

## FEATURED ARTICLE

# Pioneering Contribution of Hermann August Hagen (1817-1893) to Termite Taxonomy

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### Abstract

Hermann August Hagen (1817–1893), a German entomologist and physician, played a foundational role in 19th-century insect taxonomy. His systematic research on dragonflies, lacewings, and termites—then grouped under Linnaean Neuroptera—established essential principles for comparative morphology and species classification. Hagen's *Monographie der Termiten* (1855–1860) provided the first comprehensive taxonomic framework for termites, emphasizing wing venation, morphology, and biogeographical distribution. His later works, including *Synopsis of the Neuroptera of North America* (1861) and *Bibliotheca entomologica* (1862–1863), reflected an unprecedented integration of descriptive and bibliographic scholarship. As the first Professor of Entomology at Harvard University, Hagen advanced entomology as a professional discipline in the United States. This article highlights his life, scientific career, and enduring significant contributions on termite systematics, illustrating how his rigorous methods continue to underpin modern taxonomic and phylogenetic research.



**Hermann August Hagen (1817–1893)**  
(Photograph reproduced from Krishna et al., 2013)

### Introduction

Hermann August Hagen (1817–1893), a German Entomologist is recognized for his novel taxonomic studies on dragonflies, termites and lacewings- groups then classified under **Linnaean Neuroptera**. These insects were likely chosen for his studies due to their complex wing venation and the unclear phylogenetic relationships of the time. For instance, In Linnaeus' 10<sup>th</sup> edition of *Systema naturae* (1758), only three species of termites were known,

placed in two different orders, Neuroptera and Apterata, highlighting the need for systematic study. Although trained as a surgeon, Hagen developed a deep interest in insects, producing extensive catalogues, comparative analyses, and innovative classifications that laid the foundation for modern Entomology.

Born on May 30, 1817, in Königsberg, East Prussia, to Anna Dorothea Linck and Carl Heinrich Hagen, he was influenced by his grandfather Carl Gottfried Hagen, a Professor of Natural history, and by mentors such as Rathke, von Baer, and von Siebold. Hagen enrolled in medicine at the University of Königsberg in 1836, where his fascination with natural history flourished. His interest in Odonata, was sparked when his first collected specimen proved to be a previously undescribed species (Henshaw, 1894).

In 1839, Hagen accompanied Professor Rathke on a scientific journey through Sweden, Norway, and Denmark, focusing on entomological collections and libraries. As part of his medical training, he prepared a dissertation entitled “**Synonymia Libellularum Europaeorum**,” earning his Doctor of Medicine degree in 1840 (Henshaw, 1894).

Like many German naturalists of his time, Hagen pursued entomology, especially the Linnaean Neuroptera alongside medical practice and civic responsibilities. His first published work, “**A list of dragonflies of East Prussia**” (1839), marked the beginning of his scholarly career. His collaboration with Baron de Selys-Longchamps resulted in a series of important monographs, including **Revue des odonates d’Europe (1850)**, **Monographie des Calopterygines (1854)**, and **Monographie des Gomphines (1857)**. Their scientific partnership continued for four decades,

during which they exchanged notes, specimens, and illustrations.

## Major Scientific Contributions

Hagen’s studies extended beyond extant species to the fossil record. His monograph **Neuroptera der Bernsteinfauna (1854)** compared fossilized species preserved in amber with modern taxa, providing one of the earliest comprehensive analyses of paleoentomology (Psyche, 1894). His **Monographie der Termiten (1855–1860)**, regarded as a “masterpiece of original research”, synthesized prior work on termites and emphasized their complex social organization (Hagen, 1858).

In 1861, the Smithsonian Institution published Hagen’s **Synopsis of the Neuroptera of North America**, a landmark reference in American entomology. This work distinguished species of Chrysopidae based on wing venation and morphology, indicating the limited knowledge of their diversity at the time. Hagen also produced **Bibliotheca entomologica (1862–1863)**, a monumental two-volume bibliography that catalogued global entomological literature up to 1862. This compilation, often described as the “Entomologist’s bible,” was based on his exhaustive examinations of library collections across Germany, France, Belgium, Holland and England.

## Hagen and the Taxonomy of Termites

Hagen’s termite studies represented the first comprehensive taxonomic framework for the group. He placed termites under **Pseudoneuroptera** (Family: Termitinae) and classified them based on alate morphology, particularly wing venation, head and thorax shape, and antennae (Hagen, 1861), which differs from usual termite identification based on soldiers. He recognized four principal lineages

- *Termopsis*, *Hodotermes*, *Kalotermes*, and *Termes* and published detailed descriptions in **Catalogue of the Specimens of Neuropterous Insects in the Collection of the British Museum: Part I – Termitina (1858)**. Hagen described six genera of termites, namely *Calotermes*, *Hodotermes*, *Porotermes*, *Stolotermes*, *Rhinotermes* and *Kalotermes*. In addition, he also described several species of termites, including *Zootermopsis angusticollis*, *Hodotermes mossambicus*, *Stolotermes brunneicornis*, *Electrotermes affinis*, *Postelectrotermes praecox*, *Comatermes perfectus*, *Rugitermes nodulosus*, *Termitogen umbilicatus*, *Pseudocanthotermes militaris*, *Tenuirostritermes strenuus*, and, along with Bates, he described *Serritermes serrifer*.

His works also included descriptions of termite diversity in Ceylon (Synopsis der Neuroptera Ceylons, 1858) and the Mozambique region (Hagen, 1862). His description of *Hodotermes japonicus*, a wingless termite expanded knowledge of termite biogeography in East Asia (Hagen, 1868). Hagen's writings also addressed the economic importance of termites, describing of their destructive potential: "Nothing is more dangerous than underrating or overlooking the power of even the feeblest enemy"

(Hagen, 1876, p.408). He emphasized their role as pests in warmer climates and foreshadowed the study of termites as agricultural threats.

Beyond termites, Hagen explored biological control methods. He mistakenly attributed insect mortality to *Saccharomyces cerevisiae* (beer yeast fungus), believing it is pathogenic to insects (Hagen, 1884). Later, Metschnikoff demonstrated that the true pathogen was *Isaria destructor* (green muscardine). Despite this error, his interest in microbial control anticipated modern entomopathology.

### Later Career in America

In 1867, Hagen accepted Louis Agassiz's invitation to lead the entomological department at Harvard's Museum of Comparative Zoology in Cambridge at United States of America. By 1870, he became **Professor of Entomology**, the first such appointment in the United States. Hagen emphasized the importance of specimen collection, remarking that "the study of natural history consists chiefly in comparison" (Hagen, 1876).

In 1882, he joined Raphael Pumpelly's Northern Transcontinental Survey, studying insects

**Table.01.** List of insects named in honour of Hagen

Sl.No.	Scientific name	Insect	Family
1.	<i>Eucryptotermes hagenii</i> (Muller, 1873)	Termite	Kalotermitidae
2.	<i>Reticulitermes hageni</i> Banks, 1920	Termite	Heterotermitidae
3.	<i>Tanypteryx hageni</i> (Selys, 1879)	Dragonfly	Petaluridae
4.	<i>Enallagma hageni</i> (Walsh, 1863)	Damselfly	Coenagrionidae
5.	<i>Microthyria hageni</i> (Selys, 1889)	Dragonfly	Libellulidae
6.	<i>Dipheter hageni</i> (Eaton, 1885)	Mayfly	Baetidae
7.	<i>Ceratonia hageni</i> Grote, 1874	Moth	Sphingidae
8.	<i>Atrophaneura priapus hageni</i> (Rogenhofer, 1889)	Butterfly sub-species	Papilionidae
9.	<i>Hagenius</i> Selys, 1854	Dragonfly genus	Gomphidae

harmful to agriculture and forestry across the western United States. His contributions included taxonomic revisions of *Colias* butterflies (Hagen, 1883). Throughout his career, Hagen authored over 400 works, demonstrating his remarkable productivity and influence.

## Honors and Legacy

Hagen's scientific achievements were widely recognized. He received honorary doctorate from the University of Königsberg (1863) and Doctor of Science from Harvard University (1887). In 1868, he was elected a fellow of the American Academy of Arts and Sciences and later served on its council. He was an active member of numerous scientific and entomological societies worldwide and helped to reverse the traditional flow of insect collections from America to Europe. His students, including John Henry Comstock, Herbert Osborn, Henry G. Hubbard, and Charles W. Woodworth became leading figures in American entomology.

After a distinguished career, Hagen passed away in Cambridge on November 9, 1893, following several years of illness. His systematic approach, exhaustive bibliographies, and taxonomic rigor firmly established him as one of the most important entomologists of the 19th century.

## Conclusion

Hermann August Hagen's careful observation, systematic classification, and dedicated research provided a solid foundation for termite taxonomy and modern insect systematics. His studies on Odonata, Neuroptera, and termites, along with his bibliographic compilations, bridged European and American entomological traditions. By emphasizing collection-based research and mentoring future scientists, Hagen shaped generations of entomologists. His pioneering

frameworks continue to guide contemporary taxonomy, phylogenetic studies, and museum curation, cementing his enduring legacy as a cornerstone of entomological science.

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