The UTEX Culture Collection of Algae

USCCN Virtual Meeting
November 12, 2019

David Nobles, Curator
Algal Culture Collection History

Ernst Pringsheim (1881 – 1970)

Culture Collection of Algae at the Laboratory for Algology (CCALA), Czech Republic

Culture Collection of Algae at Göttingen University (SAG), Germany

Culture Collection of Algae and Protozoa (CCAP), United Kingdom

Indiana University Culture Collection (IUCC), United States

Culture Collection of Algae at the University of Texas at Austin (UTEX), United States
The IUCC was established at Indiana University in 1952. It was moved to the University of Texas at Austin and renamed UTEX in 1976.

Richard C. Starr

Jeff Zeikus

Founder and Director
1952 - 1998

Curator
1972 - 2001
UTEX Mission

UTEX promotes, supports, and enables the use of algae for research, education, and practical applications.
UTEX Objectives

1. to maintain a curated, permanent repository for newly discovered and recently described algal species of potential value to research and industry

2. to serve as a public repository for a broad range of genetic, morphological and biochemical diversity

3. to provide living algal cultures and related materials to the user community at a modest cost

4. to act as a source of information regarding algae to researchers, educators, and the interested public

5. to engage in outreach to the user community through training, support services, and supplies
UTEX is a biodiversity resource

UTEX is one of the most diverse assemblages of living organisms in the world. We maintain over 3,000 strains (>80% are unique to the Collection), including 450 type strains.
Taxonomic Diversity

UTEX holdings include representatives of the cyanobacteria and all major eukaryotic clades, with 1,469 named species spanning 565 genera.

### Algal Group

<table>
<thead>
<tr>
<th>Algal Group</th>
<th>Number of Genera</th>
<th>Number of Strains</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bacillariophyta</td>
<td>64</td>
<td>414</td>
</tr>
<tr>
<td>Chlorarachniophyta</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Chlorophyta</td>
<td>273</td>
<td>1729</td>
</tr>
<tr>
<td>Ochrophyta</td>
<td>53</td>
<td>180</td>
</tr>
<tr>
<td>Cryptophyta</td>
<td>6</td>
<td>12</td>
</tr>
<tr>
<td>Cyanobacteria</td>
<td>62</td>
<td>299</td>
</tr>
<tr>
<td>Euglenozoa</td>
<td>9</td>
<td>124</td>
</tr>
<tr>
<td>Glaucoephyta</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Haptophyta</td>
<td>12</td>
<td>24</td>
</tr>
<tr>
<td>Miozoa</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>Rhodophyta</td>
<td>71</td>
<td>195</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>565</strong></td>
<td><strong>3002</strong></td>
</tr>
</tbody>
</table>
Geographical Diversity

Strains from more than 80 countries and every continent

*Heterococcus cf. protnematoides*, Antarctica

*Dictyosphaeria cavernosa*, Japan

*Glaucocystis nostochinearum*, England

*Stigeoclonium farctum*, Argentina

*Chlamydomonas surtseyiensis*, Iceland

*Dysmorphococcus sp.*, Zimbabwe

*Bornetella oligospora*, Fiji Islands

*Callithamnion corymbosum*, Korea

*Navicula pelliculosa*, Canada

*Neochloris fuispora*, Cuba

*Chlorocladus australasicus*, Australia

*Zygnema amosum*, India

*Stichococcus bacillaris*, Arctic Ocean
Products

Teaching Kits

Photobioreactors

Genomic DNA

Starter Cultures

Bulk Cultures

Growth Media
DNA Sequence and Biochemical Analyses

UTEX provides a full suite of genetic and analytical services

Biochemical Characterization – Identification and Quantitation of

- Metabolites
- Pigments
- Fatty Acids
- Amino Acids
- Sugars

Strain Identification via DNA Sequence Analysis
Cryogenic Storage
Web Site & Social Media
Community Outreach

- Educational Demonstrations
- Workshops
- High School Internships
- Undergraduate Research and Training
- Facility Tours
- Distribution of Instructional Materials
UTEX algae and services are essential resources for diverse areas of basic and applied research

- evolution
- photosynthesis
- CO2 sequestration
- aquaculture
- human food and food supplements
- production of high-value specialty products
- biofuels
- wastewater remediation
Since 2010

UTEX has distributed more than 23,000 orders of living algae and related products to academic, private, and government entities in all 50 states, Washington D.C. and Puerto Rico, and 94 countries.

More than 8,000 journal articles and patent applications have cited the use of UTEX strains.
Recent Activities

Formally accessioned and made available to the public, 2 specialty (rescued) collections:

• **The Euglenid Collection** - a research collection of Euglenids, assembled and maintained by the Richard Triemer Laboratory at Michigan State University comprising 65 strains with 31 named species spanning 8 genera. The collection primarily includes strains collected in North America but also includes confirmed toxic strains of *Euglena sanguinea* from Argentina and Denmark.

• **The Marine Cladophorales Collection** – this is a unique collection of marine siphonocladosid (multicellular with thalli composed of coenocytic cells) green algae (Cladophorales), originally assembled by John A. West. The cells of these algae can be quite large reaching a diameter of 2-3 centimeters in some species. This collection was maintained by the R. Malcolm Brown Jr. Laboratory at the University of Texas at Austin for more than 30 years during which time they were used extensively as models for cellulose biosynthesis research. The collection includes 29 strains with 13 named species spanning 10 genera.
Recent Activities

Implemented major updates and improvements to the UTEX Web Site.

Made two new teaching kits available:

- **DNA Barcoding** - based on protocols developed for use by the Algae Technology Educational Consortium, the kit demonstrates principles of barcoding and basic bioinformatics.

- **NASA Community College Aerospace Scholars** - The Microalgae Biosynthesis in Microgravity (MicroAlgae) conducted on the International Space Station (ISS) by NASA scientists studied the effects of microgravity on the ability of *Haematococcus pluvialis* UTEX 2505 to produce astaxanthin, a powerful antioxidant. A community college student, in collaboration with alumnae of the NASA Community College Aerospace Scholars (NCAS) program, proposed this research. The NCAS is engaging community colleges across the U.S. to conduct ground studies for comparison with the in-orbit investigation.
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Recent Activities

Advised and developed course materials for

• Freshman Research Initiative Streams:
  
  ➢ Biohackers – synthetic biology using cyanobacteria
  
  ➢ Urban Ecosystems – ecology of freshwater systems in the Austin area

• BIO 122L Structure, Physiology and Reproduction of Seed Plants Lab
Jerry J. Brand Research Fellowship for Algal Research

Description:

The UTEX Culture Collection of Algae (CCA) offers stipends for scholarly research projects conducted by rising UT sophomores, juniors, and seniors enrolled in any department. Original proposals for algae-based research in all disciplines of study will be considered. CCA faculty and staff provide facilities, equipment, supplies, and supervision for fellowship researchers. Support is given for full time appointments (35-40 hours per week) of eight weeks with a stipend of $3,500.
Ongoing and Near-Term Projects

• Comprehensive inventory of cryopreserved cultures and data reconciliation between hard copies, current database and new cryo-database – *Nearly completed*

• Implementation of a barcoding system for metabolically active and cryopreserved strains - *Initiated*

• Viability testing and regeneration of all cryopreserved strains - *Future*
Challenges

Funding

Bandwidth

Relevance to our host institution (UT)