773. GINKGO BILOBA

Connections with people and art across a thousand years

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Summary. We review the representation of *Ginkgo biloba* L., a quintessentially Chinese plant, in the art of those Western botanists who first encountered it in China and Japan. We also show how several later representations of *Ginkgo*, in both the West and the East, were inspired and made possible by specimens of *Ginkgo* in cultivation.

In a rapidly changing world, a thousand years seems a vast span of time. Yet *Ginkgo biloba* L. has seen thousands of millennia come and go. In the past, *Ginkgo* and its fossil cousins were widespread: fossil *Ginkgo* leaves are known from every continent. Just a few million years ago *Ginkgo* grew in Europe and also in North America (Crane, 2013). Today, however, *Ginkgo* is a botanical oddity, a single species with no close living relatives. With its iconic fan shaped leaves, and twigs that show strong differentiation into long and short shoots, it is one of the most distinctive of China's deciduous trees.

The association of *Ginkgo* with people is documented for about a thousand years in China, where *Ginkgo* survives in a few potentially relict populations. The early cultivation of *Ginkgo* focused on its use as a nut tree, and it was probably for this purpose that the tree was grown widely, and then later transplanted to Japan and Korea. One of the Chinese common names for *Ginkgo* is 'silver apricot'.

Ginkgo was introduced into the West in the mid-18th century and the 'Old Lion' at Kew, which dates from the early 1760s, is one of the oldest in cultivation (Crane, 2013). By the mid 19th century *Ginkgo* was widely grown in Europe, and as early as 1815 *Ginkgo* was celebrated by Johann Wolfgang von Goethe in one of his most famous poems (Unseld, 2003). In the late 19th and early 20th centuries, with the recognition that fertilization in *Ginkgo* differed from that in other trees in being mediated by motile sperm rather than a pollen tube, and with growing recognition of its long fossil record, it became clear that *Ginkgo* was important in plant evolution and a living link to primeval landscapes that have long since disappeared.

Curtis's Botanical Magazine 2013 vol. 30 (3): pp. 239–260
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Ginkgo and its early cultural associations in China

While there are many reports of *Ginkgo* trees that are claimed to be between 1000 and 3500 years old (He *et al.*, 1997), such extreme antiquity of individual trees has never been fully substantiated. The supposed long history of *Ginkgo* cultivation (He *et al.*, 1997) also needs more secure documentation, as do claims of the representation of *Ginkgo* in Chinese art from the 4th and 5th centuries. For example, the fan-shaped structures in the relief murals, the 'Seven Worthies of the Bamboo Grove' (4th–5th century) and 'Nymph of the Luo River', by Gu Kaizhi (344–406 AD), which are often cited as early representations of *Ginkgo* (Minford & Lau, 2000; Thorp & Vinograd, 2001), are unconvincing. They could equally be depictions of clusters of other kinds of leaves.

The earliest secure written reference to *Ginkgo* is from 980 in the *Ko Wu Tshu Than*, ('Simple Discourses on the Investigation of Things'), written by Lu Tsan-Ning, a 'learned monk' (Needham, 1986). Thereafter, during the Song Dynasty (960–1279), there is a famous exchange of poems between the early Chinese historian Ouyang Hsiu (1007–1072) and the poet Mei Yao-Chēn (1002–1062), which summarise the early history of *Ginkgo* cultivation as a nut tree. Referring to *Ginkgo* by one of its Chinese common names, 'duck foot', Ouyang writes:

> Ya chio (duck foot) grows in Chiangnan with a name that is not appropriate. At first it came in silk bags as a tribute, and as yin hsing (silver apricot) it became cherished in the middle provinces. The curiosity and effort of the Noble Prince [Li] brought roots from afar to bear fruit in the capital. When the trees first fruited they bore only three or four nuts. These were presented to the throne in a golden bowl. The nobility and high ministry did not recognize them and the emperor bestowed a hundred ounces of gold. Now, after a few years, the trees bear more fruits. (Needham *et al.*, 1996)

A later record by Ruan Yue in *Shihuazonggui* (Xuan He Period, Song Dynasty, 1119–1129) states, 'In the Capital … there was no *Ginkgo*. Since the coming of Mr. Li Wenhe, the emperor's son-in-law, from the south, he introduced it and planted it in his private house' (He *et al.*, 1997). The interest of the Imperial family and their role

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Plate 773 *Ginkgo biloba* MASUMI YAMANAKA

in popularising the cultivation of *Ginkgo* is further reinforced by its appearance in records of artwork from the 11th and 12th centuries. The *Hsuan Ho Hua P'u*, a catalogue of the Imperial Collections, was compiled during the reign of Emperor Hui Tsung (1101–1125). It documents a painting made in the reign of Emperor Yin Tsung (1063–1066) by his son, Prince Tuan Hsien Wang, called 'A Study of Ya Chio (duck foot)'. Another made during the reign of Emperor Shen Tsung (1067–1084) by Yo Shih-hsuan, one of the Emperor's officials, is entitled 'A picture of Yin Hsing (silver apricot) and the bird Pei Tou Wen' (Li, 1963). The catalogue entries survive as the sole record of these early *Ginkgo* images.

Early depictions of *Ginkgo* in Japan

The earliest cultural records of *Ginkgo* in Japan date from the 15th century. A *mon*, or family crest, that seems to incorporate a *Ginkgo* leaf motif is known among 260 other crests in an early book of heraldry published during the time of Shogun Yoshimasa Ashikaga (1436–1490). The first uncontroversial written references to *Ginkgo* appear in the 15th century dictionary *Ainosho*, by Gyoyo, in 1446, and then later in the travel diary of the poet Saiokuken Socho (1448–1532) in 1530 (Hori & Hori, 1997). Ancestors of Ieyasu Tokugawa, founder of the Tokugawa shogunate (1543–1616), appeared to use a crest of three *Ginkgo* leaves arranged with three swords, while Tokugawa families used a crest of modified leaves of *Asarum caulescens* Maxim. (Hori & Hori, 1997).

Early references to *Ginkgo* in Japan adopted Chinese characters and pronunciation, but later dictionaries show the divergence of pronunciation in Japanese. The Chinese characters 銀杏, pronounced '*ya-chio*', became '*icho*' in Japan. Around 1617, the dictionary *Kagaku-shu* gives two possible pronunciations; '*icho*' and '*ginkyo*'. '*Ginkyo*', meaning 'silver apricot', may have been derived from the composite pronunciation of the first character, 銀, of 'silver fruit' ('*ginka*') and the second character, 杏, of 'mountain apricot; ('*sankyo*'). The name '*Ginkyo*' also appears in the *Kinmo Zui*, an encyclopedia-like pictorial dictionary first published in 1666 that includes a woodblock print of a *Ginkgo* branch, showing short shoots, leaves and seeds (Hori & Hori, 1997; Fig. 1). *Ginkgo* is placed in the volume dealing with fruits, rather than that dealing with trees. The accompanying text gives the Chinese names. The pronunciation '*ginkyo*' persisted for only a brief period in Japan in

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Fig. 1. *Ginkgo* illustration in the *Kinmo Zui*, a Japanese encyclopedia-like pictorial dictionary published in 1666. The dictionary gives two pronunciations for Ginkgo; '*gin'nan*' and '*ginkyo*.' Kaempfer owned two editions. Reproduced by kind permission of the National Diet Library, Tokyo.

the 17th century: the *Kinmo Zui* is among the few books published between the 15th and 18th centuries to use it (Hori & Hori, 1997).

Early depictions of *Ginkgo* in the West

Engelbert Kaempfer (1651–1716) was the first Western botanist to describe *Ginkgo* and he took the name from the copy of the *Kinmo Zui* that he owned (Hori & Hori, 1997). Why *Ginkyo* was transcribed by Kaempfer as *Ginkgo* has been much speculated upon (Van der Velde, 1995; Crane, 2013), but use of the name '*Ginkgo*' might have disappeared entirely, as it has in modern Japanese, had it not been for its adoption by Kaempfer, and then by the Swede Carl Linnaeus. Having introduced consistent binomial naming for plants in his *Species Plantarum* (1753), Linnaeus used Kaempfer's spelling when he formally published the generic name as '*Ginkgo*' (Linnaeus, 1771).

The illustration of *Ginkgo* (Fig. 2) published in Kaempfer's *Amoenitatum Exoticarum* (Kaempfer, 1712: 812), shows a shoot bearing two seeds and more than a dozen mainly bilobed leaves. Four other seeds are drawn separately. The illustration does not include short shoots or

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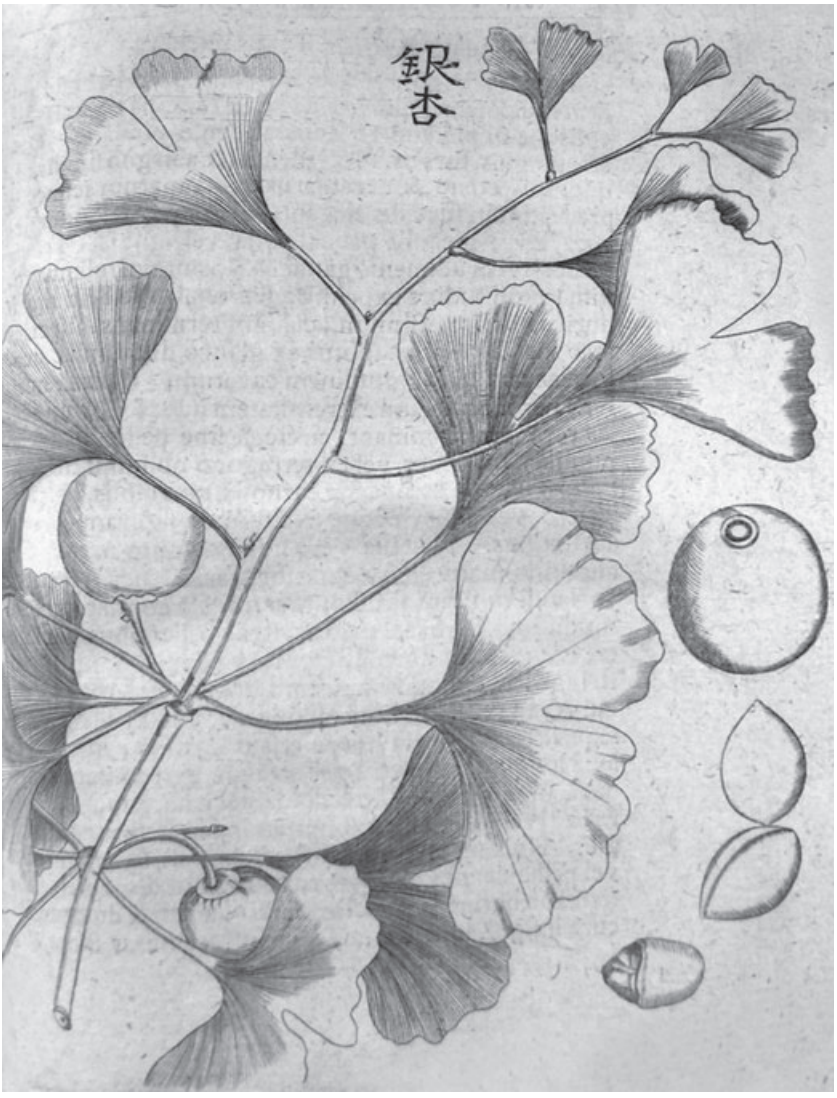

Fig. 2. Illustration of *Ginkgo* in Engelbert Kaempfer's *Amoenitatum Exoticarum*, published in 1712. This illustration, probably made by Kaempfer himself, was the first visual representation of a living specimen of *Ginkgo* to come to the attention of Western scientists, including Carl Linnaeus. Reproduced by kind permission of the Cincinnati Historical Society.

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pollen cones, and the way in which the seeds are attached, singly and without attachment to a short shoot, is inaccurate, raising the question of whether Kaempfer had access to a living tree. Kaempfer's dried specimens (now part of Hans Sloane's herbarium in London: HS 211, ff. 91, 103, BM; see Dandy, 1958; Hinz, 2001) comprise only leaf material and a poorly preserved portion of a branchlet. At this time, together with the other employees of the Dutch East India Company, Kaempfer would have been confined to the Dutch trading post on the island of Deshima in Nagasaki Harbour, except for the annual journey he made twice to Edo to pay tribute to the Shogun (Kaempfer, 1727). *Ginkgo* is also described in the *History of Japan* as a nut tree, cultivated for nuts that provide 'plenty of oyl' (Kaempfer, 1727: 181).

The first living *Ginkgo* trees in Europe were probably grown between about 1730 and 1750 (Crane, 2013), but because these plants probably took two or three decades to mature, it is not surprising that for many years the only information about the reproductive structures of *Ginkgo* in the West was that recorded by Kaempfer. The first record of a male tree producing pollen cones is in 1795 for the 'Old Lion' *Ginkgo* at the Royal Botanic Gardens, Kew (Loudon, 1838). The first report of a female tree producing ovules was by Augustin Pyramus de Candolle, in 1814, based on a tree at Bourdigny not far from Geneva (Loudon, 1838). The first viable seeds were produced in Europe in 1835 by the famous male tree in the botanic garden at Montpellier on to which branches from female trees had been grafted (Wilson, 1919).

The paucity of specimens and information about *Ginkgo* in the mid-18th century is reflected in the fact that *Ginkgo* was not treated by Linnaeus in either the first (1753) or second (1762–1763) edition of *Species Plantarum*. Among the first to cultivate *Ginkgo* in Europe was the British horticulturist James Gordon at his nursery at Mile End in London. The botanist John Ellis, who was keenly interested in the translocation of useful plants around the world in the mid-18th century and who provided Gordon with much of his material, wrote to Linnaeus on April 25, 1758 of Gordon's possession, 'He has got the Ginkgo or Arbor nucifera folio Adiantino of Kaempf: p. 811. This thrives well, and when he has increas'd it will dispose of it' (L2333.17.92–93, Linnean Society of London). Three months later, on July 21, 1758, Ellis followed up: 'The Plant of Kaempfers Amoenit: at No. 813, has not yet flowered, when it does I shall get a specimen

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for you' (L2375.17.94–95, Linnean Society of London). A dried specimen was sent by Ellis to Linnaeus in 1767, and was followed by a young living plant from Gordon in 1769. Neither, however, provided Linnaeus with the crucial 'flower' and 'fruit' characters that would enable the Swede to place it in his classification system. On September 4, 1770, Linnaeus wrote to Ellis: 'Does the Japanese tree with two-lobed leaves (Ginkgo) ever blossom with you, or do you know its botanical character?' (L4410.17.424, quoted from its English translation by Smith, 1821: 249). On September 25, 1770, Ellis responded, 'The Ginkgo of Kaempfer has not yet flowered, but grows freely, and we are in hope will soon flower' (L2333.17.154–155, Linnean Society of London). This was probably Linnaeus' final effort at understanding this singular plant before the publication of his *Mantissa Plantarum Altera* in 1771, in which he formally named it '*Ginkgo biloba*'. However, with details of the reproductive structures still lacking, Linnaeus was unable to place it in a specified Class and Order, listing it in the Appendix instead.

John Ellis was also a key link to an early illustration of *Ginkgo* made in Canton by a local Chinese artist under the supervision of John Bradby Blake (1745–1773), a supercargo (senior trader) stationed there by the British East India Company. Blake arrived at the trading post in Canton in 1766, with intentions to 'procure the seeds of all trees, shrubs, roots, fruits, flowers, &c. &c. which that great empire produces, and are used either for promoting commerce, or useful to mankind' (Laurens *et al.*, 1972). Blake, too, took an interest in *Ginkgo*, which was probably among the many seeds he successfully shipped to Ellis from China. In a note dated 1770 and attributed to Blake and pasted to the inside cover of Linnaeus' own copy of *Amoenitatum Exoticarum* (now at the Linnean Society of London) is written:

> 811. Ginkgo vel Gin-an pronounced at Canton Ging:hang
> Paa=Zuo
> from the Northward – grows in gardens
> but does not flourish at Canton the nuts are eat in
> various ways: and are brought down for sale dryed
> by fire in great quantities to Canton. In procuring seeds
> this hint must be particularly attended to as also in
> many other seed.

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While stationed in Canton, Blake hired one or more skilled Chinese draughtsmen to draw the specimens that he had collected and dissected. He also worked closely with the illustrator(s), drawing outlines of the plant parts (Anonymous, 1784; Kilpatrick, 2007). A series of 81 watercolour plant portraits, created under Blake's supervision between 1767 and 1768, were acquired on Blake's death by Sir Joseph Banks, probably from Blake's father. They are now among the Banks MSS (No. 12) at the Natural History Museum, London. One of these illustrations shows a *Ginkgo* branch, bearing seeds. The seeds are portrayed in greater detail below the shoot, in various states of dissection to reveal the hard shell that surrounds the 'meat' of the seed (Fig. 3). These illustrations were probably the first Western documentation of *Ginkgo* from its native China and the first coloured renditions of *Ginkgo* seen by scientists in the West.

A further early illustration of *Ginkgo* by a Chinese artist was that prepared for Robert Fortune, one of the first botanical explorers to penetrate the interior of China in the first half of the 19th century. This watercolour portrait showing a mature *Ginkgo* with a small human figure near its base was prepared for Fortune during his last trip to China during the 1850s (Fig. 4), and now is held in the collections of the Royal Botanic Gardens, Kew. It is one of a portfolio of 23 Chinese tree portraits, the other species being all Chinese conifers. An inscription on the inside of the front cover of the portfolio explains that the artist engaged by Fortune stipulated that he would only make the pictures 'if allowed to put a human figure in each . . . ' (Cornu, 2012).

Later depictions of *Ginkgo* in western art

The first published colour illustration of *Ginkgo* in the West is the plate of *Ginkgo biloba* that appears in *Flora Japonica* (Siebold & Zuccarini, 1835–1870, tab. 136; Fig. 5). Like Kaempfer some 130 years earlier, Philipp Franz von Siebold was stationed at Deshima as the resident physician to the trading base of the Dutch East India Company. Siebold was there from 1823 to 1829 and many of the prints in his *Flora Japonica* were based upon the work of Keiga Kawahara, a Nagasaki painter whom he hired (Kimura, 1993; see also *Paulownia*, this volume). However, other prints in *Flora Japonica* do not correspond with any of the original Keiga Kawahara illustrations now in the collections of the Komarov Botanical Library in St. Petersburg, and

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Fig. 3. A watercolour of *Ginkgo* produced around 1767–1768 by a Chinese artist working for John Bradby Blake in Canton. Blake, in the service of the British East India Trading Company, sent home detailed botanical illustrations of Chinese plants of potential interest to the company and the colonies, and aspired to capture useful plants 'in every state'. Banks MSS 12, reproduced by kind permission of the Natural History Museum, London.

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Fig. 4. Watercolour of *Ginkgo biloba* by a Chinese artist commissioned by the Scottish botanist and explorer, Robert Fortune. Reproduced by kind permission of the Royal Botanic Gardens, Kew.

were probably produced by European artists based upon cultivated or preserved material. This seems to be the case for *Ginkgo*, which was already in cultivation in Europe at that time.

The *Ginkgo* plate in *Flora Japonica* is attributed to Franz Michael Veith (1799–1846), a German artist and lithographer who perhaps worked from herbarium specimens as well as living material. Veith's illustration depicts a pollen cone and young ovules, as well as the clean sclerotesta of a seed ('nut'), but fully developed seeds with their fleshy sarcotesta are not shown, neither entire nor in cross section.

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Fig. 5. The plate of *Ginkgo* appearing in Siebold and Zuccarini's *Flora Japonica*, published in its second volume in 1870. However the plate was completed prior to 1846. The plate carries the name '*Salisburia adianthifolia*', a name proposed for the species in 1786 by James Edward Smith. The name, however, postdates Linnaeus' *Ginkgo biloba* which remains the correct name for the species. This image is in the public domain and was accessed on Wikimedia Commons.

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This may reflect the fact that pollinated and fertilized ovules were still rare in Europe at the time the illustration was made. Mature seeds were not produced in Europe until 1835, the same year as the publication of the first volume of *Flora Japonica* (see Loudon, 1838).

Illustrations of *Ginkgo* at the Koishikawa botanical garden

One of the most famous of all *Ginkgo* specimens is the large female tree in the Koishikawa Botanical Garden of the University of Tokyo. This garden had previously served as the Tokugawa Shogun's medicinal garden (Primack & Ohkubo, 2008) and the large *Ginkgo* subsequently provided the material for the discovery of the male gametes of *Ginkgo* and the first observation of swimming sperm in a seed plant. Both discoveries were made by Sakugoro Hirase, a botanical technician and illustrator working at the University of Tokyo (Hirase, 1895a, 1895b, 1896; Nagata, 1997). The same *Ginkgo* tree was probably also the source of material for a series of interesting early Japanese illustrations of *Ginkgo* created at the Koishikawa Botanical Garden (Fig. 6).

In the library of the Koishikawa Botanical Garden there is an unpublished, partially completed sketch of a *Ginkgo* showing a branching long shoot, five short shoots, and 35 leaves, both attached to the shoot and also drawn separately. Pollen and ovulate structures in various states of development are also depicted, along with a mature seed. That this is a preparatory sketch for later illustrations is clear from the detail, colour and shading on a small sample of leaves; other leaves are shown only in outline (Fig. 6A). A second unpublished illustration (Fig. 6B) is a carefully executed pen and ink drawing showing the same details as the preparatory sketch, but with fewer parts. One short shoot, a free leaf and free petiole, and an enlargement of a pollen cone releasing pollen (Fig. 6A) are all omitted here (Fig. 6B). A third unpublished illustration is a beautiful finished watercolour (Fig. 6C) that was evidently also prepared from the preparatory sketch (Fig. 6A) because it contains elements not featured in the pen and ink drawing.

All three of these unpublished illustrations bear the stamp of the Japanese botanical artist Chikusai Kato and are thought to have been prepared under the supervision of Keisuke Ito, who had studied botany with Siebold at Deshima in the 1820s. Ito helped pioneer

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Fig. 6. A preliminary sketch (A), pen and ink drawing (B) and watercolour (C) of *Ginkgo* made at the Koishikawa Botanical Garden of the University of Tokyo by the artist Chikusai Kato in the late 19th century. The pen and ink drawing (B), or perhaps the watercolour (C), was likely intended for a later volume of Keisuke Ito and Hika Kaku's 'Figures and Descriptions of Plants in the Koishikawa Botanical Garden' (Ito & Kaku, 1880–1883) that was never published. Instead, the preliminary sketch (A) served as the model for Kato's illustrations of *Ginkgo* on the *Ginkgo* wood boards at Kew (Fig. 7) and Berlin, (see Nagata *et al.*, 2013). Reproduced by kind permission of the Koishikawa Botanical Garden.

the adoption of the Linnaean system of binomial nomenclature in Japan, and also translated Carl Peter Thunberg's *Flora Japonica* (1784) into Japanese (Ito, 1900). The unpublished drawings may have been prepared as part of Keisuke Ito's effort to publish an illustrated flora of Japanese plants using materials from the Koishikawa Botanical Garden. Two such volumes, 'Figures and Description of Plants in

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Koishikawa Botanical Garden', depicting 52 plants, were published (Ito & Kaku, 1880–1883) but the planned subsequent volumes were never completed.

However, the illustrations of *Ginkgo* that were most likely prepared for this effort were not wasted because they evidently served as the models for the illustrations of *Ginkgo* included on a series of wood samples made at the Koishikawa Botanical Garden in 1878 for the teaching of botany (Morse, 1917). Some of these boards were also given as gifts to prominent figures at the time (Ito, 2010; Nagata *et al.*, 2013). Each board carries a painted portrait of the plant species that provided the wood from which the board was made, the latter also framed by small branches from the same species. All are labelled with the name of the plant in Latin, and usually also in Japanese or Chinese characters. On the verso of most boards is a red stamp from a *tenkoku* stone seal that attributes the work to Chikusai Kato.

Five collections of these boards are now known: 8 are in the Harvard University Herbaria Economic Botany Collection, 9 are in a private collection in London (Loudon collection), 25 are in the Koishikawa Botanical Gardens, 26 are in the Economic Botany Collection of the Royal Botanic Gardens, Kew, and 152 are in the collection of the Botanical Museum Berlin-Dahlem (Lack & Ohba, 1998; Lack, 1999). The 220 boards that are currently known depict approximately 150 different species (Nagata *et al.*, 2013). Two of these boards, one in the Economic Botany collection at Kew (Fig. 7), and the other in the collection of the Botanical Museum Berlin-Dahlem, bear illustrations of *Ginkgo*.

The portraits on the *Ginkgo* boards at Kew (Fig. 7) and Berlin (see Nagata *et al.*, 2013, Fig. 4c) are very similar, although that on the Kew board shows greater detail. Both are clearly linked in style and content to the three unpublished Koishikawa illustrations of *Ginkgo*. At least ten other unpublished illustrations in the collections of the Koishikawa Botanical Garden also served as models for illustrations of other species included among the five collections of wooden boards.

Conclusions

For the last 200 years, since it was immortalized in Goethe's famous poem (Unseld, 2003), *Ginkgo* has been recognized in the West as

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Fig. 7. The illustration of *Ginkgo* painted on a board made of *Ginkgo* wood in the Economic Botany Collection at the Royal Botanic Gardens, Kew, created as part of a larger collection of wood samples (xylotheque) by Chikusai Kato in 1878. The illustration is based on earlier unpublished sketches by the same artist (Fig. 6A–C). Reproduced by kind permission of the Royal Botanic Gardens, Kew.

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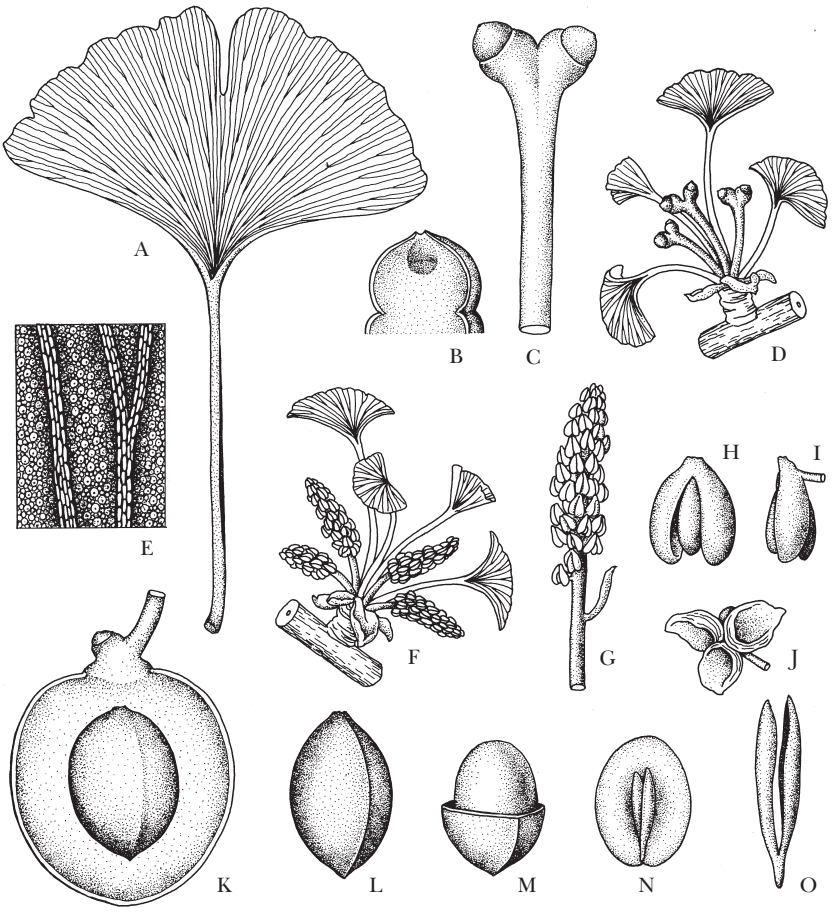

Fig. 8. **Ginkgo biloba**. A, bilobed leaf, characteristic of those produced on long shoots, showing 'parallel' dichotomizing veins, × $^{2}/_{3}$; B, young ovule in longitudinal section, showing the apical micropyle and developing gametophyte, × 4; C, ovuliferous shoot bearing two terminal ovules, × 2; D, short shoot of a female tree showing young leaves and ovuliferous shoots, × $^{2}/_{3}$; E, abaxial leaf surface showing stomata scattered between the veins, × 30; F, short shoot of a male tree bearing young leaves and catkin-like pollen cones, × $^{2}/_{3}$; G, pollen cone just before pollen release showing closely spaced lateral structures bearing pollen sacs, × 1; H, face view of three pendulous pollen sacs on a single lateral structure from a pollen cone (most lateral structures bear only two pollen sacs), × 4; I, side view of lateral structure from pollen cone showing three pendulous pollen sacs, × 4; J, lateral structure from pollen cone seen from below after shedding of the pollen showing three dehisced pollen sacs, × 4; K, mature seed in longitudinal section showing epidermis, fleshy sarcotesta surrounding the harder sclerotesta; note the second ovule attached to the seed stalk that has failed to develop, × 1; L, sclerotesta, which forms the 'stone' of the ginkgo seed, showing the longitudinal rib that extends down both sides, × 1; M, sclerotesta with the upper part removed to expose the developing female gametophtyte, × 1; N, female gametophyte in longitidinal section showing developing embryo, × 1; O, developing embryo removed from the female gametophyte showing two cotyledons, × 2; L–O in same orientation as K. Drawn by Masumi Yamanaka from specimens growing at Kew.

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a quintessential horticultural connection to the East. It was the usefulness of *Ginkgo* that first attracted the interest of early Western botanists in Asia, and in part this may have promoted its initial cultivation in Europe in the mid-18th century. Subsequently, in both Asia and the West, cultivated specimens of *Ginkgo* attracted the attention of botanical artists and scientists, and made the species available for artistic representation and also scientific study. It is therefore especially appropriate that the marvellous new illustrations of *Ginkgo* by Masumi Yamanaka, reproduced here (Plate 773 and Fig. 8), are based on specimens cultivated at Kew, one of which is the 'Old Lion', an old male tree and a survivor of the first *Ginkgo* trees to be planted in Europe.

Ginkgo biloba L., Mant. Pl. Altera: 313 (1771). Type: Gordon s.n., Herb. Linn. No. 1292B.2 (LINN), designated by Barrie (1993).

Salisburia adiantifolia Sm., Trans. Linn. Soc. London 3: 330 (1797). Type: Gordon s.n., Herb. Linn. No. 1292B.2 (LINN), designated by Barrie (1993).

Description. *Tree* deciduous, usually dioecious, up to to c. 30 m; branching ascending or horizontal, relatively sparse in young specimens, sometimes with stalactite-like outgrowths (*zhong-ru* or *chi-chi*) in ancient or stressed specimens, bark corky and irregularly fissured. Twigs on elongating shoots (long shoots) bearing alternate leaves, the axillary buds of which develop into short shoots (spur shoots) that produce clusters of leaves and, when mature, either pollen cones or ovuliferous shoots. *Leaves* deciduous, flabellate or fan-shaped, generally with an entire margin, but those on elongating (long) shoots generally narrower and often bilobed. Veins dichotomising from the two veins that enter the petiole, more or less "parallel" as they run to the leaf margin, rarely anastomosing. Pollen cones and ovuliferous shoots produced on the short shoots in the axils of leaves. *Pollen cone* a spike-like strobilus, with crowded lateral structures (scales) bearing pairs of pollen sacs. *Ovuliferous shoot* unbranched with 2 slightly sunken, partly divergent, egg-shaped ovules, each with a pointed micropylar tip. *Seed* generally developing from only one of the 2 ovules on each ovuliferous shoot, with a thin yellow skin and fleshy, rancid-smelling pulp surrounding a hard sclerotesta ("nut"), c. 3 cm long; seed stalk up to 6–7 cm. '*Nut*' pale brown, c. 2–2.5 cm long, slightly flattened with a single ridge running from micropyle to base along both margins.

Habitat. Montane forests.

Distribution. Southern China: possibly still found wild in Zhejiang (Tianmu shan), and Guizhou (Jinfo shan) (Crane, 2013). Widely planted.

Flowering time. With the new leaves in spring.

Mature seeds. Ripening at leaf fall, sometimes remaining on the tree into winter.

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Anon. (1784). Curious discoveries of Bradby Blake, Esq. Valuable researches in Natural History. *The Town and Country Magazine, or Universal Repository of Knowledge, Instruction and Entertainment*. A. Hamilton, London.

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