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ABIES CHENGII
A previously overlooked Chinese Silver Fir

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ABSTRACT. *Abies chengii* Rushforth is described from cultivated material. Seed of this species was originally distributed under the number *Forrest* 30663, but does not correspond to the herbarium specimen of the same number, which is *A. chensiensis* van Tieghem. The new species is most closely related to *A. forrestii* C. C. Rogers and *A. salouenensis* Bordères-rey & Gaussen but the cultivated trees have previously been grown as *A. chensiensis* or *A. fargesii* Franchet.

Among the Sino-Himalayan taxa of *Abies* in cultivation in the United Kingdom, Eire and the USA, there are a number of trees masquerading under the names *A. chensiensis* van Tieghem or *A. fargesii* Franchet which do not equate with the type material of either species. These trees are more closely related to *A. forrestii* C. C. Rogers, but also differ from that species. Although all the *Abies* sheets from the Sino-Himalayan region at E, K, BM and the Fan Memorial Institute, Beijing, and selected material from P, Arnold Arboretum and the Toulouse Forestry Herbarium have been examined, no specimen matching these trees has been found, and they are therefore described here as a new species, *Abies chengii*.

The trees are usually cultivated as *A. chensiensis*, often under *Forrest* 30663, the herbarium material of which is actually genuine *A. chensiensis* (Orr, 1933). Investigation has shown that, in fact, most of the trees came from seed distributed under *Forrest* 30663, and there is strong circumstantial evidence to indicate that all the others are derived directly or indirectly from the same source. Other examples are known from Forrest's last expedition where seed and herbarium material do not correlate, e.g. in *Abies F.* 30583 and *F.* 30975, but it is not known whether the muddle occurred in China after Forrest's death or in the United Kingdom.

In the early 1950s some trees of *A. chengii* were misidentified as *A. fargesii* (Hillier, pers. comm.; Harrison, pers. comm.). This name has been used for trees at the Hillier Arboretum, Westonbirt and Castlewellan and by Hillier (1974), and Mitchell (1972, '74).

Abies chengii Rushforth, **sp. nov.** Fig. 1.
Syn.: *A. chensiensis* Hort., non van Tieghem
A. fargesii Hort., non Franchet

A. forrestii C. C. Rogers affinis sed characteribus secundis recedit: folia longiora, usque ad 4cm, raro 6cm, subtus fasciebus stomatium pallidis vel albido-viridibus; ramuli annotini aurantiaco-fusci; gemmae ovoideo-conicae, pallide fuscae, resinosae sed non valde resinosae; strobili bracteis occultis vel cuspidibus exsertis usque 1–2mm; bracteae obdeltoideae.

Allied to *Abies forrestii* C. C. Rogers but separated by the following characters: leaves longer, to 4cm, rarely 6cm, with pale or whitish green

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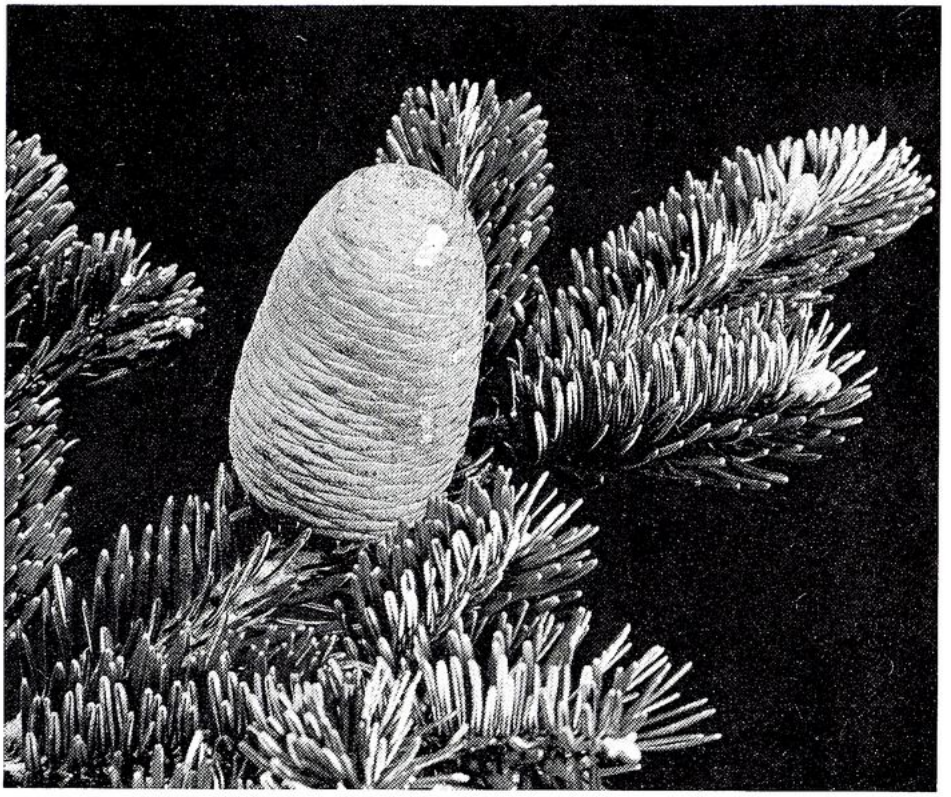

FIG. 1. *Abies chengii* showing mature cone and coning shoot foliage. Type specimen (*KR* 423) × approx. 0.75

bands of stomata beneath; last year's shoots orange-brown; buds ovoid-cylindric, pale brown, resinous but not thickly resinous; cones with bract-scales hidden or with the cusps exserted to 1–2mm.

Tree to 20m. *Bark* grey, smooth, becoming fissured and scaly at the base. *Shoot* in first year mahogany-coloured, somewhat glossy, slightly grooved, glabrous or sparsely hairy along the faint grooves; second-year shoots glabrous, shiny orange-brown, slightly fissured along the grooves of the previous year, becoming darker brown in the third year; shoot usually paler and more shiny above. *Bud* conical or ovoid-conical, somewhat globular on weak shoots, pale brown, covered with a thick resin almost obliterating the bud-scales; scales triangular, persisting for 3 or more years around shoot. *Foliage* on sterile shoots of the lower crown adpressed, the side leaves pointing forward at 45° and the upper leaves rising at 45–80° from the shoot, arrangement parted with a distinct V-groove above; arrangement on epicormic and heavily shaded shoots widely parted or fully pectinate above and below. *Leaves* 1.5–4(–6)cm × 2.5–3mm, longest about the middle of each year's growth, those above the shoot about half the length of those at the side, linear, slightly broader in the middle, narrowing abruptly to a short 'twisted' petiole, apex rounded, bifid, upper surface with a distinct

median groove, lower surface nearly flat with a distinct midrib, margins acute in TS, resin-canals marginal; glossy dark green, without stomata above, stomata below in two pale or whitish-green, somewhat waxy bands 1.5 × width of glossy midrib and 3 × width of glossy margins, 'petiole' yellow-green. *Foliage on coning shoots differs in the following respects*: leaves on upper surface of shoot more erect and becoming progressively shorter towards the centre, forming a foliar plateau with a V-shaped central groove; leaves 1.0–3.0cm with apex rounded and notched or acute, mucronate or acuminate, usually with a small patch of stomata in a groove on the upper surface near the tip. *Mature cone* ovoid-cylindric, dimple-tipped, 6.0–9.0cm, violet during growing season, becoming brown when mature, resinous, stalk 1.0–1.5cm. *Bract-scales* 1.8 × 0.9cm, included or with cusps exserted for 2.0–2.5mm especially near base of cone, rarely exserted near apex, spathulate or obdeltoid with abrupt cusp, occasionally with two sinuses on truncate apex (thus giving tripartite apex), incised or erose. *Ovuliferous scale* 2.2 × 2.6cm, auricled, margins erose. *Seed* pale brown, 1.1 × 0.4cm; seed-wing 1.9 × 1.1cm, obdeltoid, brown and black.
Type. Cultivated tree at Westonbirt Arboretum, England, 15m tall, 30cm d.b.h., 3 iii 1983, *K. Rushforth* 423 (holo. E).

The diagnostic characters of *A. chengii*, *A. chensiensis*, *A. fargesii* and *A. forrestii* are compared in Table 1.

Abies chengii is better adapted to the drier climate of southern England than *A. forrestii* but is found growing as far north as Crathes Castle in Grampian, Scotland. It is an attractive tree but not as beautiful as *A. forrestii*, *A. fargesii* or *A. delavayi* Franchet, as the colour of the cones is not so bright and the leaves are not vivid glaucous silver beneath.

In some respects *A. chengii* is intermediate between *A. forrestii* and *A. salouenensis* Bordères-Rey & Gaussen. It resembles *A. salouenensis* in bud-shape, character of the epicormic shoots and length of needles, while its leaf-section is similar in detail to both species. However, in a number of characters *A. chengii* is clearly more closely associated with *A. forrestii* and its relatives, e.g. arrangement of foliage, resinous buds, colour of the growing cones, dimpled apex of the mature cone, and the size of the bract-scale. It is also clearly related to *A. forrestii* in its crown habit and branch cross-section, which is oval with long axis vertical, not round.

Until *A. chengii* has been found in the wild I consider that it is better to consider it as a true species, rather than postulate a possible hybrid origin.

The species is dedicated to Prof. Cheng Wan-chun of the Chinese Academy of Forestry, Beijing.

ACKNOWLEDGEMENTS

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TABLE 1

	A. chensiensis	**A. fargesii**	**A. chengii**	**A. forrestii**	**A. salouenensis**
Buds	conical or ovoid-conical	conical	conical or ovoid-conical, only globose on weak shoots	globose	conical
	not or slightly resinous	resinous	resinous but buds separate	very resinous, resin usually joining all three terminal buds of strong shoots	resinous or slightly resinous
	brown	purple	pale brown	dark red, becoming white due to resin clouding	brown or pale brown
	large, often over 3mm	small, less than 3mm	large, over 3mm	very large, up to 10mm	large, over 3mm
Shoots	ash-grey, for 3 winters	purple in 1st winter, paler in 2nd & 3rd winters	mahogany in 1st winter, orange-brown, shiny in 2nd winter	red-brown for 2 winters	fawn-brown in 1st winter, ash-grey in 2nd & 3rd winters
Leaves	1.5–4.5cm	1.0–2.5cm	1.5–6cm on sterile shoots	1.5–3.5cm	1.5–9cm on sterile shoots
	apex acute or rounded, notched	apex rounded, notched, acute or acuminate on strong shoots	apex rounded, bifid	apex notched but not bifid	apex bifid
	stomatal bands green or whitish-green	stomatal bands vivid glaucous silver	stomatal bands pale or whitish-green	stomatal bands white or glaucous silver	stomatal bands green or whitish-green
	arrangement parted below the shoot, widely parted or with wide V-groove above	arrangement parted below the shoot, pointing forwards, and rising above, with or without a narrow V-groove	arrangement parted below the shoot, parted or with an obvious V-groove above the shoot	arrangement parted or radial below the shoot, rising above the shoot without a V-groove, except on shaded shoots	arrangement parted below the shoot, widely parted or with wide V-groove above the shoot
Bark	smooth, fissured in old trees, grey or pale brown	finely flaky, brown	smooth, becoming fissured in old trees, grey-brown	smooth, becoming fissured in old trees, grey	slightly flaky or smooth, becoming fissured in old trees, pale brown

Branches	round in t.s.	round in t.s.	oval in t.s.	oval in t.s.	round in t.s.
Resin canals	marginal, except in female coning shoots	median	marginal	marginal	marginal
Cones (in growing season)	green	indigo	violet	violet	green or greenish-brown
Mature cones	cylindric or cylindric-conic	ovoid	ovoid-cylindric	ovoid or barrel-shaped, rarely cylindric	cylindric, rarely ovoid-cylindric
	9–13cm	2.5–6cm	6–9cm	6–10cm	8–14cm
	bract-scales & cusps included, about $\frac{1}{2}$ length of ovuliferous scales	bract-scales & cusps exserted, longer than ovuliferous scales	bract-scales & cusps included or cusp-tips only exserted, approx. equal to ovuliferous scales	bract-scales & cusps exserted, longer than ovuliferous scales	bract-scales & cusps included, $\frac{1}{4}$–$\frac{1}{2}$ length of ovuliferous scales
	bract-scales rounded	bract-scales spathulate	bract-scales obdeltoid, may be tripartite at apex	bract-scales spathulate	bract-scales rounded
	cusp 0.1–0.2cm	cusp 0.3–0.6cm	cusp to 0.3cm	cusp 0.3 to 1.0cm	cusp 0.1 to 0.2cm
	cone-apex acute or rounded	cone-apex rounded or shallowly dimpled	cone-apex dimpled	cone-apex dimpled	cone-apex acute or rounded
Rachis	conical	fusiform	cylindric-conical	fusiform, rarely cylindric-conical	conical

I also wish to thank the directors of the herbaria of the Mus. Nat. d'Histoire Naturelle, Paris, the Arnold Arboretum, and the Laboratoire Forestière de Toulouse for providing herbarium material on loan and to J. A. Witt for sending me scions of trees cultivated at the University of Washington. Helpful advice and comments have been received from Dr. C. N. Page, D. M. Henderson, P. J. B. Woods, D. Hunt, A. F. Mitchell and others. Finally I should like to thank the owners or administrators of all the arboreta which have allowed me free access to their plants.

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