A synopsis of the enigmatic Cathay silver fir

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The discovery of the relict *Cathaya argyrophylla* or Cathay Silver Fir in a remote wilderness area of Kwangsi province (now Guangxi Zhuang Autonomous Region) in Southern China in May, 1955, created more than a ripple of excitement in scientific circles.

With the subsequent knowledge that it represented a living link to circa 10 million year old Pliocene fossils of the Tertiary period found previously in Europe, it was soon realised that here was another "living fossil" conifer genus and its discovery was reminiscent of the finding, also in China, of the ultimately world famous *Metasequoia glyptostroboides* or Dawn Redwood 14 years earlier in 1941.

Unlike the Dawn Redwood, whose discovery when announced in 1947 made international headlines and coincided with world-wide distribution of its seeds in 1947/48, the Cathay Silver Fir, after brief international publicity, was destined to languish in near obscurity behind the Bamboo Curtain for 40 years with China never allowing the tree to be taken out of the country, nor any seeds being distributed. This all finally changed when seed began to trickle out of China by official channels in 1995.

Today it remains little known outside China, even in botanical circles, as my requests to fellow IDS members for the location of cultivated specimens bears out (four replies in two years!) and relatively few books about trees feature or even mention *Cathaya*.

Even so, this was a remarkable find, adding as it did a new monotypic genus

to the Pinaceae, the gymnosperm family with the largest number of species (ca 230) within its eleven or twelve genera, the only other monotypic genera in the Pinaceae being *Hesperopeuce* (*H. mertensiana*), *Nothotsuga* (*N. longibracteata*) and *Pseudolarix* or Golden larch (*P. amabilis*).

While two of the most endangered conifers in the wild, *Wollemia nobilis* and *Metasequoia glyptostroboides* are now relatively common in cultivation, the former only recently as young plants, the reverse is true of the little known and rare *Cathaya argyrophylla*, which Chinese botanists have described as "The Giant Panda of the Plant Kingdom" and it is the intent of this article to provide a brief outline concerning this tree and alert fellow dendrologists to its desirability as a specimen for the garden or arboretum.

As an in-depth study of *Cathaya* is beyond the scope of the present work, readers wishing to further inform themselves about this remarkable tree should refer to the relevant publications listed in the Bibliography of *Cathaya* – Living & Fossil, which concludes the present article.

Discovery and naming

Deng Xianfu, a member of the Kwangfu-Lingchu Expedition exploring the remote Hauping region of northern Guangxi province in 1955, literally unearthed the first Cathay Silver Fir when he dug up a seedling of what he thought was *Keteleeria fortunei* (den Ouden & Boom 1966, Krussman 1985, Tang 1987).

Expedition leader Professor Zhong Jixin realised that *Keteleeria fortunei* could not survive there at the altitude of around 1400 metres and following closer inspection of the seedling realised that it didn't resemble a *Keteleeria* (Tang 1987).

Further searching of the mist-shrouded mountains located a mature tree on the southern slope of Mount Hongya on 16th May 1955. Herbarium specimens were taken and deposited at Guangxi Institute of Biology, these designated the type specimen No. 00198 for *Cathaya argyrophylla* in a scientific paper by W.Y. Chun (Chen Huanyong) & K.Z. Kuang (Kuang Keren) published in 1958 describing the new genus (Tang, 1987).

As well as *Cathaya argyrophylla*, the authors described a second species *C. nanchuanensis* discovered by Y.C. Yang on Jinfo Shan (Golden Buddha Mountains) of S.E. Sichuan, type No. 3163 deposited in the Herbarium of the Institute of Botany, Peking (now Beijing) (Krussman 1985, den Ouden & Boom 1966, Tang 1987, Welch & Haddow 1993). This was described from vegetative material only (Bean 1970).

Cathaya nanchuanensis differs from *C. argyrophylla* in having white stomatal bands as broad as the green ones, comprising 9-13 as opposed to 11-17 stomatic lines on either side of the midrib and obtuse as opposed to acute cilia on the leaf margin (den Ouden/Boom 1965), leaf margins acute, not blunt, and marginal cilia on juvenile leaves blunt, not tapering to a point (Dallimore & Jackson 1966).

Chun & Kuang failed to designate the type specimen for *Cathaya* in their 1958 paper but rectified this oversight in their 1962 paper when nominating *C. argyrophylla* as the type of the genus.

W. C. Cheng (Cheng Wan-Chun) and L. K. Fu having decided that the two

species ascribed to the genus were not sufficiently distinct to warrant separate identities reduced *Cathaya nanchuanensis* to a synonym of *C. argyrophylla* in *Flora Republicae Popularis Sinicae Tomus 7, Gymnospermae, (1978).*

Generic description of *Cathaya* Chun & Kuang *Acta Bot. Sin.* 10(3): 245 (1962).

Medium tall evergreen coniferous trees with columnar trunk and horizontal monopodial branching. Branchlets dimorphic; fertile long shoots with spirally arranged leaves, lateral sterile slow-growing short shoots with closely spaced leaves appearing whorled. Branchlets ribbed with decurrent bases of linear leaves, the point of leaf-insertion slightly raised. Dormant buds ovoid to ovoid conical, non-resinous. Leaves spreading radially, linear-oblanceolate, straight or gradually curved, flattened, deep green, minutely hairy in vicinity of longitudinal groove adaxially, with 2 silvery-white stomatal bands separated by raised midrib abaxially, 2 marginal sub-epidermal resin ducts in second year, margin entire, slightly revolute, ciliate at first, apex bluntly rounded. Trees monoecious. Pollen cones oblong-ovoid from axillary buds on lateral branchlets. Seed cones axillary, sessile, initially erect, finally pendulous, ovoid or oblong-ovoid, maturing same year, persist several years. Seed scales woody, dehiscent at maturity, 2 seeds per scale. Seed obliquely ovoid with terminal membranous wing. Seed germination epigeal with 3 or 4 cotyledons raised above ground to form first leaves.

***Cathaya argyrophylla* Chun & Kuang**, the only recognised living species in the genus *Cathaya*, conforms to the generic description above with the following key specific characters –

Tree to 20m high, trunk to 40 cm or more d.b.h. with irregularly fissured grey bark. Young shoots yellow-brown, densely pubescent, glabrous 2nd year, buds 6-8 mm long. Leaves on long shoots 4–6 cm long by 2.5–3 mm wide; on short shoots under 2.5 cm long, stomatal bands of 11–17 rows visible under microscope. Seed cones green maturing dark reddish-brown, 3–5 cm long, 1.5–2 cm wide with 13–16 orbicular or broad-ovate seed scales 15–25 mm long, 10–25 mm wide. Bracts free, triangular-ovate tapering to sharp point. Seed 5–6 mm long, 3–4 mm wide, blackish-olive mottled green, asymmetrical wing yellow-brown, 10–15 mm long, 4–6 mm wide.

Generic and specific references:

Bean (1970), Dallimore & Jackson (1966), den Ouden & Boom (1965), Farjon (1990), Krüssmann (1985), Fu, L., Li, N. & Mill (1999), Li & Zhou (1989), Silba (1986).

Young nine-year-old plants growing at the Australian Bicentennial Arboretum differ from the above description as follows:

1. Leaves on long shoots 4–7 cm and occasionally to 10 cm in length.
2. Leaf apex apiculate as in some *Pseudotsuga* here.

3. Dormant buds often slightly resinous.
4. Growth pattern not strictly monopodial. Lateral shoots below leading shoot often assume dominance (may be response to earlier tying for support).
5. One year shoots bright orange in sunlight.

Cytological studies have determined the chromosome number of Cathaya as 2n= 24 (Chu & Sun 1981, Frankis 1988).

The generic name *Cathaya* is derived from when China was known as Cathay and signifies the plant's ancient origins (Farjon 1990, Tang 1987).

The specific name (epithet) *argyrophylla* means "with silvery leaves" referring to the silvery under-surfaces of the leaves.

The vernacular name in Chinese is Yin Sha or Yin Shan (SK Png, pers. comm.) meaning Silver Fir, which should not be confused with a number of firs in the genus *Abies* known elsewhere outside China as Silver Firs.

Taxonomic affinities

While no-one would disagree with the placement of monotypic *Cathaya* within the Pinaceae, numerous authorities have noted its resemblance to other genera in the Pinaceae and a number have speculated about whether its one known species might be better placed under another of the Pinaceae genera, some proceeding to transfer it to their chosen genera. These included Greguss (1970) who determined by xylotomic examination that *Cathaya* was very closely related to *Pseudotsuga,* transferring it to this genus as *Pseudotsuga argyrophylla* (Chun & Kuang), Greguss.

de Laubenfels and Silba (1984) considered *Cathaya* close to *Tsuga* and made the new combination *Tsuga argyrophylla* (Chun & Kuang) de Laubenfels & Silba (Cathaya or Longleaf Hemlock). These placements were not widely accepted by the botanical community who felt it more appropriate to retain *Cathaya* as a separate genus.

Ouden & Boom (1965) thought *Cathaya* looked intermediate between *Larix* and *Tsuga,* and Oterdoom (1982) thought a potted specimen reminiscent of *Keteleeria* and *Sciadopitys*.

Harrison, in Dallimore & Jackson (1966) felt the new genus not closely related to any other in the Pinaceae. While it had the dimorphic long and short shoots characteristic of *Larix* and *Cedrus*, in other respects he felt that it resembled *Abies*, *Keteleeria* and *Picea*.

Bean (1970) points out that dimorphic shoots should not be taken to imply a particularly close relationship between *Cathaya* and the Larches, Cedars and Pines, as he felt the foliar spurs of *Cathaya* apparently sterile, while in the Larches and Cedars the long shoots are sterile. He states that the general morphology of the leaves, shoots and cones of *Cathaya* imply a close relationship with *Keteleeria* and *Pseduotsuga.*

Rushforth (1987) agrees with Bean in the similarity yet different functions of the long and short shoots in *Cathaya* compared with *Larix* and *Cedrus*. In other

characters he described *Cathaya* closer to *Abies*, *Picea*, *Pseudotsuga* and *Tsuga* while disagreeing with Silba and de Laubenfels's placement of *Cathaya* in *Tsuga*.

Van Gelderen (1989) expresses the opinion that "the cones differ markedly from *Pseudotsuga*, but not so much that the 'new' genus *Cathaya* may not be classified under *Pseudotsuga*". Later his view had changed to "the needles look very much like those of *Pseudotsuga*, but are different enough to distinguish the plants as a separate genus." (Van Gelderen, 1996).

Welch & Haddow (1993) describe *Cathaya* as something of a botanical curiosity, having foliage (sic) similar to *Cedrus* and *Larix* but in other respects an affinity with the 4 genera mentioned by Rushforth.

An examination of published reports linking *Cathaya* to other Pinaceae genera including *Pseudolarix*, *Hesperopeuce* and *Nothotsuga* led Page (1988) to maintain *Cathaya* as a distinctive genus within the Pinaceae as "there was a lack of close taxonomic fit of *Cathaya* into any other single genus of the family".

This position had been earlier confirmed by anatomical studies undertaken by Hu & Wang (1984).

Fossil occurrences of *Cathaya*

Fossil seed cones found in Germany in the early twentieth century (Bean 1970) were described as *Keteleeria loehri (*Engelhardt et Kinkelin 1908). Chun and Kuang when founding the genus *Cathaya* (Chun W.Y. & Kuang K.Z. 1958) included these fossils in the new genus as *Cathaya loehri* (Engelhardt et Kinkelin) Chun et Kuang.

Farjon (1992) feels that while the type material for *C. loehri* has been lost, it appears closer to *Pseudotsuga* than *Cathaya*.

Those readers interested in the subsequent paleobotanical records of the genus *Cathaya* are referred to the 2000 paper by Y-s Liu & James Bassinger (See Bibliography), which includes an appendix listing the then known megafossil & pollen record of *Cathaya* fossils and *Cathaya*-like fossils.

In summary, the megafossils comprising leaves and ovulate (seed) cones are relatively rare and found from the Late Oligocene to the Late Pliocene of Eurasia (Germany, Spain, Italy, Russia east of the Black Sea and Siberia) and as of 2000 were not known from China and North America.

Mentioned are:
Cathaya roselti (Schneider 1981)
C. bergeri (Schneider 1981, Mai 1999, Gregor 1990)
C. abchasica (Sveshnikova 1964, Mai & Walther 1988)
C. europaea (Sveshnikova 1964)
C. van-der-burghii (Grossmann 1991, Mai 1994, Martinetto 1995)
C. sp. (Walther 1999, Florin 1963, Mai & Walther 1988)

The pollen fossil record is found back to the Cretaceous in Asia and North America and as recently as the Quaternary in Asia and Europe.

Liu & Bassinger (2000) consider all reports listed in the pollen record of

Cathaya and *Cathaya*-like fossils, with names as applied by the original authors, are assignable to either the form taxon *Pityosporites microalatus* or to *Cathaya gaussenii*.

Those authors with taxon assigned to *Cathaya* include -

Sivak (1976): *Cathaya erdtmanii, C. van campoae, C. gaussenii, C. krutzschii, C. wilsonii, C. potoniei, C. scheuringii, C. uenoi, C. millayi, C. ponsii, C. tingii*.

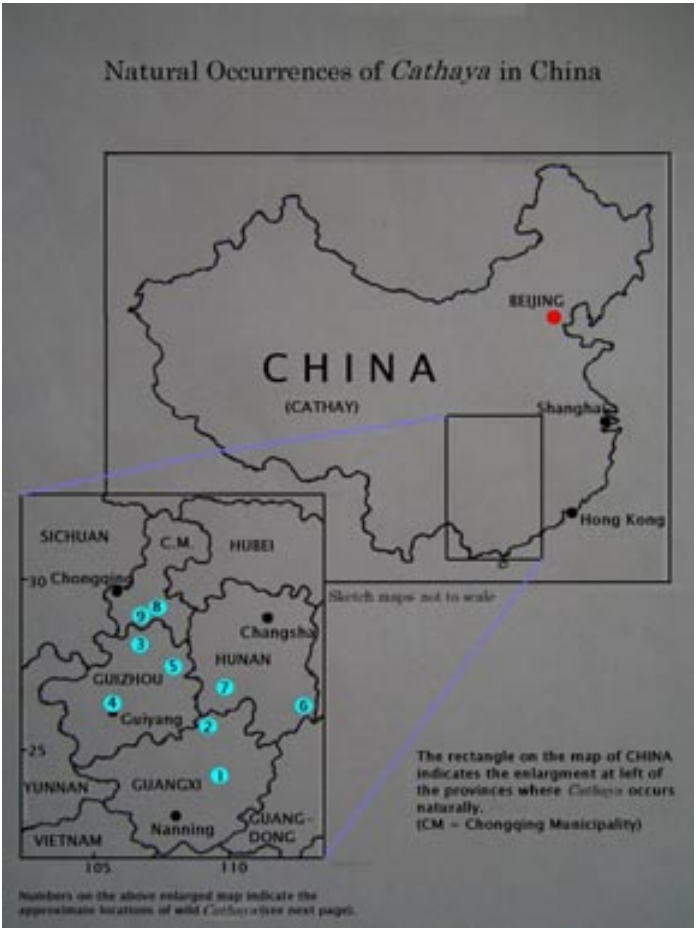
Liu et al (1997): *C. zhejiangensis*.

Meller et al (1999): *C.* sp.

Nagy (1985): *C. gaussenii, C.pseudocristata, C. pulaensis*.

Klaus (1984): *C. antiqua*.

Natural Occurrences of *Cathaya* in China



Province / Region	Number On map	Location (Reserve area in ha)
GUANGXI ZHUANG AUTONOMOUS REGION	1	Dayao Mountain Nature Reserve (aka Dayao Shan National Forest Park) Established 1982. Jinxiu County. (13,500 ha)
	2	Huaping Nature Reserve (aka Huaping Primeval Forest) Established 1961. Sanmen, Longsheng County (type specimen of *Cathaya argyrophylla* found here in 1955 near Yezhutang, Southern slope of Mount Hongya between 1340 and 1480 metres altitude). Also near Longsheng at 1240 m. (17,400 ha)
GUIZHOU	3	Cathay Silver Fir Nature Reserve (aka Dashahe Cathaya Reserve) Established 1984. Daozhen Xian, Daozhen County. (4600 ha)
	4	Forest Reserve of Guizhou Botanical Garden. Founded 1964. Liuchongguan, Guiyang.
	5	Mount Fanjing Nature Reserve. Established 1978. Jiangkou County. (41,902 ha)
HUNAN	6	Dingliao Nature Reserve. Established 1986. Zixing County / Bamian Mountain Nature Reserve est. 1982. Guidong County.
	7	Ziyunwanfeng Mountain Nature Reserve. Established 1982. Xinning and Chengbu Counties. *Cathaya argyrophylla* occurs between 940 – 1870 m. (22,840 ha)
CHONGQING MUNICIPALITY (previously part of Sichuan Province)	8	Wulong County.
	9	Jinfo Mountains Nature Reserve. Established 1979. Nanchuan County. (*Cathaya nanchuanensis*, now regarded as an ecotype of *C. argyrophylla*, found here in 1955). Occurs around 1600 – 1800 m. (900 ha)

References: Farjon(1990,1999), Fu, Li & Mill(1999), Li & Zhao(1989), Tang(1987).

Additionally, *Cathaya argyrophylla* is said to occur at Luohandong in Hunan province and in Tongzi county, Guizhou province (Farjon 2001, Walter & Gillett 1998). The approximate position of these two localities has not been determined and is therefore not indicated on the map.

Stop Press: Tongzi county has been located S-W of Daozhen **3**, midway between Guiyang and Chongqing cities.

Footnote: The Chinese word for mountain is shan and is placed after the mountain's name, eg. Mount Fanjing becomes Fanjing Shan. Alternatively Dayao Shan becomes Dayao Mountain in English.

Distribution and climate for living *Cathaya*

During the Quaternary Period, plants of the Cathay Fir genus died out throughout most of Eurasia mainly due to extensive glaciation resulting from periods of global cooling. *Cathaya* has managed to survive only in a few unaffected areas in China as an endemic monotypic genus, occurring in fragmented populations over an area of almost 200,000 sq. km. in the central-southern region of that country (refer to map p.156).

The table accompanying the map gives details of the known natural occurrences of *Cathaya argyrophylla* in China.

Cathaya argyrophylla occurs in the subtropical to warm temperate zone on steep exposed mountain slopes, ridges and vertical cliffs between 900 and 1900 metres and hence experiences cool summers, winter snow, frequent fogs and

high humidity / rainfall. The mountains are mainly of limestone formation such as the Dalou Shan straddling the Chongqing Municipality – Guizhou provincial border, where *Cathaya argyrophylla* is protected at Jinfo Mountains Nature Reserve in the former and at Dashahe Cathaya Reserve across the border in Guizhou.

Cathaya also grows on limestone at Dayao Mountain Nature Reserve in Guangxi Autonomous Region, however the *Cathaya* in Huaping Nature Reserve in Guangxi province are growing on a sandstone section of Mount Hongya, in a warm wet climate with average annual temperatures of 16-20 degrees C and average annual rainfall of over 2000 mm (ca 80 in.). Cathay Silver Firs require plenty of sunshine and lots of moisture with good drainage and the above combination of geography and climate provides *Cathaya* with its preferred situation away from the competition of the broad-leaved evergreens.

References: Farjon (1990), Li & Zhao (1989), Tang (1987), Sun & Yang (1989), Wharton, Hine & Justice (2005), Zhao et al. (1990).

Plant associates in habitat

Growing in the vicinity of the Cathay Silver Firs at Huaping Nature Reserve in Guangxi are Guangdong pine (*Pinus kwangtungensis*), Fujian cypress (*Fokienia hodginsii*), a vulnerable monotypic genus in the Cupressaceae, various evergreen *Castanopsis* species in the Fagaceae, *Schima argentea* in the Theaceae, numerous Rhododendrons including *R. brevinerve, R. chrysocalyx, R. kwangfuense* plus *R. versicolor*, endemic to the reserve. There are also small numbers of deciduous trees including *Liquidambar acalycina* and *Acer sinense* in close proximity. (Li & Zhao 1989, Tang 1987).

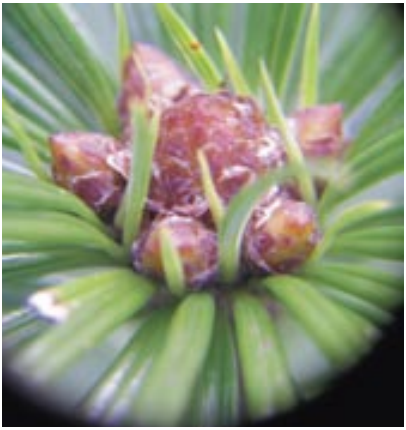
Except for the relatively small natural Forest Reserve which accounts for probably little more than half the total area of Guizhou Botanical Garden's 88 ha, the nature reserves in China which protect populations of Cathay Silver Fir range from 900 ha at Jinfo Mountains Nature Reserve to 41,902 ha at Mount Fanjing Nature Reserve. The Cathay Silver Firs being a small component of the forested areas of the reserves, it is impossible to ascertain the immediate plant associates from mentions in various publications of plant species ranging throughout such large areas.

Conservation status

Huaping and Jinfo Nature Reserves were established in 1961 and 1979 respectively to save the rare and endangered "living fossil" Cathay Silver Fir from threatened extinction and it was estimated by the 1980's that these 2 reserves contained approx. 400 of the trees (Li & Zhao 1989). A survey by the Guangxi Institute of Biology in 1979 had accounted for 1,040 Cathay Silver Firs at 6 different sites in the region, the largest colony with 300 trees and the smallest consisting of a single tree (Tang 1987), leaving the remaining 4 localities with an average 185 trees each, which are quite small vulnerable populations.

In a more recent paper by Ge, Song et al. of the Laboratory of Systematic and

Some features of *Cathaya argyrophylla*



Top left, Second year stem of *Cathaya argyrophylla* showing the characteristic furrows between the decurrent bases of the linear leaves.

Top right, Juvenile leaves showing the 2 broad silver-white stomatal bands either side of the raised midrib, and the ciliate hairs at the margins. These hairs fall away as the leaf matures.

Bottom left, Seeds of *Cathaya argyrophylla* minus the terminal membranous wings.

Bottom right, Dormant, slightly resinous axillary buds clustered around apical bud.

Evolutionary Botany, Beijing, the number of Cathay Silver Firs was put at less than 4,000 individual trees. Not having seen this paper, it must be assumed that all or most of these trees are protected in the 12 nature reserves listed previously, 10 of which are indicated on the accompanying map.

Tang (1987) reported that these irreplaceable plants could die out due to poor viability and adaptability, poor germination, slow growth in competition with overshadowing broadleaves and numerous other factors, and that few seedlings or young trees are found in the reserves of Hunan and Guizhou provinces, and the former area of Sichuan now incorporated into Chongqing Municipality.

Despite this bleak picture, Farjon (1998) believes this subtropical conifer is neither rare nor threatened. In a World List of Threatened Conifer Species (Farjon 1996), *Cathaya argyrophylla* scored a lowly 12, while the highest score of 28 was achieved by *Metasequoia glyptostroboides* and also the then recently discovered *Wollemia nobilis*.

What is interesting is that Langlois (2005) gives a figure of about 5,400 trees of *Metasequoia glyptostroboides* occurring in a natural grove in the Xiaohe Valley (aka Metasequoia Valley), Lichuan County, Hubei province, with a few isolated trees located in Hunan province.

As the total number of *Metasequoia* appears to exceed that of *Cathaya* by at least 35% and far outweighs the number of wild Wollemia nobilis, reported to be fewer than 100 adult trees and about 200-300 juveniles/seedlings (Department of Environment and Conservation, NSW, Oct. 2005), there appears to be a discrepancy in the weighted value system used to arrive at these figures and perhaps the threatened status of *Cathaya argyrophylla* should be reviewed, and possibly revised upwards?

Date of introduction outside China

Seed was first officially allowed out of China in commercial quantities in 1998, more than 40 years after its discovery. Sheffield's Seed Co. in Locke, New York were one of the recipients of this first seed distribution, receiving 2 lb in 1998 and ½ lb in 1999 and a further 2 lb+ in Feb 2005 (this seed has since been distributed worldwide, with about 30% of the 2005 shipment still available to purchase in March 2007 – provenance unknown, location China). In 2005, I was informed by another American seed company that a French company (unnamed) had acquired seeds "through the back door" prior to then. The Sydney RBG acquired cultivated *Cathaya argyrophylla* material early 1993 from Xinning Forestry Research Institute, Hunan, Accession No 933632. The records failed to show if the material was seed, cuttings or living plants (this information is usually recorded). It was entered as "no longer in the nursery" at a stocktake on 19 May 2003 (Simon Goodwin, Plant Records Officer, Sydney RBG – pers. comm.).

Missouri Botanical Garden, St. Louis, USA received 4 seeds in 1995 from Professor Fu Li-Kuo, Academia Sinica, Institute of Botany, Beijing, Accession No. 1995/2457. The unknown number of seeds that germinated died in Feb.

1996. An unknown quantity of seeds received from Iseli Nursery, Oregon early 1999 Accession No. 1999/0102 didn't germinate. Two seedlings received from the Arnold Arboretum in 2000 Accession Nos. 2000/0839 and 2000/0840 subsequently died (Chip Tynan, pers. comm.).

The earliest year of introduction I have been able to find for surviving *Cathaya argyrophylla* is 1995(?) when seeds were received by the Royal Botanic Garden, Edinburgh, Scotland from Shenzhen Botanical Garden in China.

It would be interesting to know whether the two Japanese collectors met by a botanical tour group led by Roy Lancaster to China in 1980 and who indicated their intention of finding the Cathayas of the Golden Buddha Mountains in SE Sichuan (Lancaster, 1981) succeeded in introducing seed or plants to Japan in that year.

Known cultivated sites

(Temperature Range indicated where known)
In China:

- Experimental Station of Guangxi Institute of Biology, Hongtan (largest tree was 3.5 metres high at 17 years old ca. 1982)
- Fairy Lake Botanical Garden, Shenzhen, Guangdong.
- Guilin Botanical Garden, Yanshan, Guangxi Zhuang Autonomous Region. 38 deg to –4 deg C
- Kunming Botanical Garden, Yunnan (1972). 33 deg to –5.4 deg C
- Nanjing Sun Yat-sen Botanical Garden, Jiangsu.
- Shanghai Botanical Garden, Shanghai Municipality. 40.2 deg to –12.1 deg C
- South China Botanical Garden, Guangdong, Guangzhou. 38 deg to –0.8 deg C
- Wuhan Botanical Garden (nursery area), Hubei. 40 deg to –18 deg C
- Xinning Forestry Research Institute, Hunan.

Elsewhere:

- Australian Bicentennial Arboretum, Southern Highlands, New South Wales (plants 5 years from seed, Apr 2003 Nos. 1616, 1617, May 2003 Nos. 1649-1651, Dec. 2004, No. 1871, May 2005 ex-RTBG, No. 1915).
- Arboretum de Villardebelle, France (?).
- Arnold Arboretum, Jamaica Plain, Boston, Massachusetts, USA (50 seeds from RBG , Edinburgh, Scotland, 1995 - A. A. Newsletter, Fall 1995) – no seedlings resulted. Further seeds from Fairy Lake Botanical Garden, Shenzhen, China in 1998 accession no. 276-98 with excellent germination, seedlings being widely distributed in USA. Largest of 7 plants planted outdoor in 2002 over 1m tall, with no winter hardiness problems in Boston – USDA Hardiness Zone 6. (Peter Del Tredici, pers. comm.).
- Bedgebury National Pinetum and Forest, Kent , England – 1oz of seed from Sheffield's Seeds, USA (ex-China) Dec. 2001 resulting in 100

seedlings distributed to various UK gardens. Also plants from RBG, Edinburgh wild collected Xinning County, Hunan, China between 940–1870m. Date of receipt not stated. (Daniel Luscombe, pers. comm.).

- Royal Botanic Garden, Edinburgh, Scotland (seeds from Shenzhen B.G., China). (Also under Bedgebury above).
- JC Raulston Arboretum, North Carolina State University, USA (50 seeds from Iseli Nursery, Oregon, 28 Jan. 1999 accession no. 99.0058).
- Royal Tasmanian Botanical Gardens, Hobart (seeds from RBG Edinburgh, Scotland 13 Nov. 1998 accession no. 98.0803, 7 of 24 seeds germinated, 3 dying as seedlings – Natalie Papworth, pers. comm.).
- The Tasmanian Arboretum, Eugenana (2 plants from Royal Tasmanian B.G., 25 Nov. 2005).

Propagation

Tang (1987) mentions cultivated trees with male flowers at 17 years, but it was not then known at what age female cones would be produced, and I have been unable to ascertain this. He mentions seed collected from natural populations having poor viability, which partly explains the tree's low natural regeneration, and he states that only with years of experimentation was the germination rate (in cultivation) raised from 4% to over 90%.

Seed distributed by Sheffield's Seed Company, NY, has a stated (tested) germination rate of 63% and a purity of 99%, with average seeds per pound stated as 27,694 (ca 61,000 per kg).

As well as by seeds, Cathay Silver Firs may be propagated by aerial layering and Tang (1987) reports the Chinese grafting scions onto rooted stocks of *Pinus eliottii,* the slash pine of south-eastern USA. I have heard of a nursery resorting to cuttings to increase stock, but do not know how successful this is.

The frost tolerance of recently germinated seedlings is not known.

Cultural requirements

Rushforth (1987) makes the observation that *Cathaya* "comes from sufficiently great an altitude to suggest that it will be hardy" which I take to mean "in cool temperate climates". Referring to the known cultivated sites, it can be seen that two of the Chinese botanic gardens where *Cathaya argyrophylla* is cultivated, Shanghai and Wuhan, experience minimum winter temperatures of –12.1 degrees C and –18.0 degrees C respectively, so this gives an idea as to where plants might be expected to survive. The plant's other cultural requirements can be gleaned from the earlier section on distribution and climate.

Commercial and medicinal uses

Tang (1987) reports *Cathaya argyrophylla*'s suitability as a landscape tree and mentions its potential as high-grade timber for construction, ship-building, railway ties, furniture. I certainly agree that it makes an excellent garden specimen. He also states that its bark, leaves and cones possess medicinal properties (not stated) and that its seeds contain a high percentage of oil.

Cathaya argyrophylla – in commerce and cultivation

Top left, In 1992, the post office of the People's Republic of China issued stamps featuring Cathay Silver Fir (shown here), Dawn Redwood, *Taiwania* and Beshan Fir, all rare Chinese conifers.

Top right, Skippy the Swamp Wallaby checks out the Chinese 'living fossil'.

Bottom left, *Cathaya argyrophylla* makes a most ornamental tree, ultimately for the medium or large garden.

Bottom right, The leaves at the ends of the branchlets splay out in a rosette-like pattern.

However Farjon (1998) stated that it didn't appear to be of high economic value in forestry or horticulture.

Readers interested in acquiring a Cathay Silver Fir for their gardens should check the Plant Finders/Locators for their country.

Cathaya argyrophylla is listed in the RHS Plant Finder 2006-2007 as available from Pan-Global Plants in Gloucestershire, and it is also available from the H. Kolster Nursery in the Netherlands. Also perhaps Porterhowse Farms Nursery in Sandy, Oregon, USA, has it available for sale now (item 1222), and maybe Yamina Rare Plants in Australia also.

In conclusion, I hope I have shed some light on *Cathaya argyrophylla* which until recently has been an obscure, yet in reality is a most fascinating conifer.

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Footnote The planned article on *Cathaya argyrophylla* in Worldwide Cultivation has been held over for a future issue to allow for more respondents. If you have a Cathay Silver Fir in your garden or know of one elsewhere, please forward known cultivation details, including location, age, height (it will be interesting to note growth rates in future years), provenance and any further details of interest to readers as follows:

Chris Callaghan, Australian Bicentennial Arboretum, P.O. Box 88, Penshurst, NSW 2222, Australia or email callaghan_aba@yahoo.com.au.
Thanks to all who have so far responded.