BRITISH PLANT GALL SOCIETY
Aims: To encourage and support the study of Cecidology, with particular reference to the British Isles

MEMBERSHIP SUBSCRIPTION
UK £10.00; Overseas (including the Republic of Ireland) £15.00 entitling members to receive CECIDOLOGY, to participate in all meetings, and to seek advice or information through the Society

MANAGEMENT COMMITTEE

CECIDOLOGY

Vol. 39, No 1 Spring 2024

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BRITISH PLANT GALL SOCIETY

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Instructions to Authors

See https://www.britishplantgallsociety.org/cecidology/

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CECIDOLOGY

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Edited by Paul A. Smith

Editorial

Spring is sprung, if rather damply (at least in my neck of the woods), which means it is time to think about some spring galls – and to start you off there is a challenge (p. 2) to look out for *Taphrina* galls on the catkins of *Populus* species – something that came to my attention last spring, but which seemed worthwhile holding over for this issue so that you could be alerted at the right time of year.

And since there is never a shortage of interesting challenges, Simon Haarder provides a nice article (p. 36) on galls on *Salix daphnoides* in Denmark and an opportunity to fnd the same gall-causers new to Britin and/or Ireland, though I guess you will have to remember that for later in the year.

And with an eye on later in the year, please look at p. 84 for details of the BPGS Gall Weekend in September – bookings shuld be sent as soon as possible, and payment is due by the end of May.

Sam Buckton is already collating corrections to the third edition of *British Plant Galls*, and a first instalment of these appears on p. 45. Do have a look and be aware of changes.

I wish you good fortune in your galling endeavours over the spring and summer, and look forward to the results of those appearing in future issues.

Paul Smith

The cover picture shows *Populus tremula* catkins heavily infected with *Taphrina johansonii* at Portchester, vc11 (SU62180520, 23 April 2023). Photo: © Jonathan Stokes.

Plant galls on alpine plants – fascinating connection between nature and physics

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It is tiny, the most miniature tree in the world. Just its crown peeks out of the ground. The Dwarf Willow, *Salix herbacea* (Fig. 1), is an alpine plant that thrives best on lime-free and permanently moist scree soils, at about 1800 to 3200 meters above sea level, in locations that are snow-covered for seven to

Figure 1: Dwarf Willow *Salix herbacea*, fruiting, at Wildgrat in the Ötztal Alps in Austria at 2490 meters above sea level. © 2007 El Grafo. CC-BY-SA 3.0 https://commons.wikimedia.org/wiki/File:Salix_herbacea_fruits.jpg

eight months. Carl von Linné already referred to the Dwarf Willow as the smallest among the trees. It is considered a glacial relict and is arctic-alpine in distribution. It only grows to about ten centimetres in height. Its trunk is usually hidden in the soil or in rock crevices, many of its branches are often buried in the ground.

Even this most miniature tree in the world has tenants: The willow leaf gall mite *Aculus tetanothrix* (Fig. 2) causes characteristic red galls on the leaves of *Salix herbacea*. Dr. Thomas beautifully describes these phenomena in his report in the 1870-71 Yearbook on the Activities of the St. Gallen Natural Science Society:

Figure 2: Galls of the willow leaf gall mite *Aculus tetanothrix* on leaves of the Arroyo Willow *Salix lasiolepis*. © 2012 Franco Folini. CC-BY http://tinyurl.com/mr2ukb43.

> "Also in the immediate vicinity of the snow region at about 8000' above sea level, in mid-August, I found mite deformations on the leaves of *Salix herbacea* L. on the western slope of Piz Surlei near St. Moritz (Upper Engadine). The fact that the mite galls stand in large numbers on the willow leaves and are mostly beautifully red coloured, this malformation does not easily escape an attentive eye. The bumps on the leaves are often so fine and so densely set that at their sight one must think of a stone coated with cobalt bloom, although the colour of these malformations is darker and more purple-red"* (Thomas 1872).

Let us beam ourselves 150 years into the future, to the summer of 2020 at Lake Neusiedl in Austria: Berta Moritz, a friend, invited me (ICG) to a Nature tour and a subsequent dinner. This day proved significant for me, as our guide Igor, an expert on plant galls in the national park, gave me an entirely new

* Translated. The height is given in Swiss feet, a length measure that was used in Switzerland until 1876.

perspective. As a biomimetics expert, I am used to looking at living Nature with open eyes to gain insights for technological implementations. Plant galls were not unknown to me; I had already seen them on beech leaves, acorns and oak leaves. I was particularly fascinated by galls on wild roses. What Igor told us about them was ground-breaking for me: Genetically speaking, galls are identical to the plants on which they grow. An oak gall carries the DNA of an oak, a rose gall the DNA of a rose, despite their different appearances - spherical on the underside of the leaves in oaks, mossy and shaggy on the roses, swollen and bright red on the most miniature tree in the world. Epigenetic changes, controlled by the gall-causing organisms, lead to the unique shape of the galls. This discovery excited me so much that I bought a book on plant galls (Bellmann, Spohn & Spohn, 2018) and became a member of the British Plant Gall Society.

Why this enthusiasm, you might ask?

Well, I am a physicist at the Vienna University of Technology (TU Wien) and have been dealing for many years with how we can innovatively produce the things we need, whether it is a car, a mobile phone or an egg cup. I dream of growing these things, using raw materials that are locally available or ubiquitous (like air), with water-based chemistry and at ambient temperatures and normal air pressure. And directly in their functional form. Just like a baby grows a tooth at 37 degrees Celsius directly in the mouth. My dream goes further: These manufactured things should serve as food or fertilizer for other products after use.

Moreover, that is precisely what plant galls do!

Imagine how fantastic it would be if...

The oak galls, which are currently the subject of our research, could revolutionize our approach to the production of goods. But what does "revolution" mean in this context? Most readers will agree that the current state of our global civilization is critical. Humanity is excessively burdening the global ecosystem to obtain and process the raw materials it requires. Even those who believe that this limit is still far away must concede that given the continued growth of our societies, these limits will be reached sooner or later (van Nieuwenhoven *et al.* 2023). Therefore, we should bring about a change without going through the scarcity that has accompanied human history. But how can this happen?

The current production approach involves bringing various metals and exotic basic chemical substances from distant places and then processing them

elaborately, often without considering recycling. It is time for a new kind of economy (Gebeshuber 2023).

But how could this work?

Most biological materials are used hierarchically in different places, chemically and structurally altered, depending on their purpose (Fratzl & Weinkamer 2007), yielding different functions. One example is keratin, which is used in the human cornea and in fingernails and cat claws, as well as in bird feathers, such as in the peacock and in some butterflies, where it is regularly nanostructured, yielding beautiful iridescent colours (Kinoshita 2008). Another example is chitin: this material occurs in insect exoskeletons, and also in shrimp shells and fungi. Amazingly, nanostructured chitin in organisms can show functionalities such as directed water run-off, self-cleaning and bactericidal properties as well as structural coloration (such as the red-green appearance of the rose chafer) (Kinoshita 2008). Moreover, this is how plant galls are constructed: spherical deformations on oak leaves, for example. Bacteria, fungi, nematodes, mites, and insects induce these galls. When a gall wasp lays its egg on an oak leaf, the developing larva emits chemical signals that cause the leaf to build a safe and comfortable home for it – a gall. This gall is even equipped with a nutrient-rich inner layer and eventually allows the grown insect to leave the gall through a circular exit hole. The tree is hardly affected, as the gall only grows as long as the larva sends signals.

In the course of our research on plant galls (van Nieuwenhoven & Gebeshuber 2023; van Nieuwenhoven *et al.* in press), we concluded that this mechanism can be exploited. Our goal is to grow devices from local materials. While this is quite conceivable for simple packaging and utensils, we should be bold enough to take a step further. In the distant future, there could be something like a mobile phone that grows on trees. Users could pick it and use it, when no longer needed, as "fertilizer" for other products.

Such an approach naturally has risks, which is why we have been working closely with experts in technology assessment from the beginning (van Nieuwenhoven *et al.* in press). Technology assessment experts perform policy research that examines short- and long-term societal, economic, ethical and legal consequences of the application of technology (Banta 2009). As with any new technology, regulations must keep pace with scientific development to ensure safe and ethical use of the technology and minimize the risk of adverse environmental side effects. By their very definition, devices that are grown from local materials offer great opportunities for novel applications. They may also pose specific threats to the ecosphere if not adequately controlled from environmental, health and safety aspects. Associated ethical concerns must be

addressed to promote safety, promote sustainability, and regulate societal impacts (Ebbesen *et al.* 2024).

Moreover, for these grand visions, it is necessary to get the next generation of scientists on board. Let us hear what Richard Wilhelm van Nieuwenhoven, who is researching these topics with me, has to say:

"My whole life I have been committed to sustainability and conservation. Naturally, my re-entry into scientific research should also go in this direction. Soon I became aware of research in the field of 'Engineered Living Materials' (ELM). This field of research deals with integrating the capabilities and evolutionary achievements of living materials from plants to bacteria to algae into our technical materials, to combine the best of both worlds. When my academic advisor, Prof. Ille Gebeshuber, approached me with the idea of choosing galls as a topic for my doctoral thesis after a Nature tour, I was immediately fascinated by the possibilities that opened up for me. If a larva can produce such a complex brood chamber with such minor interactions, the possibilities for us humans seem to be open in all directions."

Conclusion

We are working to bring the vision of a sustainable land of plenty with environmentally friendly products that literally grow like, or on, plants within reach.

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A mite gall from leaves of *Quercus castaneifolia*

Brian Spooner

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Leaves of Chestnut-leaved oak (*Quercus castaneifolia*) bearing conspicuous gall-mite erinea were collected recently from the Royal Botanic Gardens at Kew. These are reported and illustrated here as no such galls have been reported previously from this host, either in Britain or elsewhere, although similar galls were reported recently from the hybrid with *Q. macranthera* (Buckton 2021). The galls were present on a large, veteran tree situated close to the Orangery to the north of the Gardens (TQ186774), though not on the celebrated champion tree of this species which stands closer to the Palm House and on which no galls of any sort were evident when examined.

Quercus castaneifolia, a member of Section Cerris, is rather scarce in Britain, being found mainly in the south, and mostly in botanic gardens and other collections. In contrast to the native British oaks (*Q. robur* and *Q. petraea*), and indeed some of the many other exotic species growing here, comparatively few galls have been recorded from *Q. castaneifolia* in Britain. However, six cynipid galls (*Andricus kollari*, *A. lignicola*, *Cynips divisa*, *Neuroterus anthracinus*, *N. numismalis*, *N. quercusbaccarum*) were reported from this host at Bicton in Devon by Welch (1995), and subsequently two others have been found at the Cambridge Botanic Garden, *Andricus grossulariae* (Bowdrey 2010, 2013) and *Andricus singularis* (Bowdrey 2023). Elsewhere, only *Aphelonyx persica*, a gall-

British Plant Gall Society Weekend – 20 to 22 September 2024 in Cambridgeshire.

Dates: from Friday 20th September (booking in) to Sunday 22nd September (booking out).

Venue: Holiday Inn Peterborough West, Thorpe Wood, Peterborough, PE3 6SG.

Prices (VAT inclusive) are for two nights and include: room (all with ensuite bathroom), breakfast, 3 course hot buffet dinner and free parking.

£280 for a single room, £310 for a double occupancy room

The Hotel can arrange a packed lunch - £13 per person per day.

Saturday visit: Ferry Meadows country park with excellent diversity of habitats including grassland and waterside habitats.

Sunday visit: Woodwalton Fen, a Cambridgeshire fenland SSSI with accessible fenland habitats and some small, wooded areas.

River Nene walks are present locally, an excellent Friday visiting place should you choose.

Full directions, addresses and site information for all venues will be provided nearer to the time.

Please let Tommy Root (trroot@hotmail.co.uk, see back cover) know asap if you'd like to book. Please specify single or double room and if you like a packed lunch for one or both days.

Payment deadline: 31/05/2024. Send cheques to Alan Rix (see back cover) payable to British Plant Gall Society or you can pay by BACS, but please let Alan know.

Autumn issue of *Cecidology*

The next issue of *Cecidology* will appear in the Autumn of 2024. Please send all contributions to Paul Smith at **pas.vc110@gmail.com**, to arrive no later than **2nd October 2024** (slightly delayed from usual to allow quick reflections from the gall weekend to appear). Please note the instructions to authors at https://www.britishplantgallsociety.org/cecidology/

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Website: The Society's website address is **www.britishplantgallsociety.org**

Facebook: The BPGS is on Facebook in association with the British Plant Galls Facebook group

BPGS is on **Twitter** at **@britgalls**. Check this site for gall news and Society information. Any members using Twitter are asked to follow us and retweet when appropriate

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The Society's Bank: Lloyds Bank, Darlington Branch, Skinner Gate, DARLINGTON, DL3 7ND (Code 30-92-52: Account No. 00828153)

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