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LETTER TO THE EDITOR

A century later, resolving Joseph Grinnell's "striking case of adventitious coloration"

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ABSTRACT
In 1921, *The Auk* published an unresolved mystery submitted by Joseph Grinnell, founding director of the Museum of Vertebrate Zoology at the University of California, Berkeley. He had collected two Oak Titmice (*Baeolophus inornatus*) whose breast feathers appeared to be yellow; the feathers were covered in microscopic particles. He invited readers to further investigate the nature of these particles. Nearly a century later, we have determined that Grinnell's mysterious grains are willow (*Salix*) pollen, a diagnosis he rejected because the size of the particles had been mismeasured, and because he lacked a plausible explanation for how the birds would become coated in pollen. We investigated this case using Grinnell's own specimens, field notes, and correspondence, a testament to Grinnell's dedication to scientific rigor through carefully documented and curated natural history collections.

Keywords: history of *The Auk*, Joseph Grinnell, natural history collections, pollen

Solución de "El sorprendente caso de coloración adventicia" de Joseph Grinnell, un siglo después

RESUMEN
En 1921, The Auk publicó un misterio no resuelto presentado por Joseph Grinnell, director fundador del Museo de Zoología de Vertebrados de la Universidad de California, Berkeley. Él colectó dos individuos de *Baelophus inornatus* cuyas plumas pectorales se veían amarillas; las plumas estaban cubiertas de partículas microscópicas. Grinnell invitó a los lectores de The Auk a que investigaran a mayor profundidad la naturaleza de esas partículas. Casi un siglo después determinamos que los granos misteriosos de Grinnell son polen de *Salix*, un diagnóstico que él rechazó porque el tamaño de las partículas había sido medido erróneamente y porque carecía de una explicación razonable acerca de cómo estas aves se habrían cubierto de polen. Investigamos este caso usando los mismos especímenes, notas de campo y correspondencia de Grinnell, un testimonio de su dedicación al rigor científico a través de colecciones de historia natural cuidadosamente documentadas y curadas.

Palabras clave: colecciones de historia natural, historia de *The Auk*, Joseph Grinnell, polen

Joseph Grinnell, the great zoologist and ecologist, published an unresolved mystery in *The Auk* in 1921. In February 1920 his "son Willard, undertook to exercise the shotgun" and collected, from a stand of flowering willows (*Salix*), two Oak Titmice (*Baeolophus inornatus*) with striking yellow breasts (Grinnell 1921). Grinnell consulted prominent botanists and mycologists about the nature of the microscopic yellow grains stuck to the birds' otherwise gray breast and vent feathers. They rejected the hypothesis of willow pollen; it is generally 20–25 μm long, and they measured these grains as 6 μm long. Willow pollen morphology is otherwise consistent with Grinnell's description of the grains, but he concluded that they were perhaps from a profusely sporulating slime mold (Myxomycota) growing within the pair's roosting cavity. Grinnell finished his account by inviting the reader to continue investigation of the nature of the grains on these birds: "They, and their loads of spores, constitute Nos. 40,391 and 40,392 in the bird collection of the Museum of Vertebrate Zoology" (MVZ, University of California, Berkeley). Grinnell was the first director of the MVZ.

Ninety-seven years after their collection, we were kindly provided breast feather samples from nos. 40,391 and 40,392 by Carla Cicero of the MVZ. Three observers using two microscopes with calibrated eyepiece reticules measured the yellowish grains, still stuck to the feathers. The resulting measurements all fall in the range of 20–26 μm, consistent with willow pollen. Examination of the morphology of the grains by scanning electron microscope (Figure 1) confirms that Grinnell's titmice were yellowed

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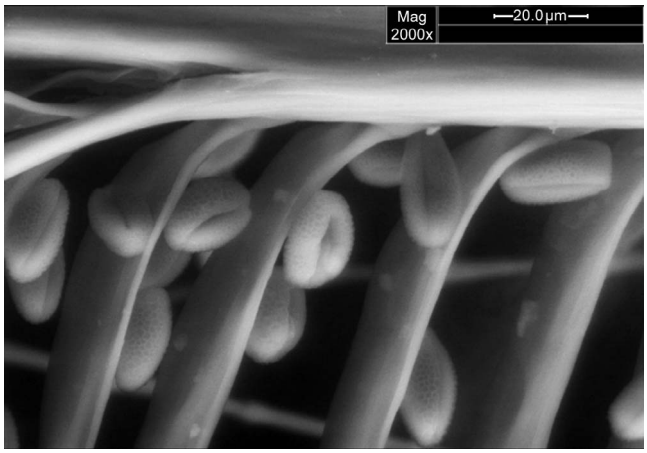


FIGURE 1. Environmental scanning electron microscope imaging of yellow grains adhering to feathers from Grinnell's Oak Titmouse specimens reveals that the propagules in question have all the standard characteristics of willow pollen: 20–25 µm long, prolate, with a pronounced margo across the major axis, and clearly defined muri and lumina on their outer surface. Positive identification as willow pollen was made using the palynology reference collection of the Hotchkiss laboratory, Department of Botany, University of Wisconsin–Madison.

by adhering willow pollen. Spores of myxomycetes, by comparison, are generally 5–15 µm in length (Tesmer and Schnittler 2007) and morphologically quite distinct.

Unpublished correspondence from 1927 (provided by MVZ archivist Christina Fidler) between Grinnell and mycologist Lee Bonar (UC Berkeley Department of Botany) demonstrates that Bonar reached the same conclusion. Grinnell remained skeptical, responding that "I cannot see how such a lot of pollen could have been acquired by the feathers of the extreme exterior lower surface, especially the anal tuft. For this reason, when it was suggested, I felt that the conditions were met by a material into which the bird might wallow, as when going to roost. . .in. . .a cavity of a tree trunk."

Given the rarity of willow-pollen-covered bird undersides, how Grinnell's two birds achieved their adventitious coloration can still only be guessed at. Oak Titmice will use cavities in willows (Cicero 2000); these two could have used one cluttered with blown pollen or fallen catkins. An atypically early nest could have been lined with willow blossoms (locally abundant in February), rather than the more common oak blossoms (Cicero 2000), which are available starting in March (Fairley and Batchelder 1986). Bird nest collections, such as that started by Grinnell at the MVZ, tell us that both these scenarios would be possible but sufficiently unusual to explain why no other yellow-bellied Oak Titmouse has been reported.



FIGURE 2. Museum of Vertebrate Zoology bird specimens nos. 40,391 and 40,392 (foreground), along with other Oak Titmouse specimens collected in the same region. After almost a century, the yellow of their breasts is faded but still quite noticeable.

Grinnell's dedication to carefully documented and curated natural history collections (including, in this case, birds, adherent pollen, nests, field notes, and relevant correspondence) allows the resolution of his mystery almost a century later. Nos. 40,391 and 40,392, and their loads of willow pollen, remain for further examination in the bird collection of the MVZ (Figure 2).

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LITERATURE CITED

Cicero, C. (2000). Oak Titmouse (*Baeolophus inornatus*) and Juniper Titmouse (*Baeolophus ridgwayi*). In The Birds of North America 485 (P. G. Rodewald, Editor). Academy of Natural Sciences, Philadelphia, PA, USA.

Fairley, D., and G. L. Batchelder (1986). A study of oak-pollen production and phenology in northern California: Prediction of annual variation in pollen counts based on geographic and meterologic [sic] factors. Journal of Allergy and Clinical Immunology 78:300–307.

Grinnell, J. (1921). A striking case of adventitious coloration. The Auk 38:129–131.

Tesmer, J., and M. Schnittler (2007). Sedimentation velocity of myxomycete spores. Mycological Progress 6:229–234.

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