

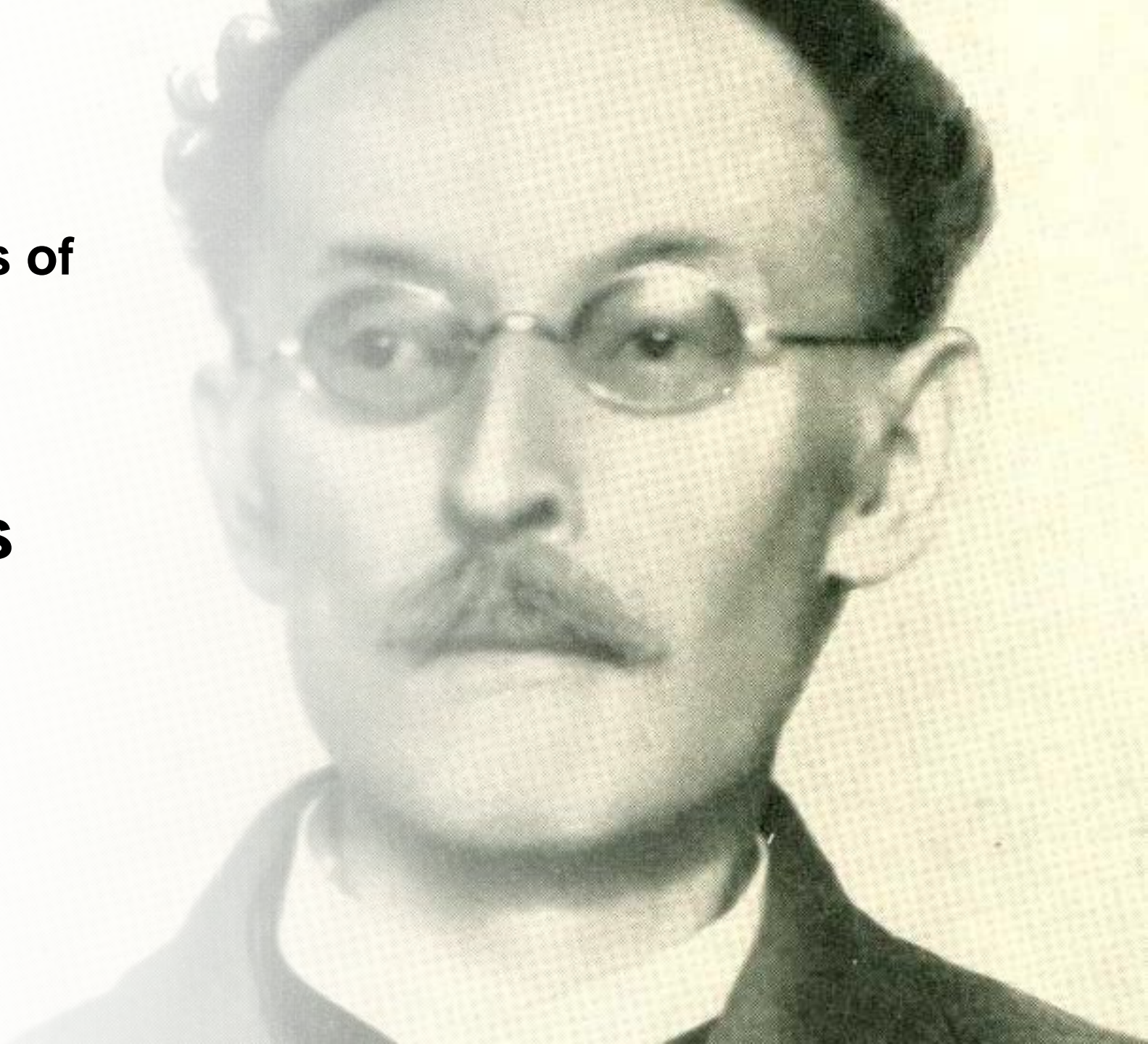
**Downstream applications of  
HTR in Biology:**

# **The case of Karl Wilhelm Verhoeff's correspondence**

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Carlos Martínez\*, Dorothee Huff, Marie Meister,  
Christine Driller, Gerwin Kasperek,  
Dmitry Mozzherin

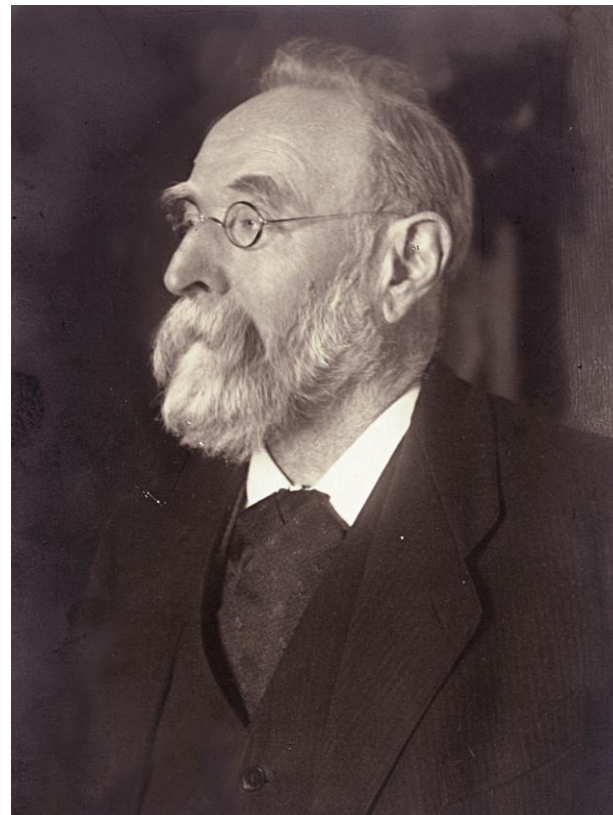
\*BIOfid.de. Email: [archilegt@gmail.com](mailto:archilegt@gmail.com)



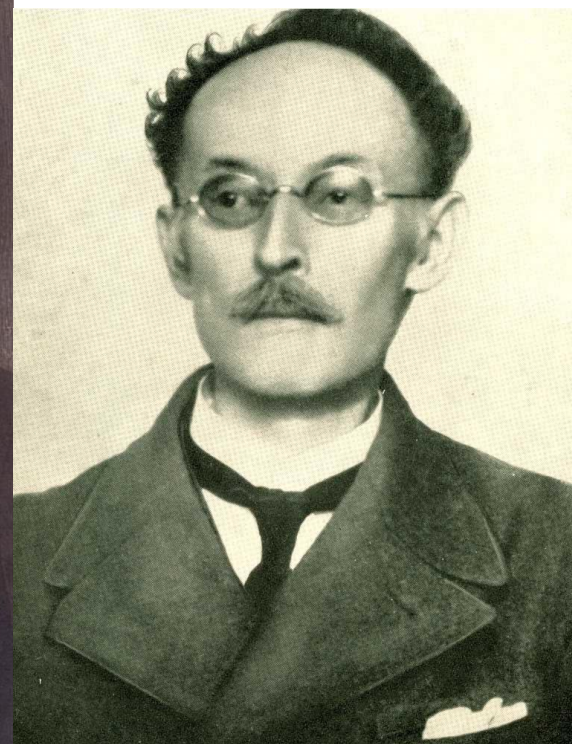
# A fragment of German history... in France



**Musée Zoologique de Strasbourg, Alsace**  
Photo: Dr. Marie Meister



**Dr. Ludwig Döderlein**



**Dr. Karl W. Verhoeff**

# “Verhoeff’s problems”

- Practices regarding the naming (oversplitting) of numerous subspecies and varieties, the distinction of which no longer seem justified.
- Extensive use of microscopic preparations.
- The difficulties in recognizing Verhoeff’s designated type specimens.
- Taxonomic descriptions are written almost exclusively in German, making the international understanding of his arrangements difficult.
- The high amount of descriptions, scattered in different publications.
- The splitting and selling of his collections to different museums, including the body being in one museum and body parts such as gonopods in another museum.

# Handwritten Text Recognition (HTR)



*Innovation and consolidation for large scale digitisation of natural heritage*

**Grant Agreement Number: 777483 / Acronym: ICEDIG**

**Call: H2020-INFRADEV-2017-1 / Type of Action: RIA**

**Start Date: 01 Jan 2018 / Duration: 27 months**

**REFERENCES:**

Deliverable **D4.1** / R / PU

Work package 4 / Lead: APM

Delivery date [13]

## Methods for Automated Text Digitisation


Deliverable 4.1

Authors: David Owen<sup>1</sup>, [Quentin Groom](#)<sup>2</sup>, [Alex Hardisty](#)<sup>1</sup>, Thijs Leegwater<sup>3</sup>, Myriam van Walsum<sup>3</sup>, Noortje Wijkamp<sup>3</sup>, [Irena Spasić](#)<sup>1</sup>.

Contributors: [Mathias Dillen](#)<sup>2</sup>, [Laurence Livermore](#)<sup>4</sup>, Sarah Phillips<sup>5</sup>, Zhengzhe Wu<sup>6</sup>

# Handwritten Text Recognition (HTR)

- Verhoeff used two handwriting styles: Latein Schreibschrift and Kurrentschrift/Sütterlinschrift.
- Very few colleagues can read K/S scripts proficiently.
- Is it possible to train an algorithm to transcribe Verhoeff's manuscripts?
- Different scripts trained separately? Recognition of individual letters or words?



Geehrter Herr College!



Auf der verehrten Herrn Professors!

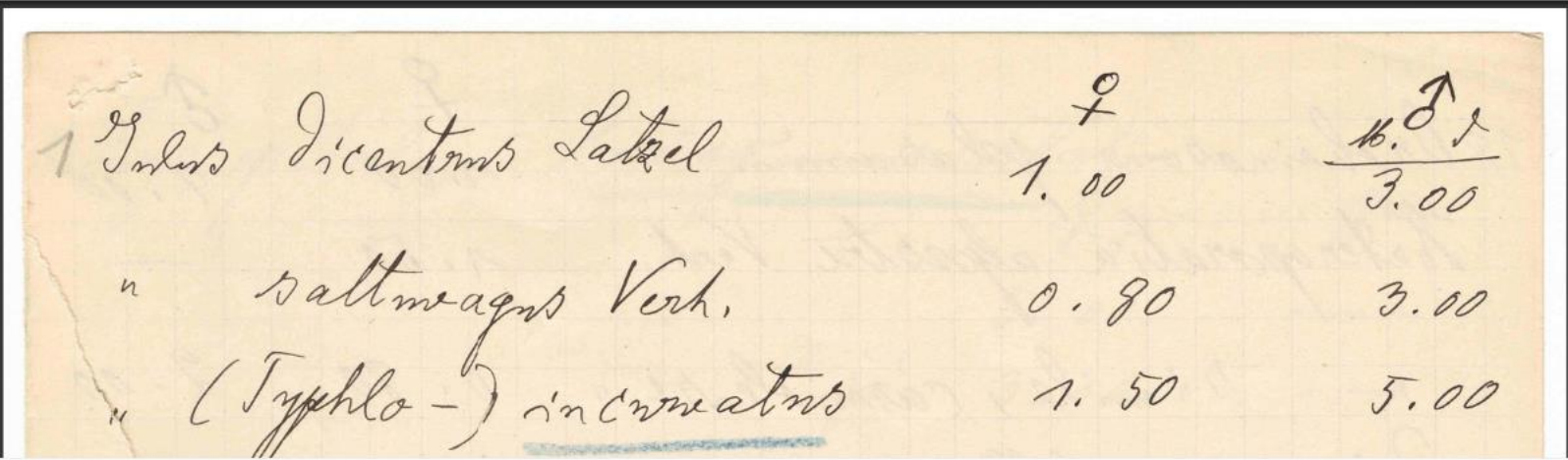
# Handwritten Text Recognition (HTR)

- There is software to do manual and automatic HTR (e.g., Transkribus).
- Work can be collaborative, through online and desktop clients.
- Algorithms don't have to be trained in recognizing individual letters or words, but whole lines of text.

Dresden - Striesen, Wittenbergerstr. 67  
3. II. 08

Sehr geehrter Herr Professor!

Mehrere deutsche Museen haben bereits namhafte Kollektionen aus den Gruppen der Myriapoden und Isopoden von mir erhalten. Da Ihr Museum seit langer Zeit nichts von mir erhielt und überhaupt nur wenig, von Isopoden aber noch nichts, erlaube ich mir Ihnen die beiden folgenden Sammlungen anzubieten:



Annotation
 




In Progress

		♀	♂
1	Iulus dicentrus Latzel	1.00	M. ♂ 3.00
	„ saltuivagus Verh.	0.80	3.00
	„ (Typhlo-) incurvatus	1.50	5.00



# Handwritten Text Recognition (HTR)

- There is software to do manual and automatic HTR (e.g., Transkribus).
- Work can be collaborative, through online and desktop clients.
- Algorithms don't have to be trained in recognizing individual letters or words, but whole lines of text.
- Customized HTR models can be created, stored, and retrained.
- HTR statistics and charts can be automatically generated.
- With small training data, character error rate (CER) in validation data has been as low as 5%.
- Several export formats, ranging from PDF to XML and TEI.

# Handwritten Text Recognition (HTR)

Filter language      Search      Type      Sort      All/Private

Filter language      Search...      Handwriter      Featured fir:      All

bioFID\_1      Engine HTR+      German      ✓  
A Words: 1 802      handwritten      18.88%

By handschriften@ub.uni-tuebingen.de

More information

Description      Stats

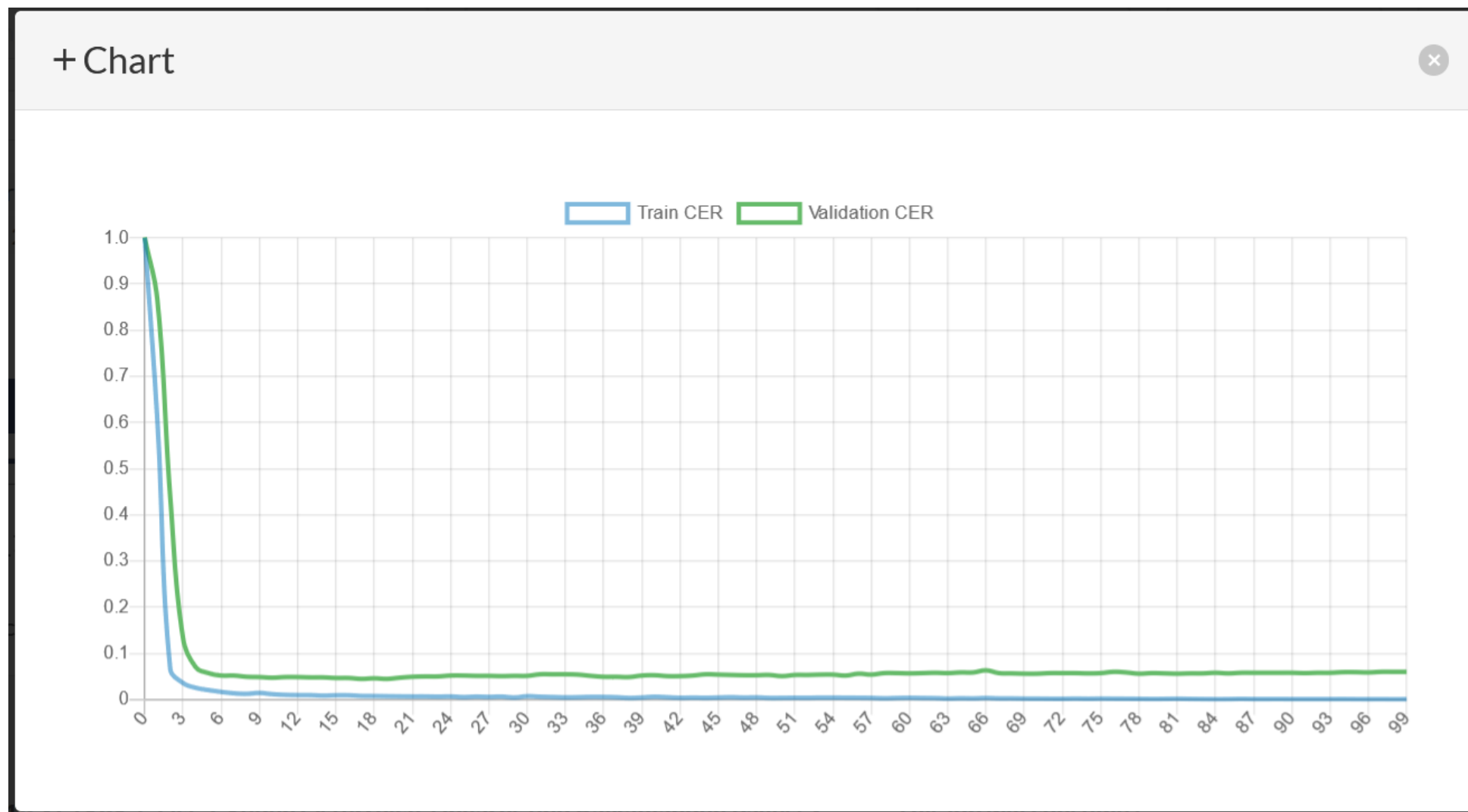
Publisher :      Lines: 393  
Created: 20/12/2021      GT Pages: 24  
Validation Pages: 2  
Train CER: 0.10%

Chart

Summary      Credits      Start Recognition

TRAINING\_VALIDATION\_SET\_bioFID\_1d Pages: 1      This job will consume :  
Model : bioFID\_1      -1.25 Credits

# Handwritten Text Recognition (HTR)



# Downstream applications of HTR in Biology



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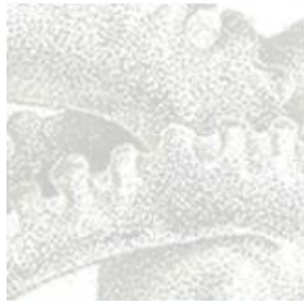
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# Displaying, linking, and annotating

## Karl Wilhelm Verhoeff

[View](#)[Edit](#)[EXIF Settings](#)[Forum/E-mail integration](#)[OpenID identities](#)[Publications](#)[Shortcuts](#)[Track](#)[Contact](#)

### ▼ [Name and Identifiers](#)

<b>Title:</b>	Dr
<b>Other/given name(s) :</b>	Karl Wilhelm
<b>Family name:</b>	Verhoeff
<b>Alternative Name:</b>	Carl Wilhelm Verhoeff, C. Verhoeff, Carl W. Verhoeff, K. Verhoeff, K. W. Verhoeff
<b>Standard Form:</b>	Verh.

### ▼ [Professional information](#)

<b>Area of Taxonomic Interest:</b>	Myriapoda, Isopoda
<b>Homepage:</b>	<a href="#">Wikipedia</a>

### ▼ [Personal information](#)

<b>Country:</b>	Germany
<b>Gender:</b>	Male
<b>Birth Date:</b>	1867-11-25
<b>Birth Place:</b>	Westphalia: Soest
<b>Date of Death:</b>	1945-12-06
<b>Place of Death:</b>	Bavaria: Munich: Pasing
<b>Manner of Death:</b>	Suicide



# Displaying, linking, and annotating

## Karl Wilhelm Verhoeff

[View](#) [Edit](#) [EXIF Settings](#) [Forum/E-mail integration](#) [OpenID identities](#) [Publications](#) [Shortcuts](#) [Track](#) [Contact](#)

[Author](#) [Keyword](#) [Title](#) [Type](#) [ [Year](#) ▼ ]

Export 7 results: [BibTeX](#) [RTF](#) [MARC](#) [EndNote](#) [XML](#) [RIS](#)

Filters: Author is Verhoeff, Karl Wilhelm. [\[edit\]](#)

**1940**

[K. W. Verhoeff](#), "[Zur Kenntnis ostasiatischer Diplopoden V \(Polydesmoidea\)](#)", *Zoologischer Anzeiger*, vol. 131, no. 5-6, pp. 129-145, 1940. [Google Scholar](#) [BibTeX](#) [RTF](#) [MARC](#) [EndNote](#) [XML](#) [RIS](#)

**1938**

[K. W. Verhoeff](#), "[Über einige Chilopoden des zoologischen Museums in München](#)", *Zoologischer Anzeiger*, vol. 123, no. 5/6, pp. 123-130, 1938. [Google Scholar](#) [BibTeX](#) [RTF](#) [MARC](#) [EndNote](#) [XML](#) [RIS](#)

**1916**

[K. W. Verhoeff](#), "[\[Postcard to Ludwig Döderlein\]](#)", *Correspondence with Ludwig Döderlein*, Archives de la Ville et de l'Eurométropole de Strasbourg, Strasbourg, Grand Est, France, 1916. [Google Scholar](#) [BibTeX](#) [RTF](#) [MARC](#) [EndNote](#) [XML](#) [RIS](#)

**1908**

[K. W. Verhoeff](#), "[\[Letter to Ludwig Döderlein\]](#)", *Correspondence with Ludwig Döderlein*, Archives de la Ville et de l'Eurométropole de Strasbourg, Strasbourg, Grand Est, France, 1908. [Google Scholar](#) [BibTeX](#) [RTF](#) [MARC](#) [EndNote](#) [XML](#) [RIS](#)

**1906**

# Displaying, linking, and annotating

## [Letter to Ludwig Döderlein]

[View](#)[Edit](#)[Clone content](#)

<b>Publication Type:</b>	Manuscript
<b>Year of Publication:</b>	1898
<b>Authors:</b>	<a href="#">C. Wilhelm Verhoeff</a>
<b>Collection Title:</b>	Correspondence with Ludwig Döderlein
<b>Date Published:</b>	19/11/1898
<b>Library/Archive:</b>	Archives de la Ville et de l'Eurométropole de Strasbourg
<b>City:</b>	Strasbourg, Grand Est, France
<b>Abstract:</b>	<b>Recommended citation:</b> Verhoeff, C. W. (1898, November 19). [Letter to Ludwig Döderlein]. Archives de la Ville et de l'Eurométropole de Strasbourg, Strasbourg, Grand Est, France.
<b>Citation Key:</b>	1426

### Taxonomic name:

[Myriapoda \(Myriatrix\)](#), [Julida \(Myriatrix\)](#), [Orobainosoma \(Myriatrix\)](#), [Chaitoiulus \(Myriatrix\)](#), [Heterolatzelia \(Myriatrix\)](#), [Typhloglomeris \(Myriatrix\)](#), [Gervaisia \(Myriatrix\)](#)

# Displaying, linking, and annotating

<b>Citation Key:</b>	1426
Full Text	<p>19.XI.98. Bonn. Sehr geehrter Herr Professor!</p> <p>Als Fortsetzung des Myriopodenangebotes, welches ich Ihnen im August d. J. machte und welches Sie wie ich annehme, erhalten haben, erlaube ich mir Ihnen anbei noch ein 2. Verzeichniss von abgebbaren Formen vorzulegen, welche alle aus dem Süden Oesterreich-Ungarns und den benachbarten Balkanländern stammen. Unter dieser Sammlung von 42 Tieren habe ich die Nova blau angestrichen, es befinden sich überhaupt sehr interessante Formen darunter, so die 4 blinden Juliden, dann Orobainosoma, Chaetoiulus, Heterolatzelia, Typhloglomeris, Gervaisia.</p> <p>Bei Abnahme dieser und der früheren Sendung vom August würde ich Ihnen eine Gesamttermässigung von 10% gewähren und Packung nebst Porto nicht berechnen.</p> <p>Auf Wunsch gebe ich Ihnen genauere Fundorte an, dieselben werden aber am ausführlichsten aus meinen bezüglichen Arbeiten ersichtlich, welche schon z.T. erschienen sind.</p> <p>Wenn Sie es wünschen, könnte ich Ihnen von einzelnen Arten auch 2 Stück bez. Paare abgeben, allerdings nicht von allen.</p> <p>Ihren w. Benachrichtigung sehe ich entgegen.</p> <p>Mit Hochachtung Ihr ergebener C. Verhoeff.</p> <p>NB die Verzeichnisse erbitte ich bei Bestellung <u>zurück!</u></p>

## Taxonomic name:

[Myriapoda \(Myriatrix\)](#), [Julida \(Myriatrix\)](#), [Orobainosoma \(Myriatrix\)](#), [Chaitoiulus \(Myriatrix\)](#), [Heterolatzelia \(Myriatrix\)](#), [Typhloglomeris \(Myriatrix\)](#), [Gervaisia \(Myriatrix\)](#)

Sat, 2022-01-22 16:08 -- [Archilegt](#) 

[Add new comment](#) [Google Scholar](#) [BibTeX](#) [RTF](#) [MARC](#) [EndNote XML](#) [RIS](#)



# Displaying, linking, and annotating

<b>Citation Key:</b>	1429
Full Text	<p>BONN 20.6.00</p> <p><b>An</b> Herrn Prof. Dr. L. Döderlein. <b>in</b> Strassburg <sup>i</sup>/E. <b>Wohnung</b> Zoolog. Anstalt der Hochschule. Univers</p> <p>Verehrter Herr Professor!</p> <p>In der <a href="#">Köln. Zeitung</a> lese ich, dass Elsässer Blätter Fall (übrigens nicht der 1.) interessiert mich u. erla erfahren haben oder aus dortigen Lokalblättern erf Wenn Sie mir die betr. Station nennen könnten, wü Grusse ergebenst</p> <p>C. Verhoeff.</p> <p>C. Verhoeff Dr. phil. Zoologe BONN</p>

The screenshot shows a web browser interface for 'zeit.punktNRW'. The address bar displays the URL: https://zeitpunkt.nrw/ulbnn/periodical/zoom/7594565. The page header includes navigation links for HOME, PROJECT, and ANNOUNCEMENTS. Below the header, there are icons for NEWSPAPERS, MAP, PLACES, and CALENDAR. The main content area displays a historical newspaper clipping from 1900, dated June 18th from Strasbourg. The text discusses a railway accident involving a train carrying silkworms (Raupen) through the Alsace region. The clipping is in German and includes a red arrow pointing to a specific part of the text.

## Taxonomic name:

[Julida \(Myriatrix\)](#), [Julus terrestris \(Myriatrix\)](#), [Schizophyllum sabulosum \(Myriatrix\)](#)

# Displaying, linking, and annotating

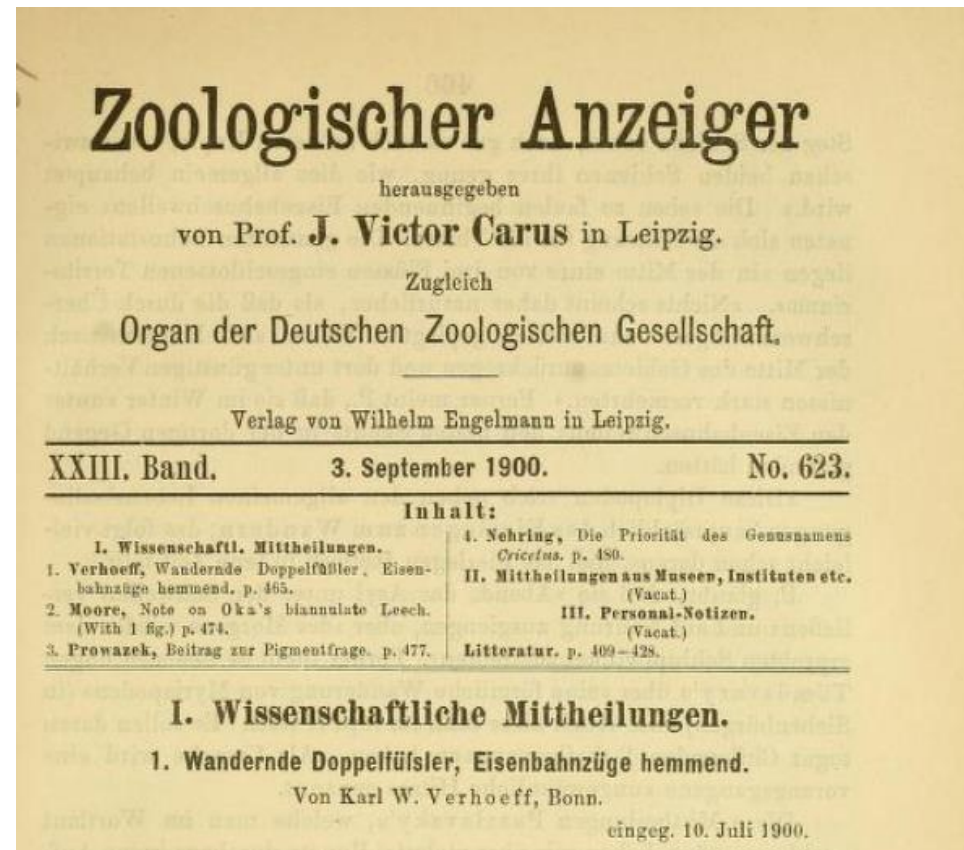
<b>Citation Key:</b>	1430
	27.VI.1900. Bonn. Sehr geehrter Herr Professor!

denn ich habe bereits Aufklärung erhalten, durch den und werde später [einen kleinen Aufsatz im Zool. Anzeiger](#)

angebotenen Myriopoden etwas erwerben wollen und ob s Ihnen senden. Gerade von letzterer Gruppe verfüge ich 1, aber doch noch die grössere Hälfte, auch brachte ich

**Taxonomic name:**

[Schizophyllum sabulosum \(Myriatrix\)](#)




Biodiversity Heritage Library

<https://www.biodiversitylibrary.org/page/31026920>

# Displaying, linking, and annotating

Issues...

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 **Myriatrix**  
The Fellowship of the Rings

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All Taxonomy

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Home » Myriatrix » Myriapoda » Diplopoda » Chilognatha » Helminthomorpha » Juliformia » Julida » Julidae » Schizophyllini » Ommatoiulus » Ommatoiulus sabulosus » Schizophyllum sabulosum - (Linnaeus, 1758) [Invalid]

MYRIATRIX

- Deleted taxa (1)
- Myriapoda (5)
  - Chilopoda (2)
  - Diplopoda (3)
    - Arthropleuridea (2)
    - Chilognatha (3)
      - Archipolypoda (7)
      - Helminthomorpha (6)
        - Colobognatha (4)
        - Helminthomorpha incertae sedis (2)
        - Juliformia (4)
          - Julida (15)
            - Arosphylosomatidae (1)
            - Blaniulidae (21)
            - Cheloujulidae (1)
            - Galliobatidae (1)
            - Julidae (92)
            - Acropoditius (1)

## *Schizophyllum sabulosum* (Linnaeus, 1758) [Invalid]


Overview Descriptions Media Literature Maps Specimens Revisions Stats Statistics

LITERATURE		
Authors	Title	Year of Publication ▼
Anonymous	<a href="#">[Tausendfuß (<i>Julus terrestris</i>)]</a>	1900
C.Wilhelm Verhoeff	<a href="#">[Postcard to Ludwig Döderlein]</a>	1900
C.Wilhelm Verhoeff	<a href="#">[Letter to Ludwig Döderlein]</a>	1900
K.W. Verhoeff	<a href="#">Wandernde Doppelfüssler, Eisenbahnzüge hemmend</a>	1900

# Displaying, linking, and annotating

Issues...

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Home » Myriatrix » Myriapoda » Diplopoda » Chilognatha » Helminthomorpha » Juliformia » Julida » Julidae » Schizophyllini » Ommatoiulus » Ommatoiulus sabulosus » Schizophyllum sabulosum - (Linnaeus, 1758) [Invalid]

MYRIATRIX

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- Myriapoda (5)
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      - Helminthomorpha (6)
        - Colobognatha (4)
        - Helminthomorpha incertae sedis (2)
        - Juliformia (4)
          - Julida (15)
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Overview Descriptions Media Literature Maps Specimens Revisions Stats Statistics

LITERATURE		
Authors	Title	Year of Publication ▼
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K.W. Verhoeff	<a href="#">Wandernde Doppelfüssler, Eisenbahnzüge hemmend</a>	1900

# Displaying, linking, and annotating

The screenshot displays the Myriatrix website interface. At the top, there is a navigation bar with links for 'Contact us', 'Report abuse', 'Help', and 'Cite me'. The Myriatrix logo and tagline 'The Fellowship of the Rings' are on the left. A search bar is on the right. Below the navigation bar is a menu with buttons for 'HOME', 'MYRIATRIX', 'LITERATURE', 'MORPHOLOGY', 'RESOURCES', 'BLOGS', 'FORUMS', 'MEDIA GALLERY', 'BIOGRAPHIES', 'ABOUT US', 'ECOLOGICAL INTERACTIONS', and 'EVENTS'. A 'SPECIMENS' button is also visible.

The main content area shows a breadcrumb trail: Home » Myriatrix » Myriapoda » Diplopoda » Chilognatha » Helminthomorpha » Juliformia » Julida » Julidae » Schizophyllini » Ommatoiulus » Ommatoiulus sabulosus » Schizophyllum sabulosum - (Linnaeus, 1758) [Invalid].

On the left, a 'MYRIATRIX' sidebar shows a taxonomic tree with expandable/collapsible icons and counts for each level: Deleted taxa (1), Myriapoda (5), Chilopoda (2), Diplopoda (3), Arthropleuridea (2), Chilognatha (3), Archipolypoda (7), Helminthomorpha (6), Colobognatha (4), Helminthomorpha incertae sedis (2), Juliformia (4), Julida (15), Aprosphylosomatidae (1), Blaniulidae (21), Chel Julidae (1), Galliobatidae (1), Julidae (92), and Acropoditius (1).

The main content area features the title *Schizophyllum sabulosum* (Linnaeus, 1758) [Invalid]. Below the title is a row of tabs: Overview, Descriptions, Media, Literature, Maps, Specimens, Revisions, Stats, and Statistics. The 'Overview' tab is selected.

A blue 'REFINDIT' section contains a list of links to related literature:

- [On the Mass Occurrence of Schizo.phyllum sabulosum in Western Germany \(Myriapoda: Diplopoda\)](#)
- [Periodomorphosis of Intersexual Individuals in the Diplopod Schizophyllum sabulosum \(L.\)](#)
- [Die Ultrastruktur des Gabeschen Organs von Schizophyllum sabulosum L. \(Diplopoda, Juliformia\)](#)
- [Zum Mechanismus der Gegenwendung nach mechanisch aufgezwungener Richtungsänderung bei Schizophyllum sabulosum \(Julidae, Diplopoda\)](#)
- [Cytochemical and electron-microscopic study of the paraoesophageal bodies and related nerves in Schizophyllum sabulosum \(L.\), diplopoda julidae](#)
- [Ommatoiulus sabulosus](#)
- [Ommatoiulus sabulosus](#)

# Displaying, linking, and annotating



**Myriatrix**  
The Fellowship of the Rings

[Contact us](#) [Report abuse](#) [Help](#)

[Cite me](#)

Search...

SEARCH

All  Taxonomy

HOME

MYRIATRIX

LITERATURE

MORPHOLOGY

RESOURCES

BLOGS

FORUMS

MEDIA GALLERY

BIOGRAPHIES

ABOUT US

ECOLOGICAL INTERACTIONS

EVENTS

SPECIMENS

Home » [Myriatrix](#) » [Myriapoda](#) » [Diplopoda](#) » [Chilognatha](#) » [Helminthomorpha](#) » [Juliformia](#) » [Julida](#) » [Julidae](#) » [Schizophyllini](#) » [Ommatoiulus](#) » [Ommatoiulus sabulosus](#) » Schizophyllum sabulosum - (Linnaeus, 1758) [Invalid]

## MYRIATRIX

- Deleted taxa (1)
- Myriapoda (5)
  - Chilopoda (2)
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    - Arthropleuridea (2)
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          - Bianiulidae (21)
          - Cheloujulidae (1)
          - Galliobatidae (1)
          - Julidae (92)
          - Acropoditius (1)

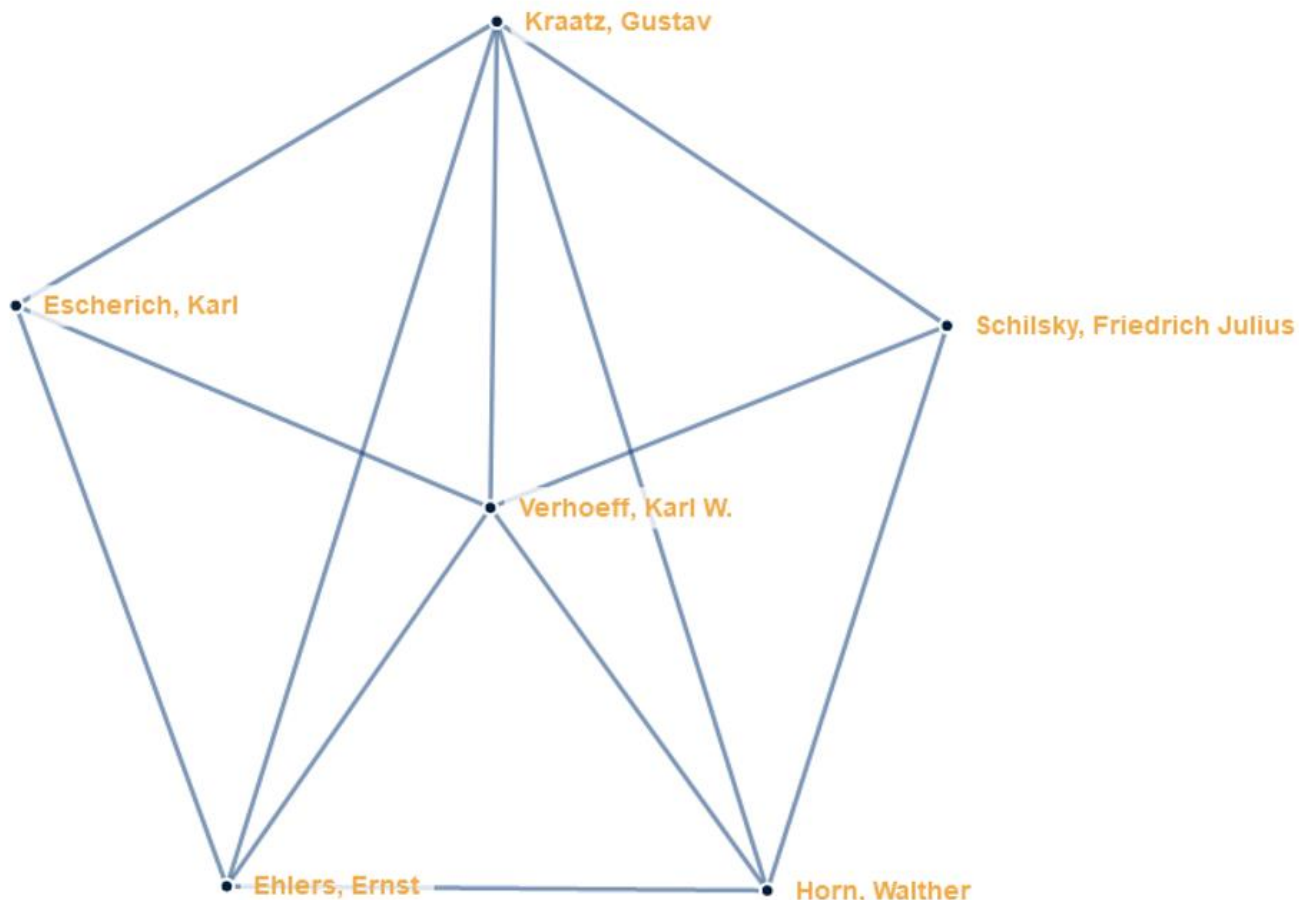
## *Schizophyllum sabulosum* (Linnaeus, 1758) [Invalid]

[Overview](#) [Descriptions](#) [Media](#) [Literature](#) [Maps](#) [Specimens](#) [Revisions](#) [Stats](#) [Statistics](#)

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- [Archiv für Naturgeschichte \(1 page\)](#)
- [Archiv für Naturgeschichte \(1 page\)](#)
- [Archiv für Naturgeschichte \(1 page\)](#)
- [Archives de parasitologie \(1 page\)](#)
- [Archives de zoologie expérimentale et générale \(1 page\)](#)
- [Arkiv för zoologi \(1 page\)](#)

# Verhoeff's network of correspondents



**Kalliope** (<https://kalliope-verbund.info>) is a Union Catalog for collections of personal papers, **manuscripts**, and publishers' archives and the National Information System of Germany.

**Verhoeff's** correspondence and interactive network of **correspondents** (<http://kalliope-verbund.info/gnd/117371319>).

# Characters which could not be differentiated

*Id* *Idea* *Ihr*

*Icht* *Yungste*

*Ihr* *Herrn* *Verh.*



# Characters which could not be differentiated

3. *Iulus (Cylindroiulus) Horvathi*<sup>1)</sup> mihi.

Länge des ♀ 10—14 mm, Breite 0·75—1·25 mm. 40—43 Rumpfsegmente, 2 beinlose Endsegmente. Körper graubraun, Vorderringe glänzend, Hinterringe ziemlich glänzend.

<https://www.biodiversitylibrary.org/page/42868706>

3. **Julus (Cylindroiulus) Dietli** mihi.

Dem *Julus Horvathi* Verh. sehr ähnlich. Da von diesem aber bisher nur das ♀ bekannt ist, muss ich mich auf einen Vergleich mit diesem beschränken:

Ocellen mit der Lupe schwerer unterscheidbar als bei *Horvathi*. Dorsaler Processus analis auf dem Querschnitt rund, zwar klein, aber doch spitz und deutlich vorragend, stärker als bei H. (Die Selbständigkeit dieser Art kann erst gesichert werden, wenn das ♂ von H. bekannt wird.)

<https://www.biodiversitylibrary.org/page/14202624>

# Fachinformationsdienst Biodiversitätsforschung



---

Der Fachinformationsdienst Biodiversitätsforschung (BIOfid) stellt aktuelle und historische Literatur zur Biodiversität überregional zur Verfügung.

---

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# Global Names Architecture

Scientific Names Services

The Global Names Architecture (GNA) is a system of web-services which helps people to register, find, index, check and organize biological scientific names and interconnect on-line information about species.

## Questions?

Drop a note at Global Names' Gitter chatroom.

[Chat on Gitter →](#)

Found a problem?

[Add an Issue on GitHub →](#)

## Work with Names

[Find →](#)

[Verify →](#)

[Parse →](#)

## Register Names

If you are a zoologist -- you can officially register species electronically.

[Zoobank →](#)

