

## Two rare new species of *Isotropis* (Fabaceae: Faboideae: Mirbelieae) from tropical northern Australia

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### Abstract

Two new species, *Isotropis browniae* and *I. faucicola* (Fabaceae) are described from the Victoria River region of the Northern Territory and adjacent Kimberley region in Western Australia. Distribution maps, conservation status and the morphological similarities with the related species *I. atropurpurea*, are presented.

### Introduction

*Isotropis* Benth. is a small Australian endemic genus of thirteen currently recognised species. The majority of the species occur in either arid or dry tropical Australia, although four species do occur in temperate Australia. The genus is delineated by the following suite of characters: herbs or shrubs; simple or unifoliolate leaves; calyx tube shorter than lobes or almost absent; ovary pubescent; fruit a turgid pod that is linear to oblong; seeds 4 to many, aril absent. On the analysis of the tribe Mirbelieae (Crisp and Weston 1987), *Isotropis* belongs to the *Daviesia* group, although its position was not highly supported.

The genus was first described by Bentham in 1837 based on material collected by Hügel in the King George Sound (Albany) region. The closest to a full revision of the genus was carried out by Bentham (1864) who recognised seven species. Various authors have described additional species or subspecies since 1864 with the most recent being by Maconochie (1980), Crisp (1984) and Keighery (2001), bringing the total to thirteen.

Both species described here are the result of recent collecting activities either in the form of a targeted rare species survey in the Victoria River region or species inventory of poorly known conservation reserves. The Northern Territory Herbarium staff recognised these as putatively undescribed taxa and raised informal 'phrase' names.

The botanical bioregions used in this paper follow Chippendale (1971) for the Northern Territory and Thackway and Cresswell (1995) for Western Australia.

## Description of new species

*Isotropis browniae* Jobson, sp. nov.

Figs 1–3, 7

**Informal name:** *Isotropis* sp. Spirit Hills (D.J. Dixon 1632) NT Herbarium

**Diagnosis:** Annual; stems, leaves and calyx covered in crisped to arcuate, shining loosely appressed hairs, often with an overlayer of twisted, spreading hairs; margin of bract and bracteole with hardened red-brown protuberances; flowers with corolla orange-red; seed surface cancellate.

**Type:** Australia: Northern Territory: Victoria River: Keep River National Park, Spirit Hills [precise locality withheld for conservation reasons], 25 Mar 2009, *I.D. Cowie* 12333 (holo: DNA D0191305; iso: AD, B, BRI, CANB, K, L, MEL, MO, NSW, NT, PERTH).

*Erect* single stemmed annual, 0.5–1 m high. *Stems* green to green-yellow, covered in crisped to arcuate, shiny loosely appressed hairs, often with sparse overlayer of twisted spreading hairs. *Branches* and branchlets green to green-yellow, closely ribbed, stems hairy, but surface not completely obscured, surface colliculate. Hairs on stems, petiole, lamina surfaces, rhachis, pedicels, adaxial surface of bracts, and calyx covered in crisped to arcuate, shiny loosely appressed hairs; lamina surface often also with a sparse overlayer of twisted spreading hairs on both surfaces, although adaxial surface with fewer hairs than abaxial surface; calyx also having sparse overlayer of longer twisted spreading hairs, longer hairs to 0.25 mm long. *Leaves* spreading to patent, rarely deflexed, ovate to broad ovate, unifoliolate; petiole green-yellow, 8–16 mm long, adaxial surface of petiole channelled, base of petiole dilated, rarely minute auriculate; pulvinus yellow-orange, hairy with spreading straight hairs, 2–2.5 mm long; lamina olive, venation at base of lamina palmate, body of lamina penninerved with obscure secondary venation, thin, (12–)18–28.5(–45) mm long, 11.5–22(–31) mm wide; apex obtuse, occasionally emarginate; mucro deflexed; base of lamina cordate or rounded; stipules present, inconspicuous, straw brown, terete, apex with hardened red-brown tip, hairy with spreading dense hairs, particularly near



**Figure 1:** Close up of flower of *Isotropis browniae*



**Figure 2:** Close up of fruit of *Isotropis browniae*



**Figure 3:** Habit of *Isotropis browniae*

the base, c. 0.75 mm long. *Inflorescence* terminal, 4–21-flowered, racemose. *Peduncles* absent. *Pedicels* present; rhachis covered in crisped to arcuate shiny loosely appressed hairs, (3.25–)9–12.5(–27) cm long. *Bracts* narrow elliptic, 1.25–1.75 mm long; adaxial surface covered in loosely appressed twisted white hairs; abaxial surface glabrous; margin with hardened red-brown protuberances. *Bracteoles* attached to pedicel 2–2.5 mm below calyx tube, linear to linear-elliptic, 1–1.5 mm long; surface covering and protuberances same as for bracts. *Buds* yellow-olive green, lobes imbricate, margin white. *Calyx* yellow-green; ribs inconspicuous, c. 5–12; calyx tube inconspicuous or absent, lobes greatly longer than tube; upper lobes rectangular to oblong with divergent acute apices and obvious mucro, notch deep v-shaped, 5–6 mm long; lower lobes narrowly elliptic, margin a mixture of fine crisped hairs and coarser hairs as for body of calyx. *Standard* broadly ovate, rarely tripartite, orange-red with faint red band and veining, spot at base yellow, notch at apex deep v-shaped separating upper lobe; lamina lobes ovate, tripartite standard with oblong lobes, lamina 6–7 mm long, 8.5–9.75 mm wide; claw yellow, 1.5–1.75 mm long, 0.75 mm wide. *Wings* oblong to spatulate, obtuse, orange-red at apex grading to pale yellow at base, upper margin auriculate; lamina 6–7 mm long, 3–3.5 mm wide; claw 1.75 mm long; auricle 0.5–0.75 mm long, 1 mm wide. *Keel* oblong-ovate in lateral view with apex obtuse and notch extending to lower margin, or keel petals not fused, lower margin curved upwards towards apex, upper margin auriculate, orange-red at apex grading to white at midpoint and continuing to base, 5.75–6.5 mm long, 3.75–4.25 mm wide; claw 1.25 mm long, auricle 0.75 mm long. *Stamens* articulated onto a sessile basal ring; filaments 5.25–7 mm long; anthers 1–1.25 mm long, versatile. *Gynoecium* 4.75–5.75 mm long; ovary covered in dense yellow-brown spreading hairs, 3.25–3.5 mm long; stipe covered in yellow spreading hairs, 1 mm long; style curved, with occasional hairs on either adaxial, abaxial or both surfaces near ovary, 1.5–2 mm long; stigma capitate. *Fruit* oblong to elliptic, turgid, olive green to light brown, densely covered with yellow-green crisped hairs, 18–25 mm long, 4.75–5.5 mm wide, calyx persistent, erect to spreading until fruit dehiscence. *Seeds* obovoid in outline, flattened, surface cancellate, yellow to olive green, 5–5.25 mm long.

**Additional specimens examined:** AUSTRALIA [precise localities withheld]: **Northern Territory:** Victoria River: Keep River National Park, Spirit Hills, 12 Mar 2006, *D.J. Dixon* 1632; 10 May 2008 (DNA), *I.D. Cowie* 12109 (DNA, BRI, MEL); 25 Mar 2009, *J. Westaway* 2862 (DNA). **Western Australia:** Victoria Bonaparte: Cockburn Range, S of Wyndham, 5 Apr 1999, *T. Handasyde* 99 489 (PERTH); W of Adolphus Island, Cambridge Gulf, N of Wyndham, 9 Apr 2013, *M.D. Barrett* 4361 (PERTH); Central Kimberley: Sir John Gorge, Mornington Sanctuary, 1 Jul 2009, *H. Dauncey* H 374 (PERTH).

**Distribution:** restricted to Spirit Hills area of Keep River National Park near the Western Australia – Northern Territory border and the East Kimberley region in Western Australia.

**Notes:** Parker and Biggs (2014) listed *I. browniae* (as ‘*I. Spirit Hills*’) as an addition to the Western Australian flora; however, a concerted effort made in April 2014 in PERTH, failed to locate the *Handasyde* and *Dauncey* specimens. Although I have not seen the Barrett collection, I have seen photographs of the plant collected and it matches the photos and specimens housed in DNA. Matt Barrett (*pers. comm.*) has seen the two missing specimens and assures me they match his collection.

**Habitat:** currently known to occur on sandstone screes below escarpments or in sheltered areas of rocky sandstone ridges. The Spirit Hills collection occurs in *Eucalyptus brachyandra* – *Planchonella* (*Pouteria*) *arnhemica* – *Terminalia latipes* open woodland with *Xanthostemon paradoxus* and *Triodia*. Occasional plants were also recorded in similar vegetation dominated by annual *Sorghum* or under small patches of vine thicket trees on steeper rocky ridges (Ian Cowie, *pers. comm.*). At the type locality it was recorded to be abundant after the previous dry season’s fire. The Western Australian collections occur in *Terminalia hadleyana* – *Cochlospermum fraseri* woodlands with *Triodia epactia*.

**Phenology:** Flowering has been recorded chiefly in late March to early April, with one occurrence in July; fruiting from March to May.

**Conservation Status:** Within the Northern Territory, *Isotropis browniae* is currently known from two populations approximately 5 km apart along the same creek drainage system with an Extent of Occurrence of just 1.5 km<sup>2</sup>. It is conserved within the Spirit Hills section of Keep River National Park but being an annual growing in a fire-prone habitat, the populations may be vulnerable to inappropriate fire regimes. A more accurate distribution or ecological responses are not known. Despite general flora surveys across the Spirit Hills area in several years, additional populations were not found and it appears to be rare (Ian Cowie, *pers. comm.*). The true distribution, abundance and threats are uncertain as the neighbouring areas have received very little targeted surveys. Using IUCN criteria and guidelines (IUCN 2001; IUCN Standards and Petitions Subcommittee 2010), the Northern Territory Herbarium reviewed and rated this species as Data Deficient (DD) in 2010.

The species is more widely distributed in the East Kimberley region, although all specimens cited record low individual numbers. It almost certainly responds to the same pressures as those observed in the Northern Territory. Based on current knowledge and a similar paucity of targeted surveys in the region, a Priority coding (Smith 2013) of P3 is suggested for Western Australian populations.

**Etymology:** this species honours my good friend and former colleague Elizabeth Anne Brown (15 November 1956 – 17 November 2013); we shared a house for a year, we inspired each other in our textile hobbies, we accompanied each other on field trips (including the memorable 1994 Bryophyte Workshop in Kuranda) and she was incredibly supportive and encouraging in my studies into the native legumes of Australia. She is permanently in my memories – mostly through her laugh.

***Isotropis faucicola* Jobson, sp. nov.**

**Figs 4–7**

**Informal name:** *Isotropis* sp. Joe Creek (J.L. Egan 4915) NT Herbarium

**Diagnosis:** Annual; stems, leaves and calyx with appressed to semi-appressed white hairs; stems with conspicuous linear ridges (on drying); stipules terete and hairy; flowers pale yellow; margin of bracts and bracteoles entire, but covered in loosely appressed white hairs; calyx reflexed during fruiting.

**Type:** Australia: Northern Territory: Victoria River: Gregory National Park: Joe Creek [precise locality withheld for conservation reasons], 26 Mar 2009, *I.D. Cowie 12339* & *J. Westaway* (holo: DNA D0191313; iso: AD, B, BRI, CANB, K, L, MEL, MO, NSW, NT, NY, PERTH).

*Erect* single stemmed, short lived perennial herb 0.5–1 m high. *Stems* green, with linear ridges (on drying), glabrous or glabrescent with semi-appressed white hairs. *Branches* and branchlets green with narrow linear ridges (on drying) sparsely pubescent with appressed minute white hairs, surface colliculate (often giving a shining appearance under the microscope), occasionally glabrous. *Leaves* spreading or patent, ovate to broadly elliptic, rarely narrowly elliptic, unifoliolate, covered in sparse appressed white hairs; petiole (7.5–)9–11(–12.5), green, sparsely to moderately pubescent with appressed minute white hairs, pulvinus yellow-orange, c. 1 mm long, hairy, particularly on abaxial surface, rarely glabrous, base of petiole dilated, slightly auriculate and often forming a slight decurrent flange with stem; lamina green, slightly discolourous, penninerved with venation obscure on adaxial surface, hairy on abaxial surface only, sparsely covered in appressed minute white hairs, thin, (15–)17–25(–29) mm long, (4–) 8–16(–18.5) mm wide; apex emarginate; stipules present, inconspicuous, light brown, caducous, c. 0.5 mm long, hairy, terete, narrow conical. *Inflorescence* terminal, 4–15-flowered, racemose. *Peduncles* absent. *Pedicels* covered with appressed minute white hairs or glabrescent; rhachis covered with appressed minute white hairs or glabrescent, 5.75–15.5(–30) cm long. *Bracts* linear to linear-elliptic 1.5 mm long, adaxial surface covered in loosely appressed white hairs, abaxial surface glabrous, margins entire.

*Bracteoles* attached to pedicel 0.75–1 mm below calyx tube, c. 0.75 mm long, linear to linear-ovate, adaxial surface covered in loosely appressed hairs, abaxial surface glabrous. *Buds* green, lobes imbricate and margins appearing white due to dense covering of white hairs. *Calyx* green, covered in sparse to moderately dense appressed white hairs 0.2 mm long; ribs inconspicuous, c. 20; calyx tube turbinate, lobes greatly longer than tube; upper lobes rectangular with shallow divergent apex and shallow emarginate notch, 5–6 mm long; lower lobes elliptic, margins with white crisped hairs. *Standard* broadly ovate, with deep v-notch separating lobes; lamina pale yellow with no obvious band, but with some veins bright yellow, 5–6 long, 5.25–5.75



Figure 4: Close up of flower of *Isotropis faucicola*



Figure 5: Close up of fruit of *Isotropis faucifolia*



**Figure 6: Habit of *Isotropis faucicola***

2000, R.A. Kerrigan 158 (DNA); 10 Apr 2001, C.R. Michell 2852 (DNA); 12 Mar 2010, K. Brennan 8333 (DNA); Victoria River Gorge, 12 May 1995, J. Egan 4962 (DNA); 21 Jun 2000, R.A. Kerrigan 211 (DNA); 1 May 2001, C.R. Michell 2853 (DNA); 4 May 2001, C.R. Michell 2854 (DNA); 5 May 2001, R.A. Kerrigan 348, 349 (DNA); 6 May 2001, C.P. Mangion 1074 (DNA); 7 May 2001, R.A. Kerrigan 347 & J. Pocock (DNA).

**Distribution:** restricted to the Victoria River Gorge and associated secondary gorges within the northern portion of Gregory National Park, Northern Territory.

**Habitat:** occurs in shady scree slopes below sandstone escarpments in *Livistonia victoriae* woodlands with *Xanthostemon*, *Erythrophleum chlorostachys* and *Triodia microstachya*.

**Phenology:** flowering has been recorded from March to May; fruiting pods with mature seed, collected from late March to June.

mm wide; claw pale yellow, 1.75 mm long, 1.25 mm wide. *Wings* oblong, curving upward, obtuse, pale yellow with yellow-orange markings along centre of lamina, upper margin auriculate; lamina 6.75–7.25 mm long, 2.5–3.25 mm wide; claw 1.25 mm long; auricle 1.0 mm long, 1 mm wide. *Keel* boat-shaped in lateral view with apex obtuse and notch extending to lower margin, yellow or orange-yellow near apex and suffused along body near base, 7–8 mm long, 3–4.5 mm wide; upper margin auriculate 0.5–1 mm long; claw c. 1 mm long. *Stamens* articulated in a sessile basal ring, filaments 6.5–8 mm long; anthers 1.25–1.5 mm long, versatile. *Gynoecium* 5.5–7.25 mm long; ovary covered with appressed white hairs, 3–3.5 mm long; stipe glabrous, hairy in upper ¼, dilated at attachment to sepals, 1.5–1.75 mm long; style hooked, scattered hairs on adaxial surface, 3–4 mm long; stigma capitate. *Fruit* elliptic, turgid, light brown to brown, occasionally with black spots on adaxial surface, sparsely covered with white appressed hairs, 16.5–21 mm long, 6.5–7 mm wide; calyx persistent and reflexed until fruit dehiscence. *Seeds* ovoid to reniform in outline, surface faintly cancellate, olive-green to brown, 3.5–4 mm long.

**Additional specimens examined:** AUSTRALIA [precise localities withheld]; **Northern Territory:** Victoria River: Gregory National Park: Joe Creek, 9 May 1995, J. Egan 4915 (DNA); 11 May 1995, J. Egan 4948 (DNA); 21 Jun

**Table 1: Comparison of morphological attributes of *Isotropis browniae*, *I. faucicola* and *I. atropurpurea***

Attribute	<i>Isotropis browniae</i>	<i>Isotropis faucicola</i>	<i>Isotropis atropurpurea</i>
Life Form	annual/ biannual	annual/ biannual	perennial
Hairs (stems, leaves, calyx)	crisped, some appearing arcuate (calyx with longer twisted hairs)	loosely appressed	crisped
Leaflet apex	obtuse, occasionally emarginate	emarginate	recurved, occasionally emarginate
Stipules	hairy, terminating in a ring of hairs appearing 'stellate'; or apex with hardened red-brown callus	hairy, no extra features	hairy, terminating in a ring of hairs appearing 'stellate'; or apex with hardened red-brown callus
Bract margin	coarse linear protuberances, easily broken off	entire	coarse linear protuberances, easily broken off
Flower colour (fresh)	orange-red	pale yellow	purple-red
Calyx ribs	5–12	c. 20	c. 5
Calyx in fruit	spreading and/or erect	reflexed	spreading and/or erect

**Conservation Status:** *Isotropis faucicola* is currently known from about five populations over an Extent of Occurrence of 164 km<sup>2</sup>. Although all are currently within the Gregory National Park, at least one population is close to a popular walking track and potentially liable to human interference such as flower picking. Using IUCN criteria and guidelines (IUCN 2001; IUCN Standards and Petitions Subcommittee 2010) the Northern Territory Herbarium has assessed the species to be Near Threatened (NT) and it is currently gazetted as this under the *Territory Parks and Wildlife Conservation Act* (2006).

**Etymology:** The specific epithet ‘faucicola’ is derived from the Latin *fauces* meaning throat or gorge and the suffix *cola* meaning dweller and in the botanical sense ‘growing on’, alluding to the preferred habitat of occurring in the Victoria River Gorge and associated gorges.

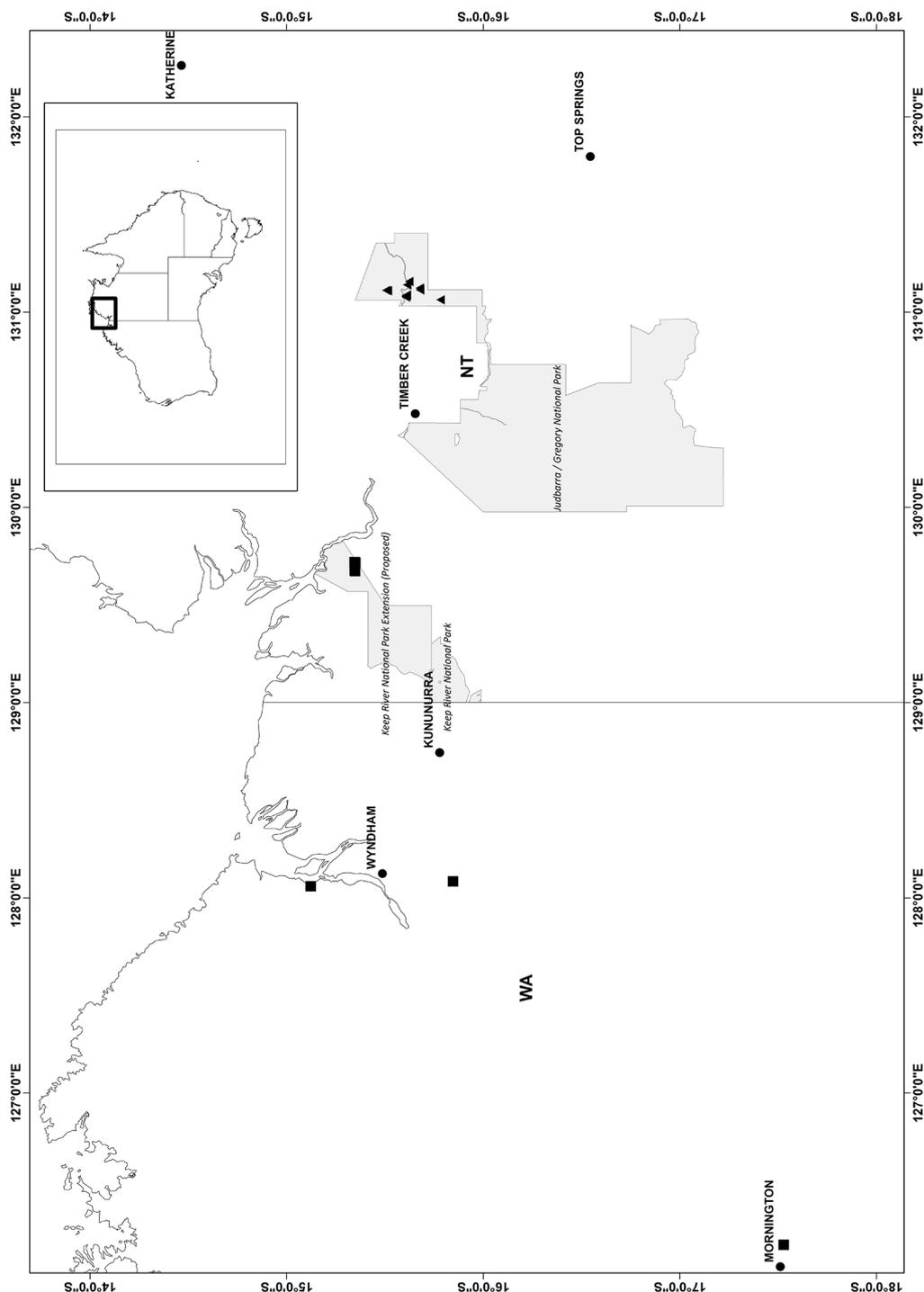


Figure 7: Distribution map of *Isotropis browniae* (solid square) and *I. faucicola* (solid triangle)

### Relationships within the *Isotropis atropurpurea* group

Both of these two new species, along with *I. foliosa* Crisp and *I. atropurpurea* F.Muell. form a natural group, hereby referred to as the *Isotropis atropurpurea* group. This grouping is characterised by the following characters: foliose unifoliolate leaves, elliptic to broadly ovate; indumentum obvious, particularly on calyx, ranges from crisped to sericeous to appressed and often coloured from white to rusty red, rarely green; inflorescence terminal with acropetal anthesis. The *Isotropis atropurpurea* group is sub-tropical to tropical in general distribution, and ranges from subcoastal ranges near Brisbane, to the drier slopes of the Great Dividing Range, the tropical savannah of the Northern Territory and Kimberley, through to arid areas of Central Australia and the Great Sandy Desert, extending to the ranges in the Pilbara bioregion.

Morphologically, the two new species described here are similar to each other, as well as to *I. atropurpurea*, even though these three species are separated geographically. Table 1 summarises the main morphological differences that readily separate these three species.

### Acknowledgments

Ian Cowie is thanked for his encouragement with this project; for providing the photographs used in this paper, collecting the type specimens; and for valuable comments on an earlier draft. Nick Cuff (DNA) prepared the map. Rob Davies (PERTH) searched for the missing Kimberley collection housed in the Western Australian Herbarium, and also made some comparisons of WA material of *I. atropurpurea* and was helpful in earlier discussions. Matt Barrett (Kings Park Botanic Garden and Authority) sent me photos and his collecting locality to verify the existence of *Isotropis browniae* in the Kimberley region. Finally, Barry Conn (NSW) and Murray Henwood (SYD), shared friends with Elizabeth Brown, are thanked for their invitation to contribute to this special volume and for their continued encouragement and support.

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