the San Francisco (California) Microscopical Society included “A communication .. from A.J. Doherty, of Manchester, England, the well-known preparer of microscopic objects, announcing his intention of visiting this city in a few months. Arrangements have been made with him for a series of demonstrations of the most approved methods used in the preparing and mounting of objects for the microscope, and from the admitted ability of the gentleman in this line his discourses cannot fail to be interesting and instructive. A series of slides mounted by him and comprising a wide range of subjects, were shown under a number of microscopes last evening by J. G. Clark, and the excellence of workmanship shown by these mounts, elicited the warmest commendation”.

The Microscope wrote that year that “We have received .. from Mr. Arthur J. Doherty, of the College Microscopical Depot, Manchester, England, a box of sample slides. We can truthfully say that we have never seen better examples of staining and mounting than as here presented . Microscopists who wish to fill empty spaces in their cabinet, will do well to consult Mr. Doherty's catalogue” and “Mr. Arthur J. Doherty, of Manchester, England, to whose work we have already referred, is shortly to pass through the United States on his way to Australia. During his tour Mr. Doherty proposes to give a series of practical demonstrations before microscopical societies. The following list of subjects have been selected for this purpose: Animal and plant-section cutting; Single and double staining; Anatomical injecting; Selecting and arranging Foraminifera; Mounting in balsam and other media and without pressure; The mechanical and optical construction of the lantern microscope, including an exhibition of a number of beautiful objects by means of this instrument. Mr. Doherty's long experience and well-known skill in practical and theoretical microscopy need not here be referred to. We hope that secretaries of Societies will avail themselves of this opportunity and communicate at once with Mr. Doherty, at 19 Blossom Ave., Manchester, England. A small fee will be charged for these demonstrations”. The next month, *The Microscope* amended this to “Mr. Arthur Doherty's address is, General Post office, Sydney, New South Wales, instead of Manchester, Eng., as given in our last issue”.

Our slide maker was probably the Mr. A.J. Doherty, “labourer”, who arrived in Sydney, Australia, on September 2, 1887, aboard the “*Orizaba*”. Just what Doherty did in Australia is as-yet unknown.

The April, 1888, issue of *The American Monthly Microscopical Journal* included this editorial, “We announced some time since (*Journal*, viii, p. 134) that Mr. A. J. Doherty, of Manchester, would shortly visit this country. The plan then projected was interfered with, but Mr. Doherty has lately written again concerning his intentions. From his letter we quote the following: ‘I am in negotiation with the San Francisco, the Denver, and the Wellesley College Microscopical Societies as to my giving before them demonstrations in practical microscopy. It is quite possible that I shall leave here for the United States towards the end of March, or early in April. . . I feel certain that the demonstrations will be both interesting and instructive, and the exhibit of slides, etc., with the lantern microscope, will give pleasure to all who witness it.’ The demonstrations include animal and plant section cutting, single and double staining, anatomical injection, selecting and arranging foraminifera, mounting in balsam and other media, construction and use of the lantern microscope. Any societies which are prepared to secure one or more of the demonstrations will unquestionably derive very great benefit, and we shall be glad to correspond with them relative to the matter”.

The May issue of *The Microscope* included the following letter to the editor, “In the January number of the *Microscope* appeared an editorial upon the condition of our microscopical societies in general. I am very forcibly impressed with the truthfulness of your charges, especially when you say: ‘That the majority of the members of local societies are those who, without any special training, have accidentally or

otherwise become interested in microscopy, bought a microscope, and have joined a society to learn how to use it'.

I am going to take the liberty to make the above a pretext for drawing the attention of your readers to a fact which has a more or less bearing upon the subject.

I am inclined to believe that this apathy, into which so many members fall, is very largely due to a want of knowledge of how to prepare even simple objects for examination. It is a fact to be deplored, that so few men can be found who are able and willing to give instructions in microscopical technology. I am sure that every microscopical society in the U. S. has a number of members who would gladly take advantage of such an opportunity, were it offered. Now, I am informed that such an opportunity has recently been presented to the different societies of this country, by Mr. Arthur J. Doherty, of Manchester, Eng. One would suppose that Mr. Doherty's work and skill is so well known that special advertisement is unnecessary, and that he would find no difficulty in making engagements in a country where just such information as he offers is so much sought after.

However paradoxical it may seem, Mr. Doherty writes me, that he has received invitations, so far, from only three societies. He states further that he will be obliged to give up the project of coming to the U.S. to give instruction in section-cutting, staining, preparing and mounting objects for microscopic study, unless a greater number of societies can be induced to accept his offer.

The Denver Microscopical Society is one of the three societies which has decided to take this course of instruction. I merely mention this, however, for the purpose of illustrating its effect. As soon as it became known among the members of this society that such an opportunity would be presented, new life seemed suddenly to pervade the whole society. Members who had not attended the meetings for months, eagerly subscribed themselves as members to this course, and expressed great pleasure that such an opportunity was expected. The truth is, they had lost interest in microscopical study, just because they did not know how to prepare the objects properly.

I suppose that I may assume our members to be representative of the average membership of most of the societies of this country. In all of them there are a few who do most of the work, and many who have joined out of curiosity, and a desire to learn and see what the workers do. The latter are the ones whom a course of instruction, such as is offered by Mr. Doherty, would change into enthusiastic and useful workers. Is it not possible to stir up enough interest in this matter that more societies may decide to accept Mr. Doherty's offer and thus insure his coming to this country?

H. F. WEGENER,

Prest. Denver Mic. Soc.

For the information of those who may not know Mr. Doherty's terms I may add, that he charges ten dollars for a lesson given to a class. If the class consists of ten members, it will cost each member one dollar a lesson.

That is the way we understand it."

I did not find any records of Arthur Doherty actually going to North America. By June, 1888, he was again advertising from Manchester, now at 63 Burlington Street, "What offers in unmounted micro-material for first-class slides of the following: arranged foraminifera (50 varieties); sections of species of echinoderms (20 varieties); sections of bone and teeth (in Canada balsam), showing the lacunae and canaliculi; whole insects mounted without pressure; and choice stained and injected preparations?—A. J. Doherty, 63 Burlington Street, Manchester".

Sale of Microscopic Slides.

TESTIMONIALS.

"I have just received the slides in good order. They are very beautiful, or, as a friend says, 'simply exquisite.' The Echinus Spines and Alga are very fine. Please accept my thanks for them."

EUGENE PINCKNEY, Esq., Dixon, Ill.

"This is the first moment that I could take to acknowledge directly to you the receipt of your preparations, and express my pleasure in studying them. I may say that I have never seen anything better combining the characters you claim for them. There is not a specimen in the list which will not be helpful to me in elucidating points which come up in my annual courses of instruction,

PROF. J. W. CHANEY, Carleton College, Minn.

	PRICE.
Set 1. 24 Physiological Stained and Injected Preparations, - - - - -	\$5.00
" 2. 24 Physiological Stained and Injected Preparations, - - - - -	5.00
" 3. 24 Stained and Injected Preparations from the Frog, - - - - -	5.00
" 4. 24 Single and Double-Stained Preparations, illustrating the Growth and Physiology of Plants, - - - - -	5.00
" 5. 24 Single and Double-Stained Preparations, illustrating the Growth and Physiology of Plants, - - - - -	5.00
" 6. 24 Slides of beautiful Foraminifera, arranged in pattern, - - - - -	5.00
" 7. 36 Preparations, consisting of Stained Sections from both Animals and Plants, Sections of the Earthworm, Transparent Carmine Injections, Opaque Vermilion and Chrome Yellow Injections, Sections of Eight different Echinoderm Spines, Foraminifera, Gorgonia Spicules and Insects. This is an exceptionally choice set, - - - - -	10.00

Twelve of the Slides in Set No. 3 and Twelve in Set 5 are duplicates of former preparations. With these exceptions, all the Slides named above are new and entirely different from those offered by me in this JOURNAL two years ago.

They are of the same high grade of work as my former preparations; but I believe the physiological sets will give even greater satisfaction than before, on account of the large proportion of exquisite Carmine Injections and Human Tissues which they contain.

The Stained Sections have been cut in the Sliding Microtome from Tissues imbedded in Paraffin, in some, by the method devised by Hoffmann; and I submit that, either as regards beauty or clearness of histological details, they are superior to anything which has yet been placed on the market.

In offering these Slides I would draw attention to the fact that the law of the United States exempts from duty "specimens of Natural History, Botany, and Mineralogy when imported for Cabinets, or as Objects of Taste or Science, and not for sale. This is held to include Microscopic Specimens on Glass."

The prices include carriage and trans-Atlantic freight to the port of that United States nearest to the address of consignee; the remaining charge for overland carriage, if any, is comparatively small.

ARTHUR J. DOHERTY,

63 Burlington St.,

Manchester, England.

Figure 9. Advertisement from 'The American Monthly Microscopical Journal', 1889.

Doherty also sought stones and fossils by 1889. In *The American Monthly Microscopical Journal*, he requested, "Specimens of rocks for slicing and grinding into sections; also bones and teeth of different animals, diatoms in situ on alga;, diatomaceous and polycystinous earths, ocean soundings, etc., etc. Liberal exchange in microscopic slides or cash. Arthur J. Doherty, 63 Burlington St., Manchester, Eng". The *Microscope* offered "For a choice assortment of microscopic slides, send, in exchange, a parcel of minerals and rocks, or of bones and teeth of extinct animals, or of diatomaceous and polycystinous earths, or of diatoms in situ on marine algae. Exchangers will be liberally dealt with. A.J. Doherty. 63 Burlington St., Manchester, Eng". *Hardwicke's Science-Gossip* requested, "Wanted, teeth and bones of different animals; also any rock specimens. Liberal exchange offered in first-class microscopic slides.—

A.J. Doherty, 63 Burlington Street, Manchester”.

The May issue of *Hardwicke's Science-Gossip* raved, “We have received from Mr. A. J. Doherty, of Manchester, the following excellent slides: - Skin of ear of rabbit (injected carmine); tongue of kitten, trans. sec. (injected carmine), a beautiful preparation; lip of cat, vert. sec. (injected carmine and stained blue); medulla oblongata of rabbit (stained ruematoxylin), showing the fine nervous structure very beautifully; ankle of kitten, trans. sec. (injected carmine and stained blue), showing the ossifying cartilage, besides other interesting details; stomach of frog, trans. sec., pyloric end (stained carmine), showing the glands and columnar epithelium; apothecium of a lichen (*Soloriua saccata*), vert. sec., showing the spores in asci; anther of *Lilium auratum*, trans. sec. (stained carmine), showing all the pollen in situ; fertile head of field horsetail (*Equisetum arvense*), trans. sec., showing the spores with their spiral elaters; ovary of foxglove (*Digitalis*), trans. sec. (stained carmine), showing all the ovules in situ; trans. sec. of the spine of *Aeroeladia mamillata*, and echinoderm from the Indian Ocean; frog's blood (stained picro-carmine). The peri-nuclear portion of each corpuscle is coloured yellow, the nucleus itself red. With a good 1/4-inch objective the ‘intra-nuclear plexus of fibrils’ (Stirling) can be seen distinctly”.

Beginning in 1889, Arthur Doherty began publishing advertisements that he was ending his microscopy business (Figure 10). At the same time, he requested items suggesting that he planned a chemistry-oriented business, “Wanted, a first-class chemical balance with working parts of agate, and susceptible to 1/4 milligramme. Also combustion furnace, potash bulbs, and any other apparatus for organic and volumetric analysts.—A. J. Doherty, 63 Burlington Street, Manchester”.

Figure 12. (below) "Double Staining", by Arthur J. Doherty. From 'The Northern Microscopist', 1881.

DOUBLE STAINING.

BY ARTHUR J. DOHERTY.

THERE are few microscopic objects which are more beautiful and interesting, and more worthy of a place in the cabinet than stained vegetable sections; and it is a matter of surprise, considering their great popularity, that the number of persons by whom they are prepared is, comparatively speaking, small. It appears, however, that this inequality is attributable, not to any difficulty in the art itself, but to the paucity of instruction; for it cannot be doubted that less has been written upon this subject than upon any other branch of microscopical study. Certainly Double Staining does not stand isolated from all other departments of the science by an entire absence of information regarding it, but the subject has nevertheless been treated upon only in such journals as one would not directly think of consulting with reference to it, whereas those works which ought manifestly to have exhausted the subject have dismissed it with a few words, or a chapter upon the staining of animal tissues only.

Perhaps the best paper which has yet been published on double staining is that which appeared in "Science Gossip" for January, 1880; but even the process therein described is in several points open to modification and improvement. It is in the hope, therefore, of supplying a want which must have been long felt that this article has been written; and though it would be perhaps presumptuous to say that the method here advocated is in anyway superior, or even equal, to many others which may be adopted, we believe it can be affirmed that it is the simplest and cheapest yet made public.

The art of staining in carmine and green consists of five stages or processes,—(1) decolourising the sections, (2) washing the same,

(3) preparing for staining, (4) staining in carmine, (5) staining in green. These processes will be described *seriatim*.

Vegetable sections may be bleached in various ways. When alcohol is used, no washing afterwards is necessary; but when acids are employed, all traces of the same must be entirely removed, so as to prevent crystallisation taking place after the sections have been mounted. But as there are objections to the use of alcohol, preference is to be given to a solution prepared in the following manner:—Dissolve in half a pint of water one ounce of fresh chloride of lime, and whilst the latter is in partial suspension, add about fifty drops of sulphuric acid.* Allow the solution to stand for about half-an-hour, or until all insoluble particles have entirely subsided, after which syphon off the clear liquid, and preserve in a stoppered bottle in a dark place. This latter precaution is imperative, because if the solution were exposed to the sun's rays its bleaching properties would be destroyed by a liberation of hydrogen which would combine with the chlorine from its state of inactive combination in the water.

After the sections have been bleached, which process it should be observed is completed when all colour has been demolished, they are to be washed in one or two waters and then soaked in a solution of sulphite of soda, composed of one part of sulphite to twenty parts of water, and finally washed in from ten to fifteen changes of warm water, for the purpose of removing any remaining traces of the reagents.

After this, in order to obtain deep colours, the sections are to be steeped in a mordant composed of ten per cent. solution of alum and water for twenty-four hours, at the end of which time they will be ready to be placed in the first staining fluid, the formula for which is as follows:—

Carmine.....	15 grs.
Ammonia	15 grs.
Water.....	2 ozs.

The carmine is to be dissolved in the ammonia over the flame of a spirit lamp, the water added next, and the fluid filtered through fine muslin before it is used.

Immerse the sections in this stain for six or eight hours, then take them out, and wash them in not more than two changes of water, and finally transfer them to the green stain, for which take,—

Aniline Green.....	5 grs.
Absolute Alcohol	1 oz.

* Hydrochloric acid would be better adapted for use than sulphuric, inasmuch as sulphate of lime, often difficult to get rid of, is not formed by this addition.—Ed.

Dissolve in a test tube with a slight heat only, so as to avoid any unpleasant mishap, and filter before using.

After a three hours' soaking in the above, the staining will be completed, and the sections should be mounted without delay.

Take them out of the fluid one at a time by means of Marsh's section spoon shown in fig 17, and place in a small saucer containing methylated spirit to wash the superfluous colour away. Then remove the section into another vessel containing oil of cloves, oil of cajeput, or benzol, and as soon as it becomes translucent, place it upon the centre of a warm glass slip, apply balsam and benzole immediately, and cover with a thin glass circle or square, and hold it down with a spring clip, as shown in fig. 18.



Fig. 17.



Fig. 18.

On finishing mounting, place the slides in a warm place to bake for a few days. The recess generally to be found above a kitchen oven forms a capital little bakehouse; but care should be taken that it is not too hot, or the balsam will be thrown into ebullition and the objects ruined.

Do not attempt to clean the slides until the balsam has thoroughly hardened, when it may be removed with the point of a pen-knife. The slides should then be ringed with brown cement, and the next day perfectly cleaned and polished by means of turpentine and warm water.

If it should be found that by following the above *modus operandi* a good deep carmine colour cannot be obtained, the strength of the mordant may be increased to fifteen per cent; but if even after this, the carmine remain poor and faint, the amount of water added in preparing the stain should be diminished by about half an ounce.

In conclusion, it may be remarked that the sections should be handled with the greatest delicacy throughout, and in order to obtain good specimens a microtome is absolutely indispensable, a

good form of which is shown in fig. 19. This section-cutter is

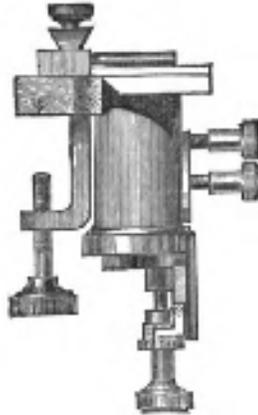


Fig. 19.

known as Hailes', and is sold by Messrs. Baker of Holborn. Not only are thick sections objectionable on account of their opacity, but they also offer great resistance to the total expulsion of air from their tubulous mass.

This and other illustrated essays of historical microscopy may also be seen at the author's website, <http://microscopist.net>

Resources

American Monthly Microscopical Journal (1886) Advertisements from Arthur J. Doherty, Vol. 7, page iii

American Monthly Microscopical Journal (1887) Microscopical demonstrations – Mr. Arthur J. Doherty, Vol. 8, pages 134-135

American Monthly Microscopical Journal (1887) Microscopical societies – San Francisco, Cal., Vol. 8, pages 158-159

American Monthly Microscopical Journal (1888) Editorial, Vol. 9, page 77

American Monthly Microscopical Journal (1889) Advertisement from Arthur J. Doherty, Vol. 10, page iii

American Monthly Microscopical Journal (1889) Exchange request from Arthur J. Doherty, Vol. 10, page 168

Australia Entry record for A.J. Doherty (1887) Port of Departure: London, Port of Arrival: Sydney, New South Wales, Voyage Arrival Date: 2 Sept. 1887, Vessel Name: Orizaba

Bracegirdle, B (1998) *Microscopical Mounts and Mounters*, Quekett Microscopical Club, London, Pages

32 and 130, and plate 13, slides L and M

Davis, George Edward (1882) *Practical Microscopy*, second edition, D. Bogue, London, Page 262

Doherty, Arthur J. (1881) White varnish, *Northern Microscopist*, Vol. 1, page 71

Doherty, Arthur J. (1881) Double staining, *Northern Microscopist*, Vol. 1, pages 128-131

Doherty, Arthur J. (1884) *Solorina saccata*, *Journal of Microscopy and Natural Science*, Vol. 3, page 28-31 and plate V

Doherty, Arthur J. (1884) On injecting, *Microscopical News and Northern Microscopist*, Vol. 4, pages 268-275

Doherty, Arthur J. (1887) On making sections of injected lung, *The Microscope*, Vol. 7, pages 101-102

England census, birth, marriage and death records, accessed through ancestry.co.uk

Gill, Steve (2008) The Adye enigma, *Quekett Journal of Microscopy*, Vol. 40, pages 685-694

Hardwicke's Science-Gossip (1881) Exchange offers from Arthur J. Doherty, Vol. 17, pages 95, 96, 120, 144, and 216

Hardwicke's Science-Gossip (1882) Exchange offers from Arthur J. Doherty, Vol. 18, page 240

Hardwicke's Science-Gossip (1883) Exchange offers from Arthur J. Doherty, Vol. 19, pages 24 and 72

Hardwicke's Science-Gossip (1884) Advertisement from Arthur J. Doherty on back cover, Vol. 20, page xxv

Hardwicke's Science-Gossip (1884) Notes on Arthur J. Doherty slides, Vol. 20, pages 89, 90, and 185

Hardwicke's Science-Gossip (1884) Exchange offer from Arthur J. Doherty, Vol. 20, page 192

Hardwicke's Science-Gossip (1885) Exchange offer from Arthur J. Doherty, Vol. 21, page 216

Hardwicke's Science-Gossip (1886) Exchange offer from Arthur J. Doherty, Vol. 22, page 144

Hardwicke's Science-Gossip (1888) Exchange offer from Arthur J. Doherty, Vol. 24, pages 167-168

Hardwicke's Science-Gossip (1889) Exchange offers from Arthur J. Doherty, Vol. 25, pages 71 and 114

Hardwicke's Science-Gossip (1889) "Going out of business" ads from Arthur J. Doherty, Vol. 26

Hardwicke's Science-Gossip (1890) Exchange offers from Arthur J. Doherty, Vol. 26, pages 48 and 168

Hardwicke's Science-Gossip (1891) "Clearance sale" ads from Arthur J. Doherty, Vol. 27

Illustrated Science Monthly (1885) Popular studies in comparative histology, Vol. 1, page 154

Journal of Microscopy and Natural Science (1884) Advertisements on covers of the January and April issues, Vol. 3

The Microscope (1887) Acknowledgements, and notes Vol. 7, pages 83, 216-217 and 250

The Microscope (1889) Exchange requests from Arthur J. Doherty, Vol. 9, pages 128 and 192

Microscopical News and Northern Microscopist (1883) Report of the Manchester Microscopical Society, Vol. 3, page 26

Microscopical News and Northern Microscopist (1883) Exchange offer, Vol. 3, page 28

Microscopical News and Northern Microscopist (1884) Advertisement from Arthur J. Doherty, Vol. 4, inside cover, February issue.

Northern Microscopist (1881) Cleaning diatoms, request from Arthur J. Doherty, Vol. 1, page 47

Northern Microscopist (1881) Report of the Manchester Microscopical Society, Vol. 1, page 120

Northern Microscopist (1881) Exchange offer from A.J. Doherty Vol. 1, page 228

Probate Record (1906) Doherty Arthur John of 100 Lloyd-street Greenheys Manchester commercial-traveller died 3 January 1906 Administration Manchester. 13 February to Sarah Jane Doherty widow Effects £77 18s 3d

Slater's Directory of Manchester and Salford (1886) Doherty Arthur J. (microscopist), 33 Burlington st., Oxford st. C on M, page 174

Slater's Directory of Manchester and Salford (1895) Burlington Street, 63 Doherty Joseph, tailor, and Doherty Arthur John, microscopist, page 64

Slater's Directory of Manchester and Salford (1903) Doherty Arthur John, householder, 63 Burlington st, page 782

Wegener, H.F. (1888) Letter to the Editor, *American Monthly Microscopical Journal*, Vol. 9, pages 158-159

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