OBSERVATIONS ON THE "RICE PAPER TREE" *(TETRAPANAX PAPYRIFERUM)* NOW NATURALISED IN SYDNEY, N. S. WALES,

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The tree which produces the pith which is manufactured into that delicate material known as "Rice Paper," belongs to the *Araliaceæ*, or ivy worts, and is the *Tetrapanax papyriferum*, or *Aralia papyrifera*, of botanists. It is a native of the island of Formosa, and was supposed to be procured only from the northern part of the island, but it has recently been ascertained that it is found wild, and is also cultivated abundantly in different parts of the island, where it grows on the hills. In N. S. Wales it thrives luxuriantly on low land, and attains a greater and more rapid growth when planted in good soil. It was found that when a tree cultivated in the Botanic Garden at Sydney, had been planted in poor soil, the trunk was of small diameter, and a greater length of time was required to develope the pith to a size sufficient for use; whilst a tree planted in the garden of Mr. Wildman, at Paddington, near Sydney, in a clay and loam soil well manured, in one year and ten months had attained the elevation of two feet ten inches, from the base of the main trunk to the crown of foliage, the whole of which would, to all appearance, be available for pith, the circumference of the trunk of the tree was equally the same in every part of the stem, and measured seven and a half inches. The tree had just produced (May 26th, 1865) twelve fine flowery spikes for the first time, but the blossoms were not yet expanded. The cellular tissue or pith in the main stem, is the portion of the tree used in the preparation of the exquisitely beautiful substance named "Rice Paper," so well known in Europe as an excellent material for drawings of specimens of natural history, more particularly butterflies and other insects.

For many years the popular opinion that prevailed respecting this peculiar substance was that it was manufactured from Rice, hence it became known as "Rice Paper;" but when it was submitted to microscopic examination, the question was decided against the commonly received opinion by the delicate medullary portion of a Dicotyledonous stem being displayed. The Rice Paper Tree is named Tong-Shue by the Chinese, and is extensively cultivated on the island of Formosa in large plantations, and is propagated principally, if not entirely, from suckers, which every year—as we find in the trees growing in Sydney—are thrown up in great numbers.

The names of the places where this plant is chiefly cultivated

on the island of Formosa are Ke-lung-Shan, and the three districts named Fung, Shan, Kea-e, and Chang-Kwa, all within two hundred miles of the chief-prefecture city, Tai-wanfoo, the capital of the island; the furthest being Ke-lung-Shan. It is also stated that it forms "a main source of revenue to the population engaged in its cultivation, and the inhabitants depend chiefly upon it for their maintenance." According to the Chinese account of this plant it is of a delicate nature, "suffering from a cold or damp air, and withering in a bleak wind, a warm mild temperature appears to be a chief condition of its thriving;" whereas in Sydney it is always observed to be very hardy, enduring in full luxuriance of foliage the intense heats and hot winds of the summer season, and the bleak cold winds and sharp frosts of the winter, even when exotic trees have suffered severely, and some of them had even been destroyed.

In forming a plantation of these trees it will be necessary to remove the suckers from the parent stem when they are a few inches high, and place them in pots; when they have attained about a foot in height they ought to be removed to the land prepared for them, and planted in rows about five feet apart. Respecting the method adopted by the Chinese for removing the pith and manufacturing it into "Rice Paper," I extract an account sent by Mr. Sinclair to Sir William Hooker:—"When the plants have attained their full growth, which is said to be in the tenth month, they are cut down, the twigs and leaves removed, and the stems left to soak for some days in running water, to loosen the bark and wood, and facilitate the removal of the pith. This last, after being cleaned and made into a cylindrical shape, is cut into convenient lengths, and is now ready for the hand of the paper-cutter, who performs his part as follows: Taking a sharp broad-bladed knife, he makes a slight longitudinal incision in the cylinder of the pith, which is then turned round gently and regularly on the edge of the knife, until the whole available material is planed off in thin slices. Much care and dexterity are required to produce sheets of even thickness; if the operation is performed too hastily, and the motion of the hand not properly regulated, the sheets will not take the required curl, and will come off in wrinkled masses. If, on the other hand, the paring is done too slowly, the paper is liable to come out of uneven thickness. This is the blunder which the Fuh-chow artisans are too apt to commit, as they are far behind the Formosa cutters, whose skill is truly admirable; one or two workmen at Amoy have, however, done wonders in this line, and deserve considerable praise." The sheets as they are cut are placed one upon the other, and

pressed for some time, and then cut into squares of the required size. The small sheets of this material are dyed of various colors, and sold at a very cheap rate, and are extensively used in the manufacture of artificial flowers; the larger sheets are sold at a much higher price, in proportion, from the greater difficulty attending their preparation.

As far as I have yet been able to ascertain in plants grown at Sydney, it would be useless to cut them down after ten months' growth for the purpose ef procuring the pith, as that portion of the plant is not sufficiently formed in that space of time; but I have found that, by careful cultivation, in about twenty months, when the tree has commenced flowering for the first time, the pith is sufficiently formed for all the purposes for which it is required. This I ascertained by cutting down some plants grown in the Botanic Gardens at Sydney, by permission of my friend, Mr. Charles Moore, the Director of that establishment, and the result was that I was able to exhibit at one of the meetings of the Acclimatisation Society specimens of the pith of plants grown in Sydney, measuring one inch and a quarter in diameter, and which in comparison with specimens of pith brought from China was considered fully equal to it both in size and quality.

The spare shavings and cuttings which remain after the preparation of Rice Paper are used for stuffing mattrasses and pillows, and it is also used by the Chinese as a medicinal remedy; the properties of the Ivy worts, to which family this tree belongs, are generally described as being aromatic, tonic, and stimulant. The famous Chinese medicine, the Ginseng *(Panax quinquefolium)*, belongs to this family; to it the Chinese physicians ascribe such extraordinary virtues, for they allege "that it nourishes and strengthens the body, stops vomitings, clears the judgment, removes hypochondriasis, and all other nervous affections, in a word gives a vigorous tone to the human constitution even in old age."

The first engraving of the Rice Paper Tree was published in my *Wanderings in New South Wales, Singapore and China*, (vol. 2 p. 77), in the year 1834. The engraving was made from a large colored drawing, executed by a Chinese artist, and was procured for me by the exertions of the late Mr. Beale, of Macao, who interested himself in my enquires respecting the tree producing the material known as "Rice Paper," but at that time all my efforts to procure specimens of the plant or tree producing it failed. The Chinese name for the tree, Tong-shue, has since been found to be correct with a slight difference in the orthography, being Tong-tsau, signifying "hollow plant." Specimens of the pith in the unprepared and prepared state and the drawings were all that I could pro-

cure respecting it during my visit to China. When living plants were procured by Sir John Bowring, in 1852, the Chinese drawing was found to be an accurate representation of the plant. On submitting, on my arrival in England in 1834, the drawing of the tree to Mr. David Don and Mr. A. B. Lambert, they both considered that if it was an accurate drawing of the tree from the pith of which the Rice Paper was prepared, it would probably prove to be a species of Aralia, and their conjecture has since proved correct.

About the termination of the month of May and in June, the early winter months in N.S. Wales—the Botanic and other gardens in the vicinity of Sydney are enlivened and adorned by the beauty of these trees, exciting the attention at that season of the year, not only for their luxuriant and wide-spreading canopy of broad dark green foliage, but from the beautiful head of large leaves being surmounted with from eight to twelve panicles of blossoms, three to four feet in length, crowning the tree in fine style, the magnificent drooping wand-like plumes waving over the dark green palmated leaves; the panicles of blossoms when closely examined consist of numerous small flowers of a pale yellowish white color, but which, when seen in certain directions, appear of a greenish, or greenish yellow hue, probably arising from reflected light, either from their own foliage, or from that of the trees growing in their vicinity. Although the flowers when examined in single clusters were very inconspicuous, yet when clustered on their white flowering stems they have a beautiful appearance, agreeably contrasted by the dark green palmated foliage, the latter being so widely extended, that when the tree had attained the elevation of eight feet, it was capable of affording an agreeable shade to persons standing under the leafy canopy. Although the tree when in bloom does not attract from brilliancy of color, yet it will always be admired for its fresh, elegant, and agreeable appearance.

The first Rice Paper Tree introduced into N. South Wales was sent to Sydney by Mr. Veitch, of the Royal Exotic Nursery at Chelsea, London, to Mr. Charles Moore, the Director of the Botanical Gardens, and by whom, shortly after its arrival in November, 1857, it was planted out in the open air in the Gardens. It soon grew very rapidiy, and commenced early to develop a number of suckers. On the 26th of April, 1858, the plant had attained the height of three feet eight inches, and still continued to throw up suckers in such numbers, that it was quite clear that there would be no difficulty in propogating so prolific a plant in the colony; and this has since been proved to be correct, as from this specimen the whole of the numerous Rice Paper Trees now growing luxuriantly in

the colony of N. S. Wales have originated. This tree attained the elevation of six feet, with a circumference of foliage of twenty-six feet, and about the year 1859, it first bore flowers, and died soon after. From the habits of the tree at that time not having been coreectly known, it was considered that the tree died soon after flowering, leaving a numerous progeny of suckers, by which it could be propagated to a great extent, but on subsequent experience with other trees, it was found the death of this plant, immediately after flowering, was an accidental circumstance, as they regularly flower every year. I have already described the foliage as very fine, one of the leaves measured as follows :—

	feet	inches.
Length of stem	2	10
Diameter of stem	0	1
Breadth of leaf from across the third section	3	0
Greatest length	2	0
Thickness of leaf	0	0 $\frac{1}{4}$
Greatest length to the dichotomal division	0	9 $\frac{1}{2}$

The under surface of the leaf is white and downy, the upper green, the ribs of each digitation strong, the middle one the strongest. The branching mid-ribs of the leaf are very prominent, and the lamina is detached from them, like the swimming webb from the phalanges of water-fowl.

I will now proceed to give the measurement of four trees growing in the Botanic Gardens at Sydney in April, 1862. The first tree had the main trunk, six feet high, which then divided into two branches, from each of which during the flowering season there issued six spikes of blossoms. The total height of the tree was ten feet, with a circumference of foliage of twenty-four feet, and any person could stand upright under the broad and long leaves of this tree perfectly sheltered from the sun's rays. This tree was then four years old, and bears flowers regularly every year. The circumference of the trunk at the centre was eight inches. The second tree had the trunk six feet high clear of foliage, and a circumference of eight and a half inches, it then divided into two branches, the total height was eight feet, with a circumference of foliage of twenty feet. The third tree had the trunk four and a half feet high, and then like the others divided into two branches, the circumference of the trunk was ten inches, and the total height of the tree was eight and a half feet, with a circumference of foliage of twenty-two feet. The fourth tree was very irregular in growth, the main trunk clear of foliage was four feet nine inches high, with a circum-

ference of nine inches, and then divided into two branches, the total height of the tree was seven feet, with a circumference of foliage of eighteen feet. The usual length of the leaves when full-grown, including the long foot-stalk, was four feet ten inches to five feet; the base of the long foot-stalk of each leaf clasp the trunk, in a similar manner to the fronds of the palm, and on being detached when dead, leave a mark on the trunk. The trees when young grow straight, and have a handsome and highly ornamental appearance, and are of very rapid growth, but after six or seven years, judging from the trees in Sydney, they for the most part lose their beauty, and throw off straggling branches, by which the tree is deprived of its elegant, graceful, and shady foliage, which forms so luxuriant a crown of leaves in the young trees; every year after flowering new branches are formed, and the foliage diminishing in size is the cause of the beauty of the tree being lost, but as the tree is very prolific in suckers, and is of very quick growth,—being a handsome shrub in less than twelve months,—after a few years when they cease to be ornamental, I should recommend the old trees to be removed and give place to young plants. The Rice Paper Tree flowers once every year, about the end of the months of May and in June, and at that season imparts great beauty to the gardens, attracting a number of bees and other insects, no doubt for the nectar secreted by the flowers. As the tree increases in size, it loses all its value for the pith as an article of commerce, and can then only be regarded as an ornamental tree for the garden or shrubbery for a few years. In the young bifurcated branches, the pith was also found to be well formed, and some prepared measured one inch in diameter. The bark of the tree is rough, and the wood, which is of a white color, is close grained, hard, heavy, and apparently durable, there is a mucilaginous substance secreted between the bark and the wood, which emits a strong smell resembling that of hemlock It has been remarked that after the suckers are removed from the parent tree, not potted, but at once planted into the ground, they will not again bear transplanting, those removed under these circumstances having perished.

The stem near the junction of the foot-stalk, as also the foot-stalk of the leaves, is densely covered with a kind of down of a rich brown color, and which is readily removed on the slightest touch; the young foliage just beginning to expand is also abundantly covered with this material. This down when placed under the microscope at 200 diameters exhibits a a stellate form with rays of unequal length.

The pith produced in this colony may be usefully applied to the manufacture of solar hats, now so much worn during the

sultry summer months, and would form a new article of economic value for the colony.

In making this communication to the Society, I am desirous of popularising scientific knowledge, and making it bear as much as possible on the every-day pursuits of life.