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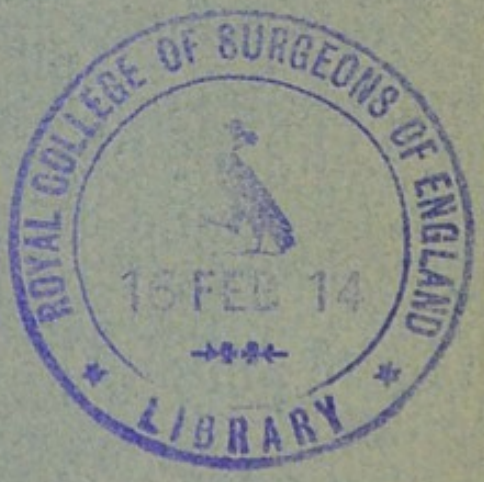

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THE INFLUENCE AND DEVELOPMENT OF SOME OF THE RESEARCHES OF DANIEL HANBURY.*

BY

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The custom which has long prevailed, especially in professional institutions, of initiating a new session by an address to the students is one which has been most worthily maintained in the School of Pharmacy of the Pharmaceutical Society. In responding to the very kind invitation extended to me by the President and Council to deliver the address on this occasion I have been deeply conscious of the responsibility which is thereby assumed, as well as of the honour and privilege which have thus been conferred. In undertaking this pleasant duty it was primarily my desire to render to the Society any service of which I might be deemed capable, while at the same time the hope was entertained that it might be possible to bring some message of interest to those who are now either entering upon, or engaged in, a course of professional study in this School.

A consideration of the many able discourses which have been delivered here on similar occasions in preceding years has somewhat accentuated the difficulty of deciding upon a subject for my address to-day. It has, however, occurred to me that it would be both profitable and of interest at this time to consider some of the achievements of one whose name is inseparably associated with, and adorns, the annals

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* Inaugural Sessional Address delivered before the Pharmaceutical Society of Great Britain at the opening of the School of Pharmacy, October 1, 1913, and reprinted from *The Pharmaceutical Journal and Pharmacist*, October 4, 1913.

of this Society, and whose memory will always be revered wherever pharmacy is known. I have, therefore, chosen as my theme "The Influence and Development of Some of the Researches of Daniel Hanbury."

Before proceeding to the principal part of my subject I would like to make a slight digression in order to recall some incidents that are not entirely disconnected from it, and which are now somewhat vividly brought to my mind.

It was not my privilege ever to have met Daniel Hanbury, but so long ago as the time when I was a student of pharmacy I became familiar with his name and writings, and ever since that time I have felt that I knew him. The first time that his name was brought prominently to my notice was in the course of lectures in materia medica given at the Philadelphia College of Pharmacy during the session of 1873-1874 by my honoured teacher, the late Professor John M. Maisch. It was the custom of Professor Maisch not to restrict his teaching to the statements of the text-books, but, with characteristic thoroughness, he brought to his students the latest results of scientific investigation in the special field of study to which he was devoted. At about the time referred to it had been shown by Mr. Hanbury, in a most interesting paper (*Pharm. J.*, 1873, 33, 81, 102), that the true Pareira Brava, or the root to which the reputation of the drug as a medicinal agent is due, was not derived from *Cissampelos Pareira*, Linné, as stated in the Pharmacopœias and text-books of that period, and as had, indeed, been assumed for over a century, but that the plant yielding it was *Chondodendron tomentosum*, Ruiz and Pavon. It was, furthermore, shown that the so-called Pareira Brava which then occurred in commerce was for the most part of unknown botanical origin and of doubtful medicinal value. Thus the name of Daniel Hanbury first became familiar to me, and although many things have passed from mind during the somewhat long interval of years, the source and characters of at least one South American drug had become firmly fixed in my memory.

It was also at about the time indicated—namely, in 1874—that the classical work 'Pharmacographia' appeared, the result of the joint labours of Mr. Hanbury and his friend, Professor Flückiger. The influence which this work was destined to exert in so many directions Mr. Hanbury was, unfortunately, not permitted to see, for he passed away in the early part of the following year.

The interest which had been awakened in the subject of the chemistry and natural history of drugs through the publication of 'Pharmacographia' was not confined to the British Isles, but extended across the Atlantic, and even to more remote parts of the world. So far as I can remember, it was largely due to the impression this work had produced that I was led shortly thereafter, in 1876, to seek instruction from one of its authors at the University of Strassburg. Although

my studies were by no means restricted to the subjects which Professor Flückiger taught—namely, pharmacognosy and pharmaceutical chemistry, it was my happy privilege to have been for four years in close association with him, and during that time I was the recipient of his unceasing kindness. A friendship was, indeed, formed which was only terminated by his lamented death in 1894.

On my first visit to the home of Professor Flückiger, in Strassburg, my attention was specially attracted to a fine portrait which adorned the walls of his study. It was that of his friend and co-worker, Daniel Hanbury, of whom he frequently spoke in terms of deepest affection, and whose loss to himself and the world he never ceased to mourn.

Among the gifts received during my student days from Professor Flückiger there was one that I particularly prized. It was a copy of the then recently-issued 'Science Papers,' with a presentation inscription in my teacher's own writing, and this valued memento I hold in my hand to-day.

The researches of Hanbury did not include a great deal pertaining to the chemistry of drugs, for his early training and inclinations did not lead him in that direction. On the other hand, historical and botanical studies appear to have had a special attraction for him, particularly in their bearing on the history and source of drugs, and it is evident, from a perusal of his writings, that he was also deeply interested in many other subjects, such as records of travel and exploration, as well as classical literature. The motto he is said to have adopted from the French chemist Fourcroy (1755-1809), *Il faut que chacun ne fasse que ce qu'il sait faire*, which may be rendered into English by the precept that "one should only do that which he knows how to do," indicates that he recognised the limitations of effort which individual endowments or circumstances impose, notwithstanding his own varied gifts and the capability of doing many things well.

In indicating my purpose to consider the development of some of the researches of Daniel Hanbury, it might easily be presumed that I had completely disregarded the motto which has just been quoted, inasmuch as it would be quite beyond my capacity to discuss in any critical sense the various historical and botanical investigations to which Mr. Hanbury had devoted the greater part of his life. It may, therefore, be explained that I shall only undertake to touch somewhat lightly upon a few selected topics of either general or chemical interest which have been suggested by his researches, but which may, nevertheless, serve to illustrate their nature and development. The most striking characteristics of Mr. Hanbury are said to have been thoroughness and accuracy, and it was these qualities which have given to his writings a permanent value. In this connection it may not be amiss to emphasise the importance of accurate know-

ledge respecting the botanical source or identity of plants and plant products which are intended to be used for chemical investigation, as otherwise much uncertainty or confusion is likely to occur. Fortunately, there still remains a connecting link between the days of Hanbury and the present generation which enables such information to be secured, for no one can be considered to possess a more exact and comprehensive knowledge of drugs than the accomplished Curator of the Museum of the Pharmaceutical Society. His recent contribution to the history and source of myrrh (*P.J.*, 1913, **91**, 116) has further elucidated a subject which forty years ago had likewise engaged the attention of Hanbury (compare 'Science Papers,' p. 378), and in the communications of the earlier and the later investigator one may observe the same careful consideration of facts and precision of statement.

The first communication made by Daniel Hanbury to the Pharmaceutical Society was in 1850, and was entitled, "On Turnsole" (*Pharm. J.*, 1850, 9, 308). Although a short paper, on account of its orderly arrangement and clearness of diction it might still serve as a model for scientific writers.

It is quite probable that the word turnsole (Fr. *Tournesol*) is not very familiar to either the pharmacists or chemists of the present day. In the course of time it has, in fact, been applied to several plants or products, and considerable confusion has thus been produced. In accordance with its etymology the name has been given to the heliotrope, and also to *Euphorbia helioscopia*, Linné, with reference either to the supposed turning of the flower toward the sun or the flowering of the plants at the summer solstice.

The word turnsole has, however, been more particularly employed to designate a product obtained from the small euphorbiaceous plant, *Crozophora tinctoria*, A. Juss[1]. (*Croton tinctorium*, Linné), which is indigenous to Southern Europe and the Orient. The expressed juice of the plant is said to be at first of a dark green colour, but speedily to assume a purple hue on exposure to the air. Coarse hempen cloths were soaked in this juice, then dried, and exposed to the vapour of ammonia, after which treatment, and under the name of turnsole rags, they were shipped to Holland. When steeped in water, which extracts all the colour, the rags yield a bright purple solution, and this is said to be reddened on the addition of an acid or an alkali. It was the special object of Mr. Hanbury's inquiry to ascertain the uses to which these rags were put by the Dutch, and, although quoting one author as asserting that the use of turnsole is confined to colouring the exterior of cheese, he concludes his paper by stating that "we are still in want of more precise information." It may, therefore, now be noted that some further information on the subject has in the meantime been re-

1 Hanbury attributes the botanical name of the plant to Endlicher.

corded, which serves to confirm the statement regarding the use of turnsole (*Kew Bulletin*, 1899, p. 88). According to this more recent account,[2] the stems and leaves of the plant are placed in small heaps, whereby they undergo fermentation with the production of a red colouring matter. The material thus prepared is then sent to Holland, where it is used for wrapping cheese, the exterior of the latter thereby acquiring the familiar red colour of the Dutch product.

It appears, furthermore, from the paper by Mr. Hanbury that turnsole was supposed by some of the older writers to form the colouring matter of litmus, which is now known to be obtained from various lichens, and Dr. Ure is quoted as stating that the name was applied to litmus in order to conceal the true origin of the latter substance. In view of the source and characters of turnsole, it has been somewhat surprising to find that in one of the largely used commentaries ('U.S. Dispensatory,' eighteenth edition, p. 1,711) it is still only mentioned as a synonym for litmus, and in a similar work of reference ('National Standard Dispensatory,' p. 892) the word *tournesol* is given as the French equivalent for the latter substance. The last-mentioned work has, however, also recorded (p. 612) that *Crozophora tinctoria* "yields an indigo, and is a fatal poison" (compare *Kew Bulletin*, 1889, p. 279, and 1896, p. 233). Notwithstanding a somewhat extended search through the literature, I have been unable to find any further information concerning the constituents of this plant than has here been noted. It would thus appear to merit a chemical examination, both with respect to the nature of the colouring matter and its asserted toxic properties, the latter, however, being not uncommon among plants of the family to which it belongs.

Shortly after the communication on turnsole, Mr. Hanbury published a paper "On the Resin of the Norway Spruce Fir" (*Pharm. J.*, 1850, **9**, 400), in which he described the characters of the true so-called Burgundy pitch and the various fictitious preparations which were frequently sold under that name. After an interval of seventeen years, this resin was again the subject of investigation by him (*Pharm. J.*, 1867, 27, 162), and it was then shown to be obtained from *Abies excelsa*, DC., the countries of its production having been definitely ascertained. It was likewise pointed out that the appellation "Burgundy," as applied to this resin, is a misnomer, inasmuch as it was not produced in France, or, at least, not in modern times.

It has been noted by the editor of 'Science Papers,' Mr. Joseph Ince (*loc. cit.*, p. 11), that among the separate investigations of Mr. Hanbury, general opinion would attribute the warmest praise to a communication "On Otto of Rose" which was read before the Pharmaceutical Society in 1859

[2] My thanks are due to Mr. E. M. Holmes, F.L.S., for having kindly brought this account to my notice.

(*Pharm. J.*, 1859, **18**, 400), although Mr. Hanbury himself was supposed to have attached most importance to his essays on Calabrian manna (*Pharm. J.*, 1869, **29**, 326; 1872, **32**, 421) and Pareira Brava (*loc. cit.*). The last-mentioned drug, to which I have already briefly referred, has in recent years been the subject of several extended investigations with repect to its alkaloidal constituents (*Arch. Pharm.*, 1898, **236**, 530; 1899, **237**, 199; 1906, **244**, 555; 1911, **249**, 408; 1912, **250**, 684).

The subject of otto of rose was discussed by Mr. Hanbury under the three main divisions of production, adulteration, and chemical characters. The chemical examination was restricted to determinations of the liquefying point of the otto and of the percentage of stearoptene in samples produced in England, France, and Turkey, but it should be remembered that at that early period comparatively little was known of the constituents of essential oils or of the methods which are now employed for their investigation. They were then considered to be quite simple products, consisting of liquid and solid portions, which, in accordance with a suggestion of Berzelius in 1837, were designated respectively as *elaeoptene* and *stearoptene*, and the latter term is still in frequent use.

In no branch of chemistry has the advance in knowledge during recent years been more marked than in that pertaining to the constituents of the large group of natural products known as the essential or volatile oils. This was amply demonstrated in the interesting course of special lectures delivered before the Society last year, but for the present purpose it may be exemplified by the otto of rose, which is now known to be of very complex composition. The substances which up to the present time have been identified as constituents of this fragrant oil are as follows: Geraniol, *l*-linalool, *l*-citronellol, nerol, phenylethyl alcohol, citral, *n*-nonylic aldehyde, eugenol, and an aliphatic sesquiterpene alcohol, $C_{15}H_{26}O$, which apparently is identical with farnesol (*Ber.*, 1904, **37**, 1904; 1913, **46**, 1732). The alcohol, farnesol, so named from the fact that it was obtained from the cassie flowers (*Acacia Farnesiana*, Willd.), is now known to be widely distributed in nature, occurring apparently in the largest proportion in ambrette seed (*Hibiscus Abelmoschus*, Linné), and also in relatively smaller amounts in the flowers of the common or false acacia (*Robinia pseudacacia*, Linné), the linden (*Tilia europæa*, Linné), lilac (*Syringa vulgaris*, Linné), mignonette (*Reseda odorata*, Linné), and lily-of-the-valley (*Convallaria majalis*, Linné). The sweet fragrance of many flowers, including those mentioned, appears, in fact, to be due to a considerable extent to the alcohol farnesol. The predominating constituent of otto of rose is the alcohol geraniol, but it is by no means the most important one, since both the citronellol and nerol, and esters of the respective alcohols, as well as some of the other com-

pounds mentioned, contribute largely to its fragrance. The phenylethyl alcohol, which possesses a mild odour, appears to be contained in rose oil, as well as in the oil of orange flowers (neroli), not only as such, but also in the form of esters of benzoic and phenylacetic acids (Gildemeister and Hoffmann, 'Die aetherischen Oele,' 2nd edit., Bd. I., p. 388). The interesting observation has also been made that although this alcohol is contained in exceedingly small amount in the otto of rose, it represents quantitatively the chief volatile constituent of the rose petals. On account of being quite freely soluble in water it remains for the most part in the aqueous portion of the distillate from which the otto of rose has been separated (*Ber.*, 1900, **33**, 1720, 1903; 1901, **34**, 2803).

The so-called stearoptene of otto of rose, as already mentioned, was the subject of some experiments by Hanbury, and it may incidentally be noted that it also attracted the attention of Flückiger, who was the first to show that it belonged to the paraffin series of hydrocarbons (*Pharm. J.*, 1868, **28**, 147). While serving as his assistant (1879-1880), a particularly nice specimen of this substance was given to me by him for the purpose of analysis and the determination of its vapour density, the results of which indicated it to possess the formula $C_{16}H_{34}$ (Flückiger, 'Pharmakognosie,' 3rd edit., p. 170). It has, however, since been found by Schimmel and Co. ('Semi-annual Report,' October, 1890, p. 54) that even the stearoptene of rose oil is not a simple substance, but consists of a mixture of apparently homologous hydrocarbons, the composition of which has not as yet been determined.

The only other investigation by Mr. Hanbury pertaining to an essential oil was one concerning the source of the so-called oil of origanum of English commerce (*Pharm. J.*, 1850, **10**, 6; 1851, **10**, 324). It was then shown that this was really the oil of thyme, imported from the south of France, and that the true oil of origanum, as distilled by himself from *Origanum vulgare*, Linné, was quite different in character.

It has been of interest to observe, by a perusal of 'Science Papers,' that several natural products which received the consideration of Mr. Hanbury, either with respect to their origin, characters, or uses, have within the past few years been the subjects of somewhat extended chemical research in this country, and some further contribution has thus been made to our knowledge of them. Among such investigations there may be mentioned those pertaining to chaulmoogra oil and allied products (*J. Chem. Soc.*, 1904, **85**, 838, 851; 1905, **87**, 349, 884, 896; 1907, **91**, 557), the constituents of olive leaves (*Ibid.*, 1908, **93**, 891), jalap and scammony (*J. Amer. Chem. Soc.*, 1910, **32**, 80; *J. Chem. Soc.*, 1912, **101**, 1 and 398), and the ordeal bean of Calabar, from *Physostigma venenosum*, Balf. (*J. Chem. Soc.*, 1911, **99**, 2,148).

Another subject which had attracted the attention of Mr. Hanbury would appear to merit at least a brief notice at this

time on account of the very considerable degree of interest that has recently been revived concerning it. This is the so-called *Lignum nephriticum*, a Mexican wood, which has long been the subject of inquiry respecting its botanical origin. It appears from 'Science Papers' (pp. 173, 184) that the 'Admiralty Manual of Scientific Inquiry' in 1859, and again in 1871, contained requests for information concerning a number of natural products which were used either medicinally or in the arts. These botanical and pharmacological inquiries, which were formulated at the first-mentioned date by Sir W. J. Hooker and Mr. Hanbury, and subsequently by Professor Oliver and Mr. Hanbury, included a question concerning the tree which yields *Lignum nephriticum*, a specimen of the wood so designated having been sent from Mexico to the Paris Exhibition of 1855. Quite recently a very interesting monograph has been published by Mr. H. J. Möller, of Copenhagen[3] (*Ber. d. deutsch. pharm. Ges.*, 1912, **23**, 88-154), in which he has recorded the results of an extended research concerning the history and botanical source of the wood in question. The wood is particularly characterised by the deep blue fluorescence which it imparts to water containing a trace of alkali, and it has been stated that the first observation of the phenomenon of fluorescence was with this material. It was described in 1663 by Robert Boyle in his treatise on 'The Experimental History of Colours,' and an aqueous infusion of the wood was used by him as an indicator for acids. Isaac Newton mentions "the tincture of *Lignum nephriticum*" in his work on 'Opticks,' published in London, in 1704, and the poet Goethe, in his 'Theory of Colour' ('*Zur Farbenlehre*'), published in 1810, likewise mentions "das nephritische Holz," with a regret that the true *Lignum nephriticum* could no longer be obtained.

With regard to the botanical source of the wood referred to, Mr. Möller has been led to conclude from his investigations that it represents the heart-wood of several species of *Pterocarpus*, these differing according to the country from which it is obtained. Thus the wood from Mexico is referred to *Pterocarpus Amphymenium*, DC., and probably also *P. orbiculatus*, DC., while that from the Philippines is derived, according to the determinations of E. D. Merrill, from *P. Indicus*, Willd., *P. echinatus*, Pers., and *P. blancoi*, Merrill. It is, furthermore, considered probable that the plant yielding the *Lignum nephriticum nigrum* of Brazil is *P. violaceus*, Vogel.

In a recent brief communication on the subject by Mr E. M. Holmes (*Pharm. J.*, 1913, **90**, 898), he notes that in 1909 Dr. O. Stapf, of the Royal Botanic Gardens, Kew, had referred the Mexican *Lignum nephriticum* to *Eysenhardtia*

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[3] This publication has been issued in separate form by Gebrüder Borntraeger, Berlin, 1913.

amorphoides, H. B. and K. (*Kew Bulletin*, 1909, pp. 293-305).[4] It was stated by Dr. Stapf (*loc. cit.*, p. 294) that "there were two timber specimens of *Eysenhardtia* in the Kew Museum, and one of them, obtained from the Paris International Exhibition of 1900, was marked 'Cuatl.' This, when infused with water, gave the peculiar reaction of *Lignum nephriticum* in an unmistakable way. A comparison of Hernandez' description with herbarium specimens and with technical descriptions of *Eysenhardtia amorphoides* made it clear that this was actually the source of the old *Lignum nephriticum*."

Mr. Möller (*loc. cit.*, pp. 43, 56), although apparently not having seen Dr. Stapf's paper, had, however, also considered *Eysenhardtia*, and mentions having examined a specimen of the wood received from Professor C. A. Purpus through the Danish Consulate in Mexico. He remarks concerning it that "the wood is white, bears no resemblance to *Lignum nephriticum*, and its aqueous infusion does not show the blue fluorescence." In view of these conflicting statements, the subject would still seem to require some further elucidation.

Although the wood under consideration was recognised by many of the Pharmacopœias of the seventeenth and eighteenth centuries, including the 'Pharmacopœia Londinensis' of 1695, it appears to have long since fallen into disuse as a medicinal agent. The fluorescent constituent of the wood has been assumed to be a glucoside, but its chemical composition and characters appear never to have been determined, and such an investigation would doubtless be of considerable interest.

Any survey of the work of Daniel Hanbury, however limited in its scope, should include at least a passing reference to his contributions to Chinese Materia Medica (compare 'Science Papers,' pp. 209-275). These researches, which were conducted fifty years ago, naturally involved very great difficulties, both on account of the language and the limited facilities at that time for securing accurate information. Although regarded by their author only as descriptive notes, which were necessarily somewhat incomplete, they nevertheless contain much of interest, and are of permanent value. With consideration of the recent developments in China, and the establishment of a fully-equipped British University at Hong Kong, it may be anticipated that the natural resources of that vast country will soon be rendered more accessible for scientific study.

In view of the immense fund of knowledge which has been accumulated through the centuries, as witnessed in the great libraries and museums of London alone, it may sometimes seem as if but little could be added to that which is already known, but, notwithstanding all the recorded facts and

[4] Through the kindness of Mr. Holmes I have had the opportunity of perusing this very interesting publication.

observations and the wonderful progress that has been made in recent years in every department of learning, the boundaries of science are constantly becoming enlarged, and, with the broader view which is thus obtained, the greater is the scope for intellectual effort and achievement. I would therefore like to assure the students who will soon be entering upon their careers that the field of research is still practically unlimited. If we consider, for example, only those branches of knowledge with which we are more particularly concerned, there is much immediately before us and readily available which requires further investigation. Moreover, the vast continents of Africa and Asia and the forests of South America, as well as the islands of the sea, doubtless contain among their natural resources many thousands of plants which have never yet been touched by human hand, and a still larger number which have not as yet been named or classified. This wealth of material which nature has provided will be sufficient to engage the attention of both the botanist and the chemist for a period of time so remotely distant that it cannot be forecast. There can, furthermore, be nc doubt that the chemical study of the countless number of plants or plant products whose constituents are as yet completely unknown will not only reveal much of scientific interest, but also principles of medicinal value which may be capable of alleviating some of the ills of mankind.

It will thus be seen that there is a large and fruitful field of research which still awaits development. Those who enter upon the exploration of this field will surely meet with ample reward, but at the close of their labours they will doubtless also experience in some measure the feeling of Sir Isaac Newton, who said: "I do not know what I may appear to the world, but to myself I seem to have been only like a boy playing on the seashore, and diverting myself by now and then finding a prettier shell than ordinary, whilst the great ocean of truth lay all undiscovered before me."

One is tempted to dwell longer on the investigations of Hanbury, or the topics of interest which are suggested by them, but time forbids. Although the account which I have been able to present of his achievements is necessarily brief, and therefore very incomplete, it may, nevertheless, serve to illustrate the earnestness and diligence with which he pursued the search for truth. At the same time, the hope may be expressed that the principles by which he was guided may be emulated by students in this School of Pharmacy for many generations yet to come. It should especially be remembered by those who are now enjoying the exceptional facilities for the acquisition of knowledge which this school affords, that success in scientific pursuits, as in all other vocations in life, can only be attained by unremitting toil. Neither great wealth nor abundant leisure can alone secure that development of the mind upon which all true success depends. It may indeed be said that the path which must be trod by

those who aspire to the highest achievements is usually a rugged one, and it has been well depicted in the lines by Longfellow :—

> The heights by great men reached and kept,
> Were not attained by sudden flight,
> But they, while their companions slept,
> Were toiling upward in the night.

Such a man I believe to have been Daniel Hanbury, for only by a life of constant toil could he have gained the eminence and distinction which have been accorded him in the world of science, and to which both this Society and British pharmacy may refer with pride. It will always be for me a happy recollection to have had the privilege to-day, and in this historic hall, of rendering a slight tribute to his memory.

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