THE ESSENTIALS OF ILLUSTRATION

"A Practical Guide to the Reproduction of Drawings & Photographs for the Use of Scientists & Others"

By

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PLATE		
1	An original lithograph by Mr. Harry Becker.	
2	Chromolithograph.	Messrs. Gerrards, Ltd.
3	Collotype.	Messrs. André, Sleigh & Anglo, Ltd.
4-5	Collotype.	Messrs. André, Sleigh & Anglo, Ltd.
6	Half tone.	Swan Electric Engraving Co., Ltd.
7	Half tone.	Messrs. André, Sleigh & Anglo, Ltd.
8	Photogravure.	
9	Collotype.	
10	Half tone.	
11	Half tone.	
12	Half tone three colour.	

PREFACE

MODERN scientific publications, although they may in some or even many cases equal in their scientific quality the memoirs of earlier workers, do not, on the average, reach a high standard as regards illustration. For instance, in Great Britain botany is pre-eminent in its morphological aspects; it should therefore follow that the illustrations, which form so important a part of such papers, should be beyond reproach. This is not always so, a fact which must be patent to anyone with the slightest critical knowledge who looks through a typical journal. This is a fact much to be regretted, since many of the earlier scientists were accomplished draughtsmen and, indeed, often artists; in this connection the Hookers and Professor Daniel Oliver may be mentioned. The implication is not intended that there are no good amateur draughtsmen nowadays; there are, and in some cases possessed of great ability. The beautiful work of Church in his Floral Mechanisms may be cited as an example.

It may, of course, be argued that any picture which serves to illustrate the particular feature is good enough; this is the contention of one who takes an insufficient pride in his work. A feature worthy of an illustration deserves the best the author can produce, more especially as a literary form is still, fortunately, preserved or, at any rate, aimed at.

The reason for indifferent illustrations is primarily due to bad or mediocre drawings, or to their unsuitability for the kind of reproduction in view.

With regard to the first point: this lack of draughtsmanship often obtains; when education entirely replaces mere instruction, it is to be hoped that all students of science will be trained in the rudiments of drawing. Meanwhile the difficulty can be partly overcome, as will be seen later on, by the simple means of drawing on an enlarged scale, in order that in reproduction reduction can be made.

The second reason, the onus of which also falls on the authors, is a lack of knowledge regarding the kind of drawing suitable for the different modes of reproduction; this is a very important point, for "technical conditions govern even genius itself."

Authors, however, are not always to blame; it would appear that even editors sometimes are wanting in the requisite knowledge, for we have known straightforward line drawings reproduced by half-tone; in other cases the paper used is unsuitable for the reproduction and, at other times, the printers are at fault.

With a view to remedying, at any rate in part, these deficiencies, a course of lectures, arranged by the Board of Studies in Botany of the University of London, was delivered in the Lent term of 1913 in the Department of Botany of University College, London.

In gratifying the wish expressed by some that these lectures should be given a more permanent dress, the author feels that some apology is necessary, for he can lay no claim to authoritative knowledge of much of the subject-matter; questions relating to the graphic arts and to illustrations, however, have always been of interest to him, so that he has tried various experiments, often with disastrous results, and thus has gained some experience.

In these matters the author has benefited much through his association with Professor F. W. Oliver, who, characteristically, has been ever ready to discuss these problems with, and to place his knowledge and experience at the disposal of the author.

The outline of the ways and means of illustration contained in the following pages is primarily intended for ordinary working scientists, not for artists, professional draughtsmen or skilled amateurs.

The point of view is mainly botanical, primarily because the present writer is a botanist and also because the requirements of modern botany in the way of illustrations are more extensive than those of any other science; the requirements of other sciences, however, have not been overlooked. With regard to other branches of knowledge, the principles considered will, it is hoped, prove of some value to the workers therein.

The details of technique have been kept as brief as possible; in fact, sufficient only has been said to indicate the main principles involved. In the literature cited, to

which the author is indebted particularly for matters relating to technique, will be found full, and sometimes exhaustive, accounts.

With regard to the illustrations, these have been selected to illustrate the various methods of reproduction described or to demonstrate the points raised. In those instances where the source has not been acknowledged or the draughtsman or photographer mentioned by name, the figure is by the author: and since the actual making of plates and blocks is of considerable importance, the firms, when known, responsible for their making are mentioned in the Table of Illustrations. In this connexion the author desires to express his appreciation of the skill shewn and care taken by Messrs. André, Sleigh and Anglo, Limited, who prepared the majority of the new illustrations which appear in the following pages.

The author is indebted to many who have helped in various ways in the production of his work; particularly is he desirous of expressing his warmest thanks to Miss O. Johnston for the charming drawing of *Geranium columbinum* (Plate 2) and to Mr. Harry Becker for his beautiful lithograph (Plate 1). To Miss S. M. Baker, Dr. W. G. Ridewood, and Miss Winifred Smith thanks are due for the loan of original drawings; also to Mr. Edward Hunter and Mr. Hugh Hunter for information regarding matters of technique and cost.

The number of illustrations would have been less but for the generosity of Messrs. Chapman and Hall, the Editors of the "Annals of Botany," "The Imprint," and the "New Phytologist," Professor F. W. Oliver and Mr. G. N. Oliver in lending blocks. Recognition also must be made of the kindness of Mr. Richard G. Hatton in consenting to the use of certain blocks from his admirable "Craftsman's Handbook," of the Delegates of the Clarendon Press for permission to reproduce figure 14, and of Messrs. Frederick Warne and Co. for permission to make use of the wood engraving by Messrs. Edmund Evans, Ltd., of Kate Greenaway's charming Milkmaid. Finally, the author desires to express his sincerest thanks to Mr. Gerard T. Meynell, of The Westminster Press, for the keen interest he has taken in the work, for his help with the illustrations, and for the great care he has taken in the production of the book.

University College, London, January, 1915.

INTAGLIO PRINTING

IN the biological sciences the massing of illustrations into plates is still the favourite method of illustration, although text-figures have recently become more numerous.

This is partly due to innate conservatism, for most of the earlier memoirs were so illustrated, doubtless because it saved time, since if wood engravings were used with a view to text-figures, the compositor had to wait for the blocks, whereas in the case of plates the compositor and the engraver worked independently. Also the possibilities of plates are enormous; they may be very beautiful indeed besides being biologically satisfactory, for much finer results can be obtained by engraving metal than by engraving wood. Then again there are many different processes available for the making of plates, so that if one proves unsuitable for a subject an excellent reproduction may be obtained by another.

Before passing on it is desirable to point out the essential differences in the three ways of printing.

Intaglio printing. If the finger-tips be examined, many ridges and furrows will be seen on their under surfaces; if now a thick ink be well rubbed into these so as to fill well the furrows, and the superfluous ink be wiped off from the general surface, an impression will be obtained of the furrows on pressing the fingers on to a piece of smooth white paper. Better still, if the copper plate of a visiting card be examined, the name will be found cut into the surface. If an intimate mixture of tallow and lamp-black be well rubbed into these depressions and the excess of ink wiped off the surface of the plate, an impression can be obtained by placing a piece of damp paper on the plate and passing both through the domestic mangle—the kind with rubber-covered rollers. In each case the principle is the same, the pressure forces the paper into the depressions of the plate so that it takes up the ink.

Plane surface printing. This is characteristic of lithography and allied processes. Writing or a design well chalked on a blackboard can be transferred on to a smooth

piece of paper merely by a little vigorous rubbing on the back of the paper placed in position over the drawing. The transfers of childhood provide a further simple illustration, so also does the hectograph (jellygraph).

Relief printing. In this case, the design is raised above the general surface of the substance. A rubber stamp is an obvious example.

It will be noticed that intaglio and relief are the reverse one of the other, whilst plane-surface printing is intermediate between these extremes. In intaglio, the ink is taken from a depression; in relief from an elevation; and in flat printing from a plane surface.

INTAGLIO PLATES. There are several methods of making intaglio plates, but only a few are used in the illustration of scientific papers; attention however may be drawn to the others, not only for their own sake, but also on account of their influence on some modern photo-mechanical processes.

LINE-ENGRAVING. Line engraving, by which is meant cutting lines into copper, steel, or other suitable material with a burin or graver, is a very ancient art. Its employment for illustrative purposes is an outcome of the art of the metal workers—particularly the Florentine goldsmiths of the fifteenth century—who filled up the lines cut in the metal with a black enamel of silver and lead sulphides (niello) which was made by heating together a mixture of these metals with sulphur. This enamel when once in was very hard to remove, so that in order to see how their lines were progressing, the artists rubbed well into the metal, in order to fill up the lines, a sticky ink. The superfluous ink was then wiped off the general surface of the metal and a piece of paper was placed in position and pressed sufficiently hard to make it enter the depressions, which alone contained the pigment, and take up the ink. A print was thus obtained of the work and so its state was ascertained.

Metal engraving is carried out in the same fashion at the present time. A flat plate of copper or steel is well polished and is worked upon with a graver or burin, so that the picture is represented by lines cut into the metal. Any line, however fine, will give an impression on printing, hence it is hardly surprising that engraving has

long been a popular means of expression by artists, since force, depth and delicacy are possible of attainment.

The printing is carried out in exactly the same way as by the early metal workers: the plate is covered with a thick ink which is forced well into the lines and then the superfluous ink is removed. The plate is now ready for printing; to do this, the plate is placed in the bed of a copper-plate press and over it is laid a sheet of damped paper which is covered with two or three layers of blanket. The whole is then passed under the roller which forces the paper into the incised lines, so that not only is the ink picked out, but a mould of them is taken on the paper, hence the very finest lines will give an impression. Having passed through the press the paper is carefully peeled off, and thus the print is obtained.

With regard to the metal employed, copper is commonly used, since it is soft and easy to work; its softness however is, in a sense, a disadvantage, since the plate will soon wear, the finest lines being the first to go, so that a limited edition of good impressions only is possible. To overcome this difficulty, the plate may be faced with steel, by which means it is rendered very durable.

Steel, although once popular, is not much used nowadays owing to its hardness and the rapidity with which it rusts. As compared with copper engravings, steel gives a somewhat harder line, whilst copper gives a soft line, but this, of course, does not mean that steel engravings are harsh; the finest work can be done on steel and of remarkable delicacy.

At the present day line engraving is seldom or never used as a means of illustrating scientific work. It is obvious that the average scientist has not the time and he certainly does not possess the skill to make his own plates; the engraver must translate the originals into lines, so that much consultation would be necessary. Further, a line engraving takes a long time to make, and most publishers would certainly look at the expense.

In the past, however, the line engraving was much used, and very beautiful work was often accomplished. The following works contain outstanding examples.

Bojanus: *Anatome Testudinis Europaeæ*, Vilnae, 1819-1821. The plates are beautiful engravings by Lehmann after the drawings by the author.

Chatin: *Anatomie Comparée des Végétaux*. Good steel engravings illustrating the structure of various plants.

Curtis: *Flora Londinensis*, London, 1777. The illustrations are hand-coloured copper engravings by Sowerby and others, many of which, particularly the earlier ones, are of outstanding excellence. The engraving is often nothing more than the mere outline of the plant, whilst in cases where the structures are more massive, a certain amount of shading is used. The colouring is very good indeed, and it is obvious that much care was taken not only in the actual painting but also in the choice of pigments which, as far as can be judged, are as fresh now as when first used.

Curtis's Botanical Magazine and *Edwards's Botanical Register* contain some excellent examples of hand-coloured copper engravings.

Levaillant: *Histoire Naturelle des Oiseaux d'Afrique*. Paris, 1805-8. This work contains beautifully coloured engravings by Feesard. The original drawings were by Reinold.

Lyonet: *Traite Anatomique de la Chenille*. La Haye, 1762. The plates are amongst the best illustrative of zoological science.

Martius: *Flora Brasiliensis*. The earlier volumes, *e.g.*, Vol. 13, Part I, contain excellent engravings.

Passæus: *Hortus Floridus*. Arnheim, 1614-17.

Sowerby and Smith: *English Botany*. London, 1790-1866. The illustrations are hand-coloured copper engravings.

Thuret et Bornet: *Etudes Phycologiques*. Paris, 1878. This work contains the finest plates ever published in a botanical work. Riocreux drew from the preparations, and his drawings were engraved on steel by Picart, Thomas and others.