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# *Opegrapha trochodes*, a new widely distributed corticolous species

## *Opegrapha trochodes*, eine neue, weit verbreitete rindenbewohnende Art

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**Key words:** *Ascomycota, Arthoniales, Roccellaceae,* lichenized fungi, Taxonomy.

Schlagwörter: *Ascomycota, Arthoniales, Roccellaceae,* Flechtenpilze, Taxonomie.

**Summary:** A new corticolous lichen, *Opegrapha trochodes* COPPINS, F. BERGER & ERTZ sp. nov. *(Roccellaceae)*, is described from Africa, with further occurrences in Europe and Asia. It is characterized by its mainly rounded, gyrose, umbonate ascomata and 3-septate ascospores that lack a perispore.

Zusammenfassung: Eine neue rindenbewohnende Flechte, *Opegrapha trochodes* COPPINS, F. BERGER & ERTZ sp. nov. *(Roccellaceae)*, aus Afrika, mit weiteren Funden in Europa und Asien, wird beschrieben. Sie ist charakterisiert durch runde, kreisförmig gekrümmte, aufsitzende Fruchtkörper und 4-zellige Ascosporen, denen ein Perispor fehlt.

## Introduction

Since the 1990s, two of us (BJC and FB) have been aware of a distinctive, yet undescribed, corticolous *Opegrapha* with rounded, gyrose, umbonate ascomata occurring in humid, old woodlands in Europe. Subsequently, the same species became apparent among collections from Africa, the Indian Ocean and Taiwan during DE's studies on palaeotropical corticolous *Opegrapha* (ERTZ 2007, as *"O. pseudoconfertoides")*. Although, there is some variation among the collections from across the geographical range, we assign them all to the species newly described below.

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***Opegrapha trochodes*** COPPINS, F. BERGER & ERTZ sp. nov.

Thallus immersus vel tenuis, sordide griseoviridis vel fumosus, algae ad *Trentepohlias pertinentes*. Ascomata atra, epruinosa, desuper circularia vel quadrata aut pentagona, ad centrum demum umbonata, 0.2–0.4(–0.5) mm diam., margine in segmentis 4–5 diviso. Excipulum infra clausum, atrobrunneum, K+ viridescens. Ascosporae 3-septatae, (11–)13–18(–21) × (3–)3.8–5 µm, hyalinae vel demum brunneolae, pagina persistente laevi, perispora ut videtur absenti.

**Typus:** Zambia, along the road between Mwinilunga and Kanyama, Mujila River, alt. 1377 m, 11°30′42°9″S, 24° 27′25.5″E, riverine forest, trunk in a dense forest, 17 iv 2004, *Ertz* 6254 (BR–holotypus, E–isotypus).

**Etymology:** meaning 'wheel-like' (from Gr. τροχος = wheel), and from the uncanny resemblance of the ascomata to those of *Lecidea trochodes* (TAYLOR ex LEIGHT.) CROMB. (=*Rimularia limborina* NYL.).

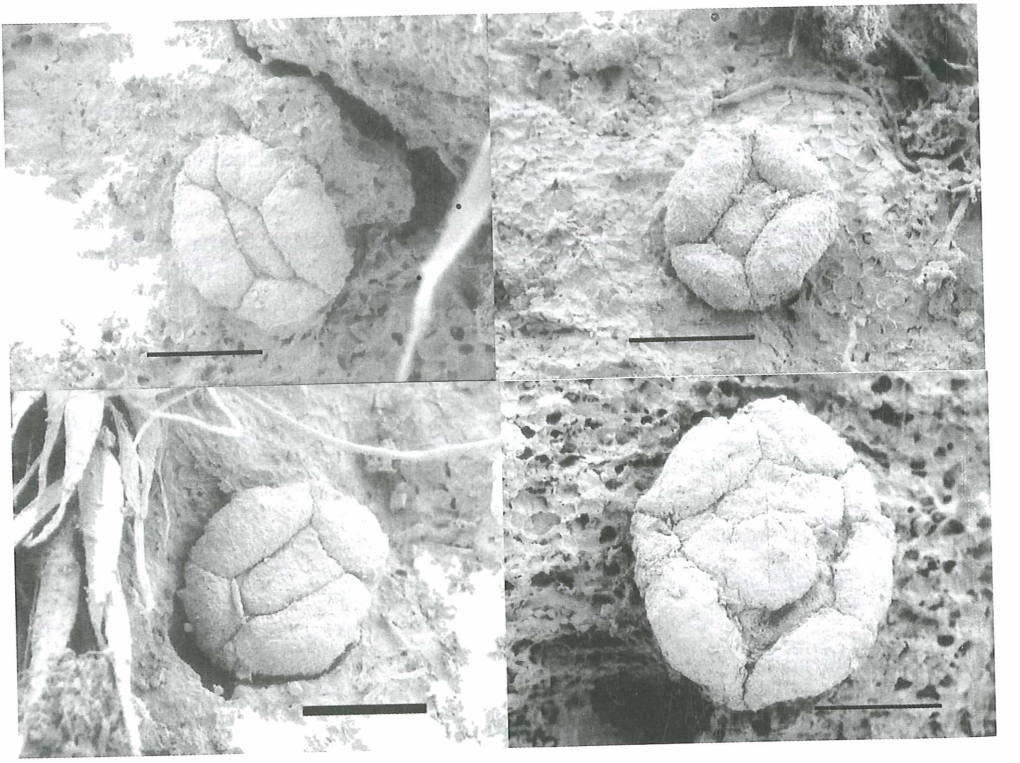

Fig. 1: *Opegrapha trochodes* (COPPINS 16661). SEM of ascomata, showing variation in shape; that in the bottom right is the most mature. Scales=200 µm.

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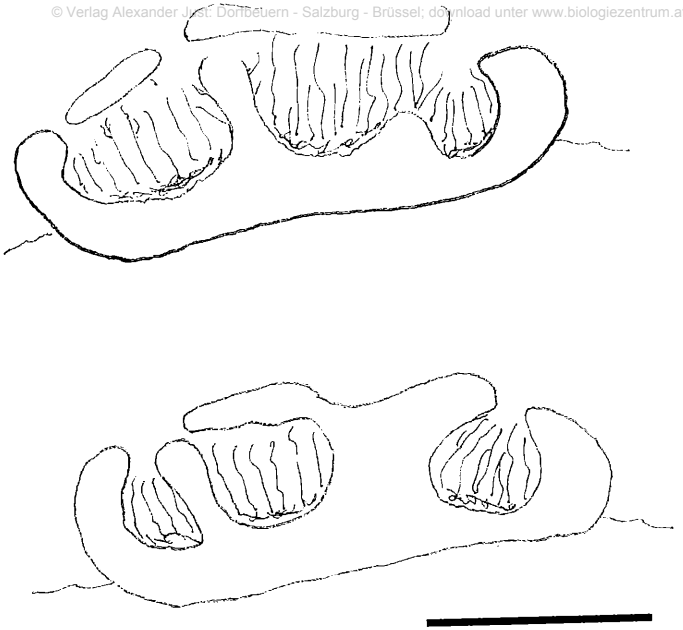

Fig. 2: *Opegrapha trochodes* (COPPINS 16661). Diagrammatic sections of ascomata. Scale = 200 µm.

Thallus effuse or (especially on smooth bark) delimited by a blackish prothallus (0.8–1.5 mm wide), endophloeodal, indistinct, giving the bark a dull grey to brown-grey coloration, or epiphloeodal, very thin, continuous to finely cracked, smooth to finely warted, dark green to brownish, matt. Photobiont Trentepohlia; cells 12–21 × 9–17 µm.

Ascomata scattered, 0.15–0.4(–0.5) mm diam., black, epruinose, rounded or ± square or pentagonal, sometimes shortly elongated; margin *c.* 0.06–0.14 mm wide, comprising 4–5 segments; central part of ascoma (covering most of the hymenium) eventually becoming umbonate (Fig. 1). Ascomata in section with 2–4 hymenial locules (Fig. 2). Exciple brown-black, K+ distinctly greenish, closed at the base of the apothecium, laterally 25–55 µm thick, at base 15–50 µm thick. Hymenium 55–75 µm tall, hyaline, I+ directly orange-red, but I+ blue following pre-treatment with 10% KOH; epihymenium hyaline to pale brown; hypothecium (subhymenium) 10–25 µm tall, hyaline, I+ blue, then turning orange. Paraphysoids richly branched and anastomosing, 1–1.3(–1.5) µm wide, not or only to 2 µm wide at apices. *Asci* cylindrical to narrowly clavate, (41–)50–60 × 10.5–12.5 µm, 8-spored; in K/I non-amyloid except for an amyloid (blue) en-

doascus layer in the upper part, and an amyloid apical ring (Fig. 3). Ascospores (11–)13–18(–21) × (3–)3.8–5 µm (n=56), rufescens-type (TORRENTE & EGEA 1989: 35, fig. 8b), 3-septate, septation starting with one median septum, not constricted at septa, the outer spore wall enclosing 4 cells that become rounded when old, cells more or less equal in size except outer cells slightly longer; old spores sometimes becoming brownish owing to an even browning of the outer wall (i.e. not with a coating of pigmented granules); perispore not evident (at ×1000) (Fig. 3). Conidiomata not found.

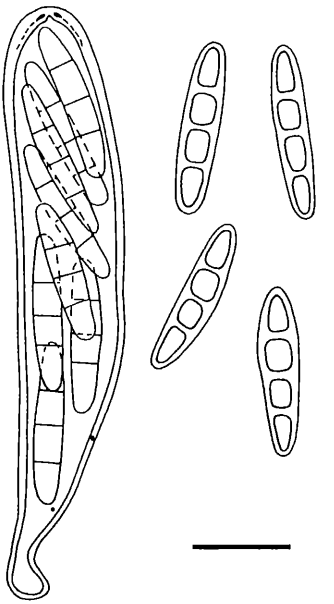

Fig. 3: *Opegrapha trochodes* (holotype). Ascus with apical K/I+ blue ring and ascospores. Scale = 10 µm.

**Chemistry:** thallus sections C–; no lichen substances detected by TLC (specimens tested: ERTZ 1529, 6254, 6271 and SEAWARD 501C).

**Distribution and habitat:** *Opegrapha trochodes* is widely distributed, being so far identified from Africa (Bénin and Zambia), Chagos Archipelago, Taiwan and Europe (British Isles, Austria and Ukraine) (Fig. 5).

In Africa it mainly grows on the shaded bark of lianas or trees in dense and humid forests, from sea-level to 1377 m altitude. However, at one of the

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Bénin localities (ERTZ 1529) it grew in a more open situation, on *Cocos nucifera* on a sandy beach (but see under Remarks below).

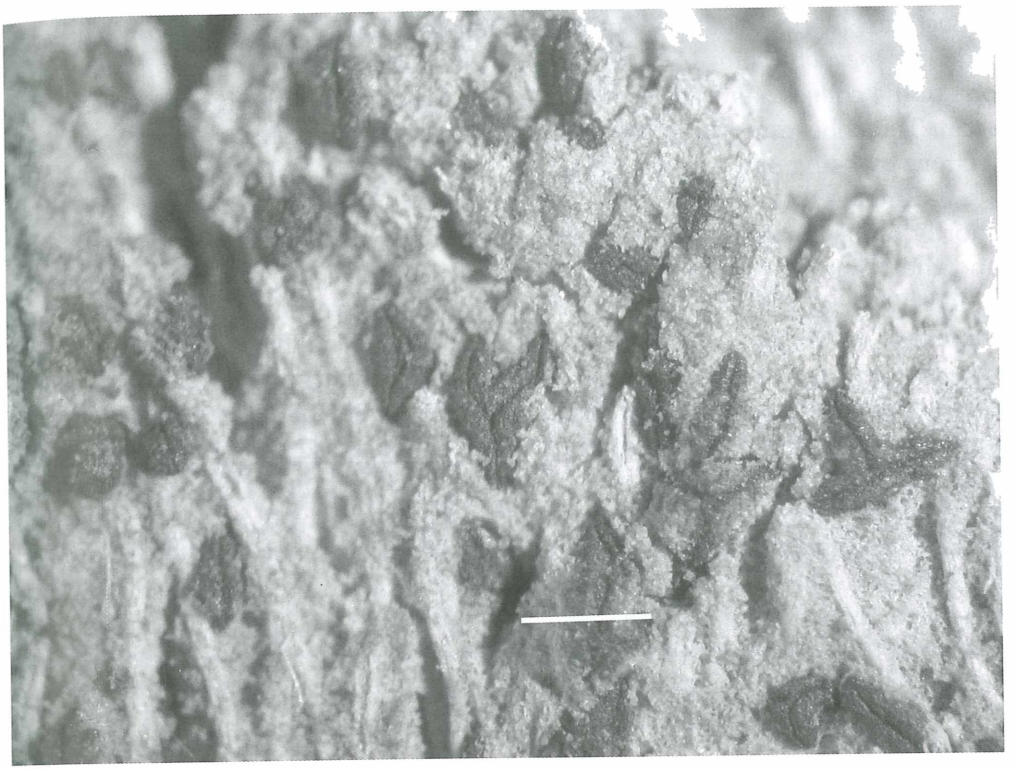

Fig. 4: *Opegrapha trochodes* (ERTZ 1529). Habitus of collection on Cocos, showing elongate and shortly bifurcate ascomata. Scale = 500 µm.

All of its British sites are ancient deciduous woodlands. At the English sites it grew on the shaded, vertical trunks of mature *Quercus*, with rather soft, slightly flaky bark that is spongy when wet. It was seen to cover extensive areas of bark with few associated species; these included *Anisomeridium polypori*, *Lepraria lobificans* and *L. vouauxii*, the bryophytes *Isothecium myosuroides*, *Zygodon rupestris* and *Metzgeria furcata*, and the non-lichenized ascomycetes *Massarina corticola* and *Hysterium* cf. *pulicare*. Elsewhere on the tree at Holne Chase (COPPINS 16661) *Biatora epixanthoides*, *B. sphaeroides* and *Thelotrema lepadinum* were found. On the other tree at Holne Chase (COPPINS 16665) notable species include *Bacidia viridifarinosa*, *Biatora sphaeroides*, *Pachyphiale carneola*, *Phyllopsora rosei* and *Piccolia ochrophora*. *Opegrapha trochodes* mostly grows directly on bark, but among COPPINS 16661 a few apothecia can be seen arising from the dead, defoliated stems of *Isothecium*. The single Welsh collection was found on the shaded buttress roots of *Fraxinus* at the edge of a stream. The Austrian collections were

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in humid habitats on the rough bark of old trees; associated species were *Acrocordia gemmata*, *Bacidia rubella* and *Opegrapha varia* on *Ulmus* trunks, and *Lepraria lobificans* and the hepatic *Metzgeria furcata* on *Fraxinus* root. In both Ukrainian collections, *O. trochodes* grew on the plateau surface of bark plates on trunks of old *Acer pseudoplatanus* in humid valley woodlands of the Carpathian foothills; one of the collections was accompanied by the pycnidial thallus of *Arthonia byssacea*. The collection from Taiwan closely resembled most of the European collections by being on thick, rough bark.

**Remarks:** *Opegrapha trochodes* is characterized by the small, gyrose or shortly lirellate ascomata on a dark green to brownish or inconspicuous thallus, and the 3-septate ascospores that lack a perispore. The hymenium is often divided by 1(–3) columns of sterile tissue visible in vertical sections. However, there is some variation among the cited specimens. The European collections all have an endophloeodal thallus, which lacks the marginal prothallus seen in some of the African collections. A possible explanation is that the latter occurred on smooth bark of youngish trees or lianas, and these differences could be a response to the substratum. Unlike the African collections, the European collections mostly have some old ascospores with brown walls, and a few brown spores were seen in the collection from Taiwan. Two atypical collections (ERTZ 1529, SEAWARD 501C), both on the bark of *Cocos* in more open habitats, differ in having more elongate apothecia to 0.6 × 0.16 mm, that are occasionally once-furcate (Fig. 4). We provisionally assign these to *O. trochodes* in the absence of any further, obvious distinguishing characters.

Its relationship within the genus *Opegrapha* are unclear, and it does not belong to the core of the genus. However it seems to have close affinities to the saxicolous *O. saxigena* TAYLOR (syn. *O. coniferta* ANZI). That species has an identical exciple pigmentation, iodine reactions of the hymenium and hypothecium, rufescens-type ascospores, dark brownish thallus, and often has some gyrose apothecia. It differs in its saxicolous habit, more robust and usually more elongate apothecia (mostly 0.5–1.2 × 0.2–0.35 mm) and somewhat longer ascospores (mostly 16–20 µm) (TORRENTE & EGEA 1989, as *O. conferta*; PENTECOST & JAMES 1992). In possessing ascospores of the rufescens-type, *O. confertoides* TORRENTE & EGEA appears also to be related to the new species. However, according to the description of TORRENTE & EGEA (1992), the former differs by having lirelliform and larger ascomata (0.3–1.5 × 0.15–0.35 mm) that are never gyrose, a usually creamy white thallus and wider ascospores (5–6 µm) becoming covered in brownish granular warts.

Rounded, stromatic, often multilocular ascomata are characteristic of several lichenicolous *Opegrapha* species, and it is possible that these, along with *O. trochodes*, are more closely related to the lichenicolus genus *Plectocarpon* Fée than to the type species of *Opegrapha* (*O. vulgata* (ACH.) ACH.) (ERTZ et al. 2004, 2005).

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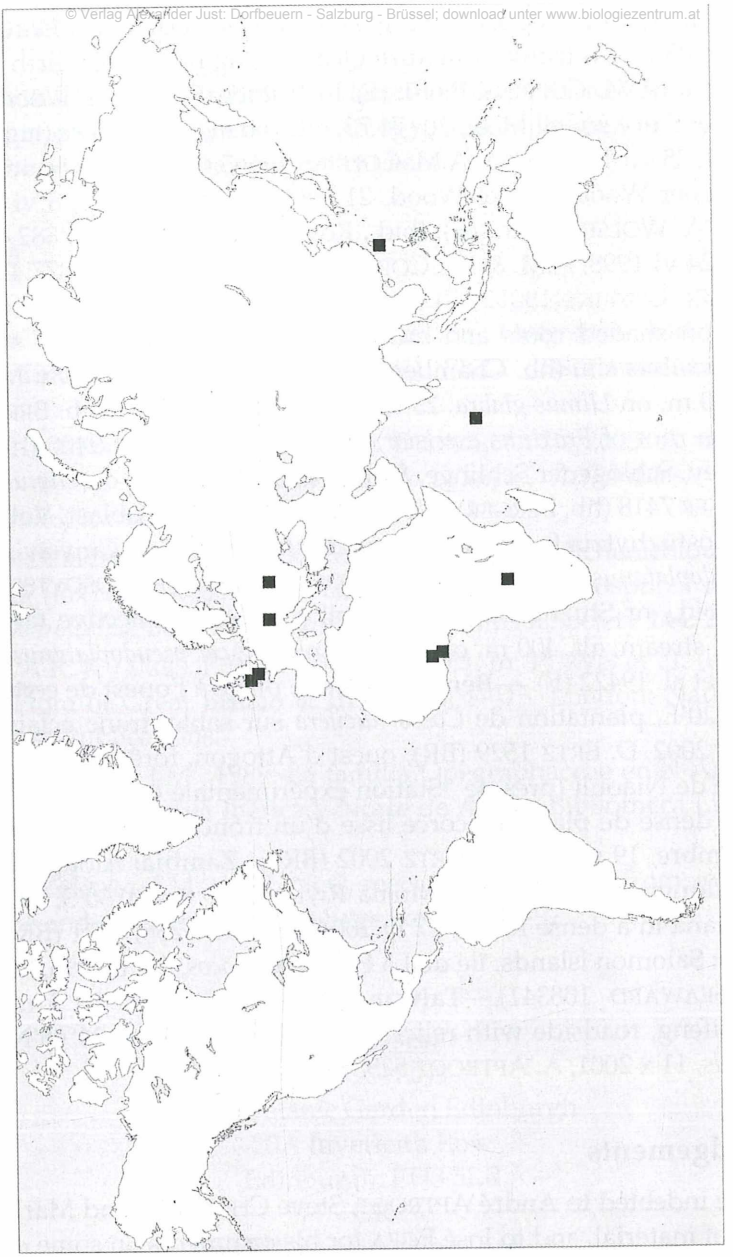

Fig. 5: Known distribution of *Opegrapha trochodes*.

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Additional specimens examined: **England: V.C. 3,** South Devon: Buckland-in-the-Moor, Holne Chase SSSI: N side of River Dart, near Warren Bridge, 20/72.72, alt. 85 m, on trunk of mature *Quercus* (tag no. 01255; girth 1.22 m), 26 vii 1995, B.J. & A.M. COPPINS 16661 (E, BR); ibid., Oakmoor Wood, by River Webburn, just S of Lizwell Meet, 20/71.73, alt. 160 m, on *Quercus* (tag. no. 01240; girth 1.95 m), 25 vii 1995, B.J. & A.M. COPPINS 16665 (E). **V.C. 5,** South Somerset, Exmoor, Horner Woods: Stoke Wood, 21/883.438, on *Quercus*, 3 vi 1988, A.M. O'DARE & P.A. WOLSELEY s.n. (E); ibid., Rowbarrow Wood, 21/882.441, 180 m, on *Quercus*, 24 vi 1998, A.M. & B.J. COPPINS 18013 (E); ibid., 21/877.445, 200–210 m, A.M. & B.J. COPPINS 18012 (E).—**Wales: V.C. 46,** Cardigan: Cwm Lyfnant, 22/730.974, on shaded roots and buttress of *Fraxinus* at edge of stream, 8 vi 1994, *S.P. Chambers* s.n. (hb. Chambers).—**Austria:** Oberösterreich: Mühlviertel, Rannatal, 380 m, on *Ulmus glabra*, 23 iv 1993, F. BERGER 6501 (hb. BERGER); ibid., alt. 390 m, on root of *Fraxinus excelsior*, 28 x 1995, F. BERGER 9400 (hb. BERGER); Danube valley, Schlögener Schlinge, Steiner Fels, alt. 300 m, on *Ulmus glabra*, 8 ii 1994, F. BERGER 7418 (hb. BERGER).—**Ukraine:** Zakarpatska oblast, Velky Berezny district: Novostuzhytzia forestry, streams 'Bystry' and 'Kamyanysty', alt. 450 m, on *Acer pseudoplatanus*, 1 viii 1997, A.M. COPPINS & O. KHODOSOVTSEV [COPPINS 17653] (E); ibid., nr Stuzhytzia village, Velky Berezny collective farm forestry, 'Zhyduvsky' stream, alt. 400 m, on large trunk of *Acer pseudoplatanus*, 28 v 1998, B.J. COPPINS et al. 19422 (E). —**Bénin:** Cotonou, plage à l'ouest de cette ville, 5 m, 06°20'N, 02°20'E, plantation de *Cocos nucifera* sur sable, tronc éclairé de *Cocos nucifera*, 1 vi 2002, D. ERTZ 1529 (BR); ouest d'Attogon, forêt entourant le centre de recherche de Niaouli (près de "Station expérimentale (café)"), 140 m, 6°44'N, 2°08'E, forêt dense de plateau, écorce lisse d'un tronc de 10 cm de diamètre en sous-bois sombre, 19 vi 2002, D. ERTZ 2002 (BR).—**Zambia:** Along the road between Mwinilunga and Kanyama, Mujila River, 1377 m, 11°30'S, 24°47'E, riverine forest, liana in a dense forest, 17 iv 2004, D. ERTZ 6256, 6271 (BR).—**Chagos Archipelago:** Salomon islands, île de La Passe, on *Cocos*, 10 iii 1996, M. SEAWARD 501C (hb. SEAWARD 108341).—**Taiwan:** Hualien County, 43 km WNW of Hualien, Meifeng, roadside with relict mature trees, 2250 m, 24°06'N, 121°11'E, on *Castanopsis*, 11 x 2001, A. APTROOT 52584 (ABL).

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It is with great pleasure that we dedicate this paper to Volkmar WIRTH, in honour of his contributions to Lichenology, and more personally for all the kindnesses he has given to us over many years.

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