02 INFORMATION ABOUT PRINCIPAL INVESTIGATORS/PROJECT DIRECTORS(PI/PD) and co-PRINCIPAL INVESTIGATORS/co-PROJECT DIRECTORS

Submit only ONE copy of this form **for each PI/PD and co-PI/PD** identified on the proposal. The form(s) should be attached to the original proposal as specified in GPG Section II.C.a. Submission of this information is voluntary and is not a precondition of award. This information will not be disclosed to external peer reviewers. ***DO NOT INCLUDE THIS FORM WITH ANY OF THE OTHER COPIES OF YOUR PROPOSAL AS THIS MAY COMPROMISE THE CONFIDENTIALITY OF THE INFORMATION.***

PI/PD Name: John Clamp

Gender: ☒ Male ☐ Female

Ethnicity: (Choose one response) ☐ Hispanic or Latino ☒ Not Hispanic or Latino

Race: (Select one or more)
- ☐ American Indian or Alaska Native
- ☐ Asian
- ☐ Black or African American
- ☐ Native Hawaiian or Other Pacific Islander
- ☒ White

Disability Status: (Select one or more)
- ☐ Hearing Impairment
- ☐ Visual Impairment
- ☐ Mobility/Orthopedic Impairment
- ☐ Other
- ☒ None

Citizenship: (Choose one) ☒ U.S. Citizen ☐ Permanent Resident ☐ Other non-U.S. Citizen

Check here if you do not wish to provide any or all of the above information (excluding PI/PD name): ☐

REQUIRED: Check here if you are currently serving (or have previously served) as a PI, co-PI or PD on any federally funded project ☒

Ethnicity Definition:
Hispanic or Latino. A person of Mexican, Puerto Rican, Cuban, South or Central American, or other Spanish culture or origin, regardless of race.
Race Definitions:
American Indian or Alaska Native. A person having origins in any of the original peoples of North and South America (including Central America), and who maintains tribal affiliation or community attachment.
Asian. A person having origins in any of the original peoples of the Far East, Southeast Asia, or the Indian subcontinent including, for example, Cambodia, China, India, Japan, Korea, Malaysia, Pakistan, the Philippine Islands, Thailand, and Vietnam.
Black or African American. A person having origins in any of the black racial groups of Africa.
Native Hawaiian or Other Pacific Islander. A person having origins in any of the original peoples of Hawaii, Guam, Samoa, or other Pacific Islands.
White. A person having origins in any of the original peoples of Europe, the Middle East, or North Africa.

WHY THIS INFORMATION IS BEING REQUESTED:

The Federal Government has a continuing commitment to monitor the operation of its review and award processes to identify and address any inequities based on gender, race, ethnicity, or disability of its proposed PIs/PDs. To gather information needed for this important task, the proposer should submit a single copy of this form for each identified PI/PD with each proposal. Submission of the requested information is voluntary and will not affect the organization's eligibility for an award. However, information not submitted will seriously undermine the statistical validity, and therefore the usefulness, of information recieved from others. Any individual not wishing to submit some or all the information should check the box provided for this purpose. (The exceptions are the PI/PD name and the information about prior Federal support, the last question above.)

Collection of this information is authorized by the NSF Act of 1950, as amended, 42 U.S.C. 1861, et seq. Demographic data allows NSF to gauge whether our programs and other opportunities in science and technology are fairly reaching and benefiting everyone regardless of demographic category; to ensure that those in under-represented groups have the same knowledge of and access to programs and other research and educational oppurtunities; and to assess involvement of international investigators in work supported by NSF. The information may be disclosed to government contractors, experts, volunteers and researchers to complete assigned work; and to other government agencies in order to coordinate and assess programs. The information may be added to the Reviewer file and used to select potential candidates to serve as peer reviewers or advisory committee members. See Systems of Records, NSF-50, "Principal Investigator/Proposal File and Associated Records", 63 Federal Register 267 (January 5, 1998), and NSF-51, "Reviewer/Proposal File and Associated Records", 63 Federal Register 268 (January 5, 1998).

List of Suggested Reviewers or Reviewers Not To Include (optional)

SUGGESTED REVIEWERS:

Samuel S. Bowser
Andre-Denis Wright
Diane Stoecker
John J. Lee

REVIEWERS NOT TO INCLUDE:

Wilhelm Foissner -- personal differences

COVER SHEET FOR PROPOSAL TO THE NATIONAL SCIENCE FOUNDATION

PROGRAM ANNOUNCEMENT/SOLICITATION NO./CLOSING DATE/if not in response to a program announcement/solicitation enter NSF 11-1

NSF 11-518 **03/28/11**

FOR NSF USE ONLY

NSF PROPOSAL NUMBER

FOR CONSIDERATION BY NSF ORGANIZATION UNIT(S) (Indicate the most specific unit known, i.e. program, division, etc.)

DEB - Dimensions of Biodiversity

DATE RECEIVED	NUMBER OF COPIES	DIVISION ASSIGNED	FUND CODE	DUNS# (Data Universal Numbering System)	FILE LOCATION
				783691801	

EMPLOYER IDENTIFICATION NUMBER (EIN) OR TAXPAYER IDENTIFICATION NUMBER (TIN)

566000730

SHOW PREVIOUS AWARD NO. IF THIS IS
☐ A RENEWAL
☐ AN ACCOMPLISHMENT-BASED RENEWAL

IS THIS PROPOSAL BEING SUBMITTED TO ANOTHER FEDERAL AGENCY? YES ☐ NO ☒ IF YES, LIST ACRONYM(S)

NAME OF ORGANIZATION TO WHICH AWARD SHOULD BE MADE

North Carolina Central University

AWARDEE ORGANIZATION CODE (IF KNOWN)

0029504000

ADDRESS OF AWARDEE ORGANIZATION, INCLUDING 9 DIGIT ZIP CODE

North Carolina Central University
1801 Fayetteville Street
Durham, NC. 277070099

NAME OF PRIMARY PLACE OF PERF

North Carolina Central University

ADDRESS OF PRIMARY PLACE OF PERF, INCLUDING 9 DIGIT ZIP CODE

North Carolina Central University
1801 Fayetteville Street
Durham ,NC ,277073129 ,US.

IS AWARDEE ORGANIZATION (Check All That Apply) (See GPG II.C For Definitions)
☐ SMALL BUSINESS ☐ MINORITY BUSINESS ☐ FOR-PROFIT ORGANIZATION ☐ WOMAN-OWNED BUSINESS

☐ IF THIS IS A PRELIMINARY PROPOSAL THEN CHECK HERE

TITLE OF PROPOSED PROJECT **A Research Coordination Network for Biodiversity of Ciliates**

REQUESTED AMOUNT	PROPOSED DURATION (1-60 MONTHS)	REQUESTED STARTING DATE	SHOW RELATED PRELIMINARY PROPOSAL NO. IF APPLICABLE
$ **554,267**	**60** months	**10/01/11**	

CHECK APPROPRIATE BOX(ES) IF THIS PROPOSAL INCLUDES ANY OF THE ITEMS LISTED BELOW

☐ BEGINNING INVESTIGATOR (GPG I.G.2)
☐ DISCLOSURE OF LOBBYING ACTIVITIES (GPG II.C.1.e)
☐ PROPRIETARY & PRIVILEGED INFORMATION (GPG I.D, II.C.1.d)
☐ HISTORIC PLACES (GPG II.C.2.j)
☐ EAGER* (GPG II.D.2) ☐ RAPID** (GPG II.D.1)
☐ VERTEBRATE ANIMALS (GPG II.D.6) IACUC App. Date _____
PHS Animal Welfare Assurance Number _____

☐ HUMAN SUBJECTS (GPG II.D.7) Human Subjects Assurance Number _____
Exemption Subsection _____ or IRB App. Date _____
☒ INTERNATIONAL COOPERATIVE ACTIVITIES: COUNTRY/COUNTRIES INVOLVED (GPG II.C.2.j)
CH
☐ HIGH RESOLUTION GRAPHICS/OTHER GRAPHICS WHERE EXACT COLOR REPRESENTATION IS REQUIRED FOR PROPER INTERPRETATION (GPG I.G.1)

PI/PD DEPARTMENT
Biology

PI/PD POSTAL ADDRESS
P O Box 19375
Durham, NC 277070099
United States

PI/PD FAX NUMBER
919-530-5167

NAMES (TYPED)	High Degree	Yr of Degree	Telephone Number	Electronic Mail Address
PI/PD NAME **John Clamp**	**PhD**	**1984**	**919-530-6395**	**jclamp@nccu.edu**
CO-PI/PD				
CO-PI/PD				
CO-PI/PD				
CO-PI/PD				

CERTIFICATION PAGE

Certification for Authorized Organizational Representative or Individual Applicant:

By signing and submitting this proposal, the Authorized Organizational Representative or Individual Applicant is: (1) certifying that statements made herein are true and complete to the best of his/her knowledge; and (2) agreeing to accept the obligation to comply with NSF award terms and conditions if an award is made as a result of this application. Further, the applicant is hereby providing certifications regarding debarment and suspension, drug-free workplace, lobbying activities (see below), responsible conduct of research, nondiscrimination, and flood hazard insurance (when applicable) as set forth in the NSF Proposal & Award Policies & Procedures Guide, Part I: the Grant Proposal Guide (GPG) (NSF 11-1). Willful provision of false information in this application and its supporting documents or in reports required under an ensuing award is a criminal offense (U. S. Code, Title 18, Section 1001).

Conflict of Interest Certification

In addition, if the applicant institution employs more than fifty persons, by electronically signing the NSF Proposal Cover Sheet, the Authorized Organizational Representative of the applicant institution is certifying that the institution has implemented a written and enforced conflict of interest policy that is consistent with the provisions of the NSF Proposal & Award Policies & Procedures Guide, Part II, Award & Administration Guide (AAG) Chapter IV.A; that to the best of his/her knowledge, all financial disclosures required by that conflict of interest policy have been made; and that all identified conflicts of interest will have been satisfactorily managed, reduced or eliminated prior to the institution's expenditure of any funds under the award, in accordance with the institution's conflict of interest policy. Conflicts which cannot be satisfactorily managed, reduced or eliminated must be disclosed to NSF.

Drug Free Work Place Certification

By electronically signing the NSF Proposal Cover Sheet, the Authorized Organizational Representative or Individual Applicant is providing the Drug Free Work Place Certification contained in Exhibit II-3 of the Grant Proposal Guide.

Debarment and Suspension Certification

(If answer "yes", please provide explanation.)

Is the organization or its principals presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency? Yes ☐ No ☒

By electronically signing the NSF Proposal Cover Sheet, the Authorized Organizational Representative or Individual Applicant is providing the Debarment and Suspension Certification contained in Exhibit II-4 of the Grant Proposal Guide.

Certification Regarding Lobbying

The following certification is required for an award of a Federal contract, grant, or cooperative agreement exceeding $100,000 and for an award of a Federal loan or a commitment providing for the United States to insure or guarantee a loan exceeding $150,000.

Certification for Contracts, Grants, Loans and Cooperative Agreements

The undersigned certifies, to the best of his or her knowledge and belief, that:
(1) No federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.
(2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, ''Disclosure of Lobbying Activities,'' in accordance with its instructions.
(3) The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements and that all subrecipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by section 1352, Title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

Certification Regarding Nondiscrimination

By electronically signing the NSF Proposal Cover Sheet, the Authorized Organizational Representative is providing the Certification Regarding Nondiscrimination contained in Exhibit II-6 of the Grant Proposal Guide.

Certification Regarding Flood Hazard Insurance

Two sections of the National Flood Insurance Act of 1968 (42 USC §4012a and §4106) bar Federal agencies from giving financial assistance for acquisition or construction purposes in any area identified by the Federal Emergency Management Agency (FEMA) as having special flood hazards unless the:
(1) community in which that area is located participates in the national flood insurance program; and
(2) building (and any related equipment) is covered by adequate flood insurance.

By electronically signing the NSF Proposal Cover Sheet, the Authorized Organizational Representative or Individual Applicant located in FEMA-designated special flood hazard areas is certifying that adequate flood insurance has been or will be obtained in the following situations:
(1) for NSF grants for the construction of a building or facility, regardless of the dollar amount of the grant; and
(2) for other NSF Grants when more than $25,000 has been budgeted in the proposal for repair, alteration or improvement (construction) of a building or facility.

Certification Regarding Responsible Conduct of Research (RCR) (This certification is not applicable to proposals for conferences, symposia, and workshops.)

By electronically signing the NSF Proposal Cover Sheet, the Authorized Organizational Representative of the applicant institution is certifying that, in accordance with the NSF Proposal & Award Policies & Procedures Guide, Part II, Award & Administration Guide (AAG) Chapter IV.B., the institution has a plan in place to provide appropriate training and oversight in the responsible and ethical conduct of research to undergraduates, graduate students and postdoctoral researchers who will be supported by NSF to conduct research.
The undersigned shall require that the language of this certification be included in any award documents for all subawards at all tiers.

AUTHORIZED ORGANIZATIONAL REPRESENTATIVE	SIGNATURE	DATE
NAME		

TELEPHONE NUMBER	ELECTRONIC MAIL ADDRESS	FAX NUMBER

* EAGER - EArly-concept Grants for Exploratory Research
** RAPID - Grants for Rapid Response Research

Directorate for Biological Sciences
Division of Environmental Biology
Dimensions of Biodiversity

Proposal Classification Form
PI: Clamp, John

CATEGORY I: INVESTIGATOR STATUS (Select ONE)

- ☐ Beginning Investigator - No previous Federal support as PI or Co-PI, excluding fellowships, dissertations, planning grants, etc.
- ☐ Prior Federal support only
- ☑ Current Federal support only
- ☐ Current & prior Federal support

CATEGORY II: FIELDS OF SCIENCE OTHER THAN BIOLOGY INVOLVED IN THIS RESEARCH (Select 1 to 3)

☐ Astronomy	☐ Engineering	☐ Psychology
☐ Chemistry	☐ Mathematics	☐ Social Sciences
☐ Computer Science	☐ Physics	☑ None of the Above
☐ Earth Science		

CATEGORY III: SUBSTANTIVE AREA (Select 1 to 4)

☑ BIOGEOGRAPHY	☐ Decomposition	☐ Molecular Evolution
☐ Island Biogeography	☐ Biogeochemistry	☐ Methodology/Theory
☐ Historical/ Evolutionary Biogeography	☐ Limnology/Hydrology	☐ Isozymes/ Electrophoresis
☐ Phylogeography	☐ Climate/Microclimate	☐ Nucleic Acid Analysis (general)
☐ Methods/Theory	☐ Whole-System Analysis	☐ Restriction Enzymes
☐ CHROMOSOME STUDIES	☐ Productivity/Biomass	☐ Nucleotide Sequencing
☐ Chromosome Evolution	☐ System Energetics	☐ Nuclear DNA
☐ Chromosome Number	☐ Landscape Dynamics	☐ Mitochondrial DNA
☐ Mutation	☐ Chemical & Biochemical Control	☐ Chloroplast DNA
☐ Mitosis and Meiosis	☐ Global Change	☐ RNA Analysis
☐ COMMUNITY ECOLOGY	☐ Climate Change	☐ DNA Hybridization
☐ Community Analysis	☐ Regional Studies	☐ Recombinant DNA
☐ Community Structure	☐ Global Studies	☐ Amino Acid Sequencing
☐ Community Stability	☐ Forestry	☐ Gene/Genome Mapping
☐ Succession	☐ Resource Management (Wildlife, Fisheries, Range, Other)	☐ Natural Products
☐ Experimental Microcosms/ Mesocosms	☐ Agricultural Ecology	☐ Serology/Immunology
☐ Disturbance	☐ EXTREMOPHILES	☐ PALEONTOLOGY
☐ Patch Dynamics	☑ GENOMICS (Genome sequence, organization, function)	☐ Floristic
☐ Food Webs/ Trophic Structure	☐ Viral	☐ Faunistic
☐ Keystone Species	☐ Microbial	☐ Paleoecology
☐ COMPUTATIONAL BIOLOGY	☐ Fungal	☐ Biostratigraphy
☐ CONSERVATION & RESTORATION BIOLOGY	☐ Plant	☐ Palynology
☐ DATABASES	☐ Animal	☐ Micropaleontology
☐ ECOSYSTEMS LEVEL	☐ MARINE MAMMALS	☐ Paleoclimatology
☐ Physical Structure	☐ MOLECULAR APPROACHES	☐ Archeozoic
		☐ Paleozoic
		☐ Mesozoic

- ☐ Cenozoic
- ☐ POPULATION DYNAMICS & LIFE HISTORY
- ☐ Demography/ Life History
- ☐ Population Cycles
- ☐ Distribution/Patchiness/ Marginal Populations
- ☐ Population Regulation
- ☐ Intraspecific Competition
- ☐ Reproductive Strategies
- ☐ Gender Allocation
- ☐ Metapopulations
- ☐ Extinction
- ☐ POPULATION GENETICS & BREEDING SYSTEMS
- ☐ Variation
- ☐ Microevolution
- ☐ Speciation
- ☐ Hybridization
- ☐ Inbreeding/Outbreeding
- ☐ Gene Flow Measurement
- ☐ Inheritance/Heritability
- ☐ Quantitative Genetics/ QTL Analysis
- ☐ Ecological Genetics
- ☐ Gender Ratios
- ☐ Apomixis/ Parthenogenesis
- ☐ Vegetative Reproduction
- ☐ SPECIES INTERACTIONS
- ☐ Predation
- ☐ Herbivory
- ☐ Omnivory
- ☐ Interspecific Competition
- ☐ Niche Relationships/ Resource Partititioning
- ☐ Pollination/ Seed Dispersal
- ☐ Parasitism
- ☐ Mutualism/ Commensalism
- ☐ Plant/Fungal/ Microbial Interactions
- ☐ Mimicry
- ☐ Animal Pathology
- ☐ Plant Pathology
- ☐ Coevolution
- ☐ Biological Control
- ☐ STATISTICS & MODELING
- ☐ Methods/ Instrumentation/ Software
- ☐ Modeling (general)
- ☐ Statistics (general)
  - ☐ Multivariate Methods
  - ☐ Spatial Statistics & Spatial Modeling
  - ☐ Sampling Design & Analysis
  - ☐ Experimental Design & Analysis
- ☐ SYSTEMATICS
- ☑ Taxonomy/Classification
- ☐ Nomenclature
- ☐ Monograph/Revision
- ☑ Phylogenetics
- ☐ Phenetics/Cladistics/ Numerical Taxonomy
- ☐ Macroevolution
- ☐ NONE OF THE ABOVE

CATEGORY IV: INFRASTRUCTURE (Select 1 to 3)

- COLLECTIONS/STOCK CULTURES
- ☑ Natural History Collections
- ☐ DATABASES

FACILITIES

- ☐ Controlled Environment Facilities
- ☐ Field Stations
  - ☐ Field Facility Structure
  - ☐ Field Facility Equipment
- ☐ LTER Site
- ☐ INDUSTRY PARTICIPATION
- ☐ Technique Development

TRACKING SYSTEMS

- ☐ Geographic Information Systems
- ☐ Remote Sensing
- ☐ NONE OF THE ABOVE

CATEGORY V: HABITAT (Select 1 to 2)

TERRESTRIAL HABITATS

- ☐ GENERAL TERRESTRIAL
- ☐ TUNDRA
- ☐ BOREAL FOREST
- ☐ TEMPERATE
  - ☐ Deciduous Forest
  - ☐ Coniferous Forest
  - ☐ Rain Forest
  - ☐ Mixed Forest
  - ☐ Prairie/Grasslands
  - ☐ Desert
- ☐ SUBTROPICAL
  - ☐ Rain Forest
  - ☐ Seasonal Forest
  - ☐ Savanna
  - ☐ Thornwoods
  - ☐ Deciduous Forest
  - ☐ Coniferous Forest
  - ☐ Desert
- ☐ TROPICAL
  - ☐ Rain Forest
  - ☐ Seasonal Forest
  - ☐ Savanna
  - ☐ Thornwoods
  - ☐ Deciduous Forest
  - ☐ Coniferous Forest
  - ☐ Desert
- ☐ CHAPPARAL/ SCLEROPHYLL/ SHRUBLANDS
- ☐ ALPINE
- ☐ MONTANE
- ☐ CLOUD FOREST
- ☐ RIPARIAN ZONES
- ☐ ISLANDS (except Barrier Islands)
- ☐ BEACHES/ DUNES/ SHORES/ BARRIER ISLANDS
- ☐ CAVES/ ROCK OUTCROPS/ CLIFFS
- ☐ CROPLANDS/ FALLOW FIELDS/ PASTURES
- ☐ URBAN/SUBURBAN
- ☐ SUBTERRANEAN/ SOIL/ SEDIMENTS
- ☐ EXTREME TERRESTRIAL ENVIRONMENT
- ☐ AERIAL

AQUATIC HABITATS

- ☑ GENERAL AQUATIC
- ☐ FRESHWATER
  - ☐ Wetlands/Bogs/Swamps
  - ☐ Lakes/Ponds
  - ☐ Rivers/Streams
  - ☐ Reservoirs
- ☐ MARINE
  - ☐ Open Ocean/Continental Shelf
  - ☐ Bathyal
  - ☐ Abyssal
  - ☐ Estuarine
  - ☐ Intertidal/Tidal/Coastal
  - ☐ Coral Reef
  - ☐ HYPERSALINE
- ☐ EXTREME AQUATIC ENVIRONMENT
- ☐ CAVES/ ROCK OUTCROPS/ CLIFFS
- ☐ MANGROVES
- ☐ SUBSURFACE WATERS/ SPRINGS
- ☐ EPHEMERAL POOLS & STREAMS
- ☐ MICROPOOLS (Pitcher Plants, Tree Holes, Other)

MAN-MADE ENVIRONMENTS

- ☐ LABORATORY
- ☐ THEORETICAL SYSTEMS
- ☐ OTHER ARTIFICIAL SYSTEMS

NOT APPLICABLE

- ☐ NOT APPLICABLE

CATEGORY VI: GEOGRAPHIC AREA OF THE RESEARCH (Select 1 to 2)

- ☑ WORLDWIDE
- ☐ NORTH AMERICA
  - ☐ United States
    - ☐ Northeast US (CT, MA, ME, NH, NJ, NY, PA, RI, VT)
    - ☐ Northcentral US (IA, IL, IN, MI, MN, ND, NE, OH, SD, WI)
    - ☐ Northwest US (ID, MT, OR, WA, WY)
    - ☐ Southeast US (DC, DE, FL, GA, MD, NC, SC, WV, VA)
    - ☐ Southcentral US (AL, AR, KS, KY, LA, MO, MS, OK, TN, TX)
    - ☐ Southwest US (AZ, CA, CO, NM, NV, UT)
    - ☐ Alaska
    - ☐ Hawaii
    - ☐ Puerto Rico
    - ☐ Canada
  - ☐ Mexico
- ☐ CENTRAL AMERICA (Mainland)
  - ☐ Caribbean Islands
  - ☐ Bermuda/Bahamas
- ☐ SOUTH AMERICA
  - ☐ Eastern South America (Guyana, Fr. Guiana, Suriname, Brazil)
  - ☐ Northern South America (Colombia, Venezuela)
  - ☐ Southern South America (Chile, Argentina, Uruguay, Paraguay)
  - ☐ Western South America (Ecuador, Peru, Bolivia)
- ☐ EUROPE
  - ☐ Eastern Europe
  - ☐ Russia
  - ☐ Scandinavia
  - ☐ Western Europe
- ☐ ASIA
  - ☐ Central Asia
  - ☐ Far East
  - ☐ Middle East
  - ☐ Siberia
  - ☐ South Asia
  - ☐ Southeast Asia
- ☐ AFRICA
  - ☐ North Africa
  - ☐ African South of the Sahara
    - ☐ East Africa
    - ☐ Madagascar
    - ☐ South Africa
    - ☐ West Africa
- ☐ AUSTRALASIA
  - ☐ Australia
  - ☐ New Zealand
  - ☐ Pacific Islands
- ☐ ANTARCTICA
- ☐ ARCTIC
- ☐ ATLANTIC OCEAN
- ☐ PACIFIC OCEAN
- ☐ INDIAN OCEAN
- ☐ OTHER REGIONS (Not defined)
- ☐ NOT APPLICABLE

CATEGORY VII: CLASSIFICATION OF ORGANISMS (Select 1 to 4)

- ☐ VIRUSES
  - ☐ Bacterial
  - ☐ Plant
  - ☐ Animal
- ☐ PROKARYOTES
  - ☐ Archaebacteria
  - ☐ Cyanobacteria
  - ☐ Eubacteria
- ☐ PROTISTA (PROTOZOA)
  - ☐ Amoebae
  - ☐ Apicomplexa
  - ☑ Ciliophora
  - ☐ Flagellates
  - ☐ Foraminifera
  - ☐ Microspora
  - ☐ Radiolaria
- ☐ FUNGI
  - ☐ Ascomycota
  - ☐ Basidiomycota
  - ☐ Chytridiomycota
  - ☐ Mitosporic Fungi
  - ☐ Oomycota
  - ☐ Zygomycota
- ☐ LICHENS
- ☐ SLIME MOLDS
- ☐ ALGAE
  - ☐ Bacillariophyta (Diatoms)
  - ☐ Charophyta
  - ☐ Chlorophyta
  - ☐ Chrysophyta
  - ☐ Dinoflagellata
  - ☐ Euglenoids
  - ☐ Phaeophyta
  - ☐ Rhodophyta
- ☐ PLANTS
  - ☐ N0N-VASCULAR PLANTS
    - ☐ BRYOPHYTA
      - ☐ Anthocerotae (Hornworts)
      - ☐ Hepaticae (Liverworts)
      - ☐ Musci (Mosses)
  - ☐ VASCULAR PLANTS
    - ☐ FERNS & FERN ALLIES
    - ☐ GYMNOSPERMS
      - ☐ Coniferales (Conifers)
      - ☐ Cycadales (Cycads)

- ☐ Ginkgoales (Ginkgo)
- ☐ Gnetales (Gnetophytes)
- ☐ ANGIOSPERMS
- ☐ Monocots
- ☐ Arecaceae (Palmae)
- ☐ Cyperaceae
- ☐ Liliaceae
- ☐ Orchidaceae
- ☐ Poaceae (Graminae)
- ☐ Dicots
- ☐ Apiaceae (Umbelliferae)
- ☐ Asteraceae (Compositae)
- ☐ Brassicaceae (Cruciferae)
- ☐ Fabaceae (Leguminosae)
- ☐ Lamiaceae (Labiatae)
- ☐ Rosaceae
- ☐ Solanaceae

☐ ANIMALS

- ☐ INVERTEBRATES
- ☐ MESOZOA/PLACOZOA
- ☐ PORIFERA (Sponges)
- ☐ CNIDARIA
- ☐ Hydrozoa (Hydra, etc.)
- ☐ Scyphozoa (Jellyfish)
- ☐ Anthozoa (Corals, Sea Anemones)
- ☐ CTENOPHORA (Comb Jellies)
- ☐ PLATYHELMINTHES (Flatworms)
- ☐ Turbellaria (Planarians)
- ☐ Trematoda (Flukes)
- ☐ Cestoda (Tapeworms)
- ☐ Monogenea (Flukes)
- ☐ GNATHOSTOMULIDA
- ☐ NEMERTINEA (Rynchocoela) (Ribbon Worms)
- ☐ ENTOPROCTA (Bryozoa) (Plant-like Animals)
- ☐ ASCHELMINTHES
- ☐ Gastrotricha
- ☐ Kinorhyncha
- ☐ Loricifera
- ☐ Nematoda (Roundworms)
- ☐ Nematomorpha (Horsehair Worms)
- ☐ Rotifera (Rotatoria)
- ☐ ACANTHOCEPHALA (Spiny-headed Worms)
- ☐ PRIAPULOIDEA
- ☐ BRYOZOA (Ectoprocta) (Plant-like Animals)
- ☐ PHORONIDEA (Lophophorates)
- ☐ BRACHIOPODA (Lamp Shells)
- ☐ MOLLUSCA
- ☐ Monoplacophora
- ☐ Aplacophora (Solenogasters)
- ☐ Polyplacophora (Chitons)
- ☐ Scaphopoda (Tooth Shells)
- ☐ Gastropoda (Snails, Slugs, Limpets)
- ☐ Pelecypoda (Bivalvia) (Clams, Mussels, Oysters, Scallops)
- ☐ Cephalopoda (Squid, Octopus, Nautilus)
- ☐ ANNELIDA (Segmented Worms)
- ☐ Polychaeta (Parapodial Worms)
- ☐ Oligochaeta (Earthworms)
- ☐ Hirudinida (Leeches)
- ☐ POGONOPHORA (Beard Worms)
- ☐ SIPUNCULOIDEA (Peanut Worms)
- ☐ ECHIUROIDEA (Spoon Worms)
- ☐ ARTHROPODA
- ☐ Cheliceriformes
- ☐ Merostomata (Horseshoe Crabs)
- ☐ Pycnogonida (Sea Spiders)
- ☐ Scorpionida (Scorpions)
- ☐ Araneae (True Spiders)
- ☐ Pseudoscorpionida (Pseudoscorpions)
- ☐ Acarina (Free-living Mites)
- ☐ Parasitiformes (Parasitic Ticks & Mites)
- ☐ Crustacea
- ☐ Branchiopoda (Fairy Shrimp, Water Flea)
- ☐ Ostracoda (Sea Lice)
- ☐ Copepoda
- ☐ Cirripedia (Barnacles)
- ☐ Amphipoda (Skeleton Shrimp, Whale Lice, Freshwater Shrimp)
- ☐ Isopoda (Wood Lice, Pillbugs)
- ☐ Decapoda (Lobster, Crayfish, Crabs, Shrimp)
- ☐ Hexapoda (Insecta) (Insects)
- ☐ Apterygota (Springtails, Silverfish, etc.)
- ☐ Odonata (Dragonflies, Damselflies)
- ☐ Ephemeroptera (Mayflies)
- ☐ Orthoptera (Grasshoppers, Crickets)
- ☐ Dictyoptera (Cockroaches, Mantids, Phasmids)
- ☐ Isoptera (Termites)
- ☐ Plecoptera (Stoneflies)
- ☐ Phthiraptera (Mallophaga & Anoplura) (Lice)
- ☐ Hemiptera (including Heteroptera) (True Bugs)
- ☐ Homoptera (Cicadas, Scale Insects, Leafhoppers)
- ☐ Thysanoptera (Thrips)
- ☐ Neuroptera (Lacewings, Dobsonflies, Snakeflies)
- ☐ Trichoptera (Caddisflies)
- ☐ Lepidoptera (Moths, Butterflies)
- ☐ Diptera (Flies, Mosquitoes)
- ☐ Siphonaptera (Fleas)
- ☐ Coleoptera (Beetles)
- ☐ Hymenoptera (Ants, Bees, Wasps, Sawflies)
- ☐ Chilopoda (Centipedes)
- ☐ Diplopoda (Millipedes)
- ☐ Pauropoda
- ☐ Symphyta (Symphyla)
- ☐ PENTASTOMIDA (Linguatulida) (Tongue Worms)
- ☐ TARDIGRADA (Tardigrades, Water Bears)
- ☐ ONYCHOPHORA (Peripatus)
- ☐ CHAETOGNATHA (Arrow Worms)
- ☐ ECHINODERMATA
- ☐ Crinoidea (Sea Lilies, Feather Stars)
- ☐ Asteroidea (Starfish, Sea Stars)
- ☐ Ophiuroidea (Brittle Stars, Serpent Stars)
- ☐ Echinoidea (Sea Urchins, Sand Dollars)
- ☐ Holothuroidea (Sea Cucumbers)
- ☐ HEMICHORDATA (Acorn Worms, Pterobranchs)
- ☐ UROCHORDATA (Tunicata) (Tunicates, Sea Squirts, Salps, Ascideans)
- ☐ CEPHALOCHORDATA (Amphioxus/Lancelet)
- ☐ VERTEBRATES
- ☐ AGNATHA (Hagfish, Lamprey)
- ☐ FISHES
- ☐ Chondrichthyes (Cartilaginous Fishes) (Sharks, Rays, Ratfish)
- ☐ Osteichthyes (Bony Fishes)
- ☐ AMPHIBIA
- ☐ Anura (Frogs, Toads)
- ☐ Urodela (Salamanders, Newts)
- ☐ Gymnophiona (Apoda) (Caecilians)
- ☐ REPTILIA
- ☐ Chelonia (Turtles, Tortoises)
- ☐ Serpentes (Snakes)
- ☐ Sauria (Lizards)
- ☐ Crocodylia (Crocodilians)
- ☐ AVES (Birds)
- ☐ Passeriformes (Passerines)
- ☐ MAMMALIA
- ☐ Monotremata (Platypus, Echidna)
- ☐ Marsupalia (Marsupials)
- ☐ Eutheria (Placentals)
- ☐ Insectivora (Hedgehogs, Moles, Shrews, Tenrec, etc.)
- ☐ Chiroptera (Bats)
- ☐ Primates
- ☐ Humans
- ☐ Rodentia
- ☐ Lagomorphs (Rabbits, Hares, Pikas)
- ☐ Carnivora (Bears, Canids, Felids, Mustelids, Viverrids, Hyena, Procyonids)
- ☐ Perissodactyla (Odd-toed Ungulates) (Horses, Rhinos, Tapirs, etc.)

☐ Artiodactyla (Even-toed Ungulates) (Cattle, Sheep, Deer, Pigs, etc.) ☐ Marine Mammals (Seals, Walrus, Whales, Otters, Dolphins, Porpoises)	☐ TRANSGENIC ORGANISMS ☐ FOSSIL OR EXTINCT ORGANISMS	☐ NO ORGANISMS

CATEGORY VIII: MODEL ORGANISM (Select ONE)		
☑ NO MODEL ORGANISM MODEL ORGANISM (Choose from the list)	☐ Escherichia coli ☐ Mouse-Ear Cress (Arabidopsis thaliana)	☐ Fruitfly (Drosophila melanogaster)

Intellectual Merit:

Ciliates are one of the major groups of protists. They are widespread and abundant in freshwater, marine, and terrestrial ecosystems, where they have a wide array of ecological roles. There are 7500–8000 known species of ciliates, but the true number may be as many as 30,000. Knowledge of microbial biodiversity, including that of ciliates, is rapidly becoming more important to modeling and managing ecosystems as the important role of such microorganisms in 'ecosystem engineering' becomes better known. However, knowledge of the actual biodiversity of ciliates and other protists lags behind that of other groups of organisms just when problems such as cryptic species and taxa with no unifying morphological characteristics are being uncovered. There is no archive of preserved material from which to obtain DNA or morphological information using novel methods. Also, sequencing genes other than the ones coding for RNA is always more difficult, and less is known about the evolution of molecular characters. Furthermore, the ciliate fauna is largely unknown outside western Europe or eastern North America, and the community of researchers in biodiversity of ciliates is scattered thinly and unevenly across the world. Lastly, many researchers are younger investigators who do not have the means to travel to professional meetings or other laboratories.

We propose to form an interdisciplinary Research Coordination Network for Biodiversity of Ciliates (RCN-BC) as a cooperative project of Chinese and U.S. labs, with an international group of investigators who are already associated with one another as its nucleus. The RCN-BC will be directed by a steering committee of experts and will focus on problems that hinder progress in research on ciliate biodiversity and on fostering relationships between investigators. It will become an 'engine' for generating new collaborations, new ideas for research projects, new procedures for archiving material, new proposals for research, and new types of interdisciplinary cooperation . It will advance the rate at which knowledge is gained about taxonomy, phylogeny, geographical distribution, ecology, and genomics of core groups of ciliated protists by bringing together specialists engaged in the investigation of different facets of ciliate biodiversity to create opportunities for exchange of ideas, sharing of data, and formation of collaborations. Activities will include (1) one workshop or symposium each year that will focus on techniques or strategies used to investigate biodiversity of ciliates, (2) developing protocols and agreements with major museums for depositing and curating samples of cells or DNA from ongoing investigations, (3) a website that will offer information on activities, promote collaborations, and provide a way to share unpublished data; and (4) funds for researchers to participate in meetings and travel to other labs for collaboration. The website, workshops, symposia, and presentations at professional meetings will serve as vehicles for publicizing the network, attracting new members or users, and sharing information.

Broader Impacts:

The RCN–BC will serve as a model for networking to achieve progress in investigations of biodiversity of protistan taxa by developing strategies to address problems that are common to studies of biodiversity in all groups of protists, such as diversity of genomic and cellular architecture and achieving adequate taxon representation in phylogenies. It also will have the potential to foster development of key species of ciliates as new research models and contribute to research on the functional ecology of ciliates and evolution of genetic characters and genome components. Students from at least two underrepresented minority groups (African-American, Pacific Islander) will be included in activities such as workshop presentations, and interactions with visiting investigators. Also, a listserv of academic contacts at Minority Serving Institutions (MSIs) will be created and used to inform faculty and students at MSIs about the RCN–BC. This will provide exposure to biodiversity studies for minority students of that traditionally get scant exposure to any area of biology other than biomedical disciplines.

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*Proposers may select any numbering mechanism for the proposal. The entire proposal however, must be paginated. Complete both columns only if the proposal is numbered consecutively.

1. Introduction

Our group of Chinese and U.S. partners proposes to form an international Research Coordination Network for Biodiversity of Ciliates (**RCN–BC**). The RCN-BC will bring together researchers in different areas of biodiversity from China, the U.S., and other countries to create opportunities for exchanging ideas, forming collaborations, advancing careers of young investigators, investigating ciliates in understudied geographic areas, discovering new methodologies, sharing data, promoting interdisciplinary projects, and raising public awareness of the value of studying biodiversity of microorganisms. New proposals for collaborative research projects, improvements in methodologies and strategies, and new ways of archiving material for future studies will be major objectives. The RCN–BC will be an 'engine' for advancing the rate at which knowledge is gained about taxonomy, distribution, ecology, and phylogeny of ciliated protists—especially those in areas of the world in which the ciliate fauna is poorly known or has not been sampled at all. Relationships fostered by the RCN-BC also will help drive research in fields that benefit from research in evolutionary biology and ecology, such as functional genomics, genomic evolution, cell physiology, and morphogenesis.

2. Why study biodiversity of ciliates?

The phylum Ciliophora is a major, well-defined, monophyletic taxon of protists that are evolutionarily allied to dinoflagellates and apicomplexans [**2**]. Ciliates are some of the most structurally and functionally complex protists and are excellent models for research in many areas of basic biology [**57**]. There are many, abundant, free-living and symbiotic species in a wide variety of freshwater, marine, and terrestrial ecosystems [**e.g., 5, 9, 10, 24, 25, 51, 75, 99, 122–124, 130**].

Currently, 10 classes of ciliates containing some 8,000 named species grouped into at least 1600 genera are recognized [**78**]. These taxa represent a wide variety of morphological patterns, centered mainly on shape of the cell and ciliary arrangements but also featuring elaborations of different specialized regions or cellular organelles (e.g., cytostome, contractile vacuole, extrusomes, myonemes). An impressive array of functional types and ecological roles have evolved within the Ciliophora, including bacterivores (perhaps the most common ciliophoran lifestyle), predators, herbivores, and symbionts of many sorts [**78**; **e.g., 94, 96**].

In particular, ciliates are widely recognized as critical members of the 'microbial loop' of both marine and freshwater systems, where they prey on bacteria and smaller protists or engage in mixotrophic relationships, linking these tiny primary decomposers and producers to larger consumers (e.g., rotifers, copepods, larval fish) that feed on ciliates [**84, 101, 102, 113, 133**]. Likewise, ciliates form an essential part of soil ecosystems, where they release nutrients from bacteria to plants and interact with the rhizosphere [**1, 6**]. Furthermore, there is some evidence that reduction in the biodiversity of soil microbes, including ciliates, reduces the resiliency of soils to stress [**17, 33, 45, 53**]. Many ciliates also are involved in symbiotic relationships with animals or other eukaryotes. Roles of symbiotic ciliates in ecosystems have been investigated less than those of free-living taxa, but they are known to participate in digestion of plant material by vertebrate herbivores (e.g., rumen and hindgut ciliates), increase vulnerability of some aquatic arthropods to predation [**59, 69, 106, 131, 135**], and foster secondary infections by bacteria and fungi in fishes and crustaceans [**e.g., 26**]. Also, many ciliates act as hosts of other micro-organisms (e.g., zoochlorellae, zooxanthellae, kleptochloroplasts), and these associations can play significant roles in aquatic ecosystems [**14, 23, 65, 67, 76, 120, 125, 126**].

Finally, ciliates are a significant part of "artificial ecosystems." In sewage treatment, they digest bacteria to help clarify waste water [**21, 47, 89, 109, 128**], and in commercial mariculture or aquaculture operations, some species are economically significant parasites [**61, 66, 77, 88, 117**]. Ciliates can be used as bioindicators of water quality in both artificial and natural ecosystems [**7, 20, 48, 58, 79, 81, 82, 108, 129**], but this application frequently has been limited by an inability to identify species with certainty.

3. Why is the RCN-BC needed?

The set of morphological, molecular, and ecological data is more fragmentary than in macroeukaryotes.

Until the mid-20th century, ciliates and other protists were identified and described mostly from "gross morphology" visible in living cells observed with a light microscope, with little or no thought of looking at intraspecific variation. Likewise, there was little investigation of the biogeography or ecological roles of individual taxa of ciliates in any systematic way. Consequently, much of the complexity of cellular structure and ecology of ciliates was overlooked. Beginning in the 1920s, staining with silver nitrate and protargol allowed many details of morphology not visible in living cells to be seen with the light microscope, and electron microscopy made even smaller details visible. This resulted in more modern hypotheses of classification and evolutionary relationship and an ability to make more accurate identifications of many species. Finally, PCR and associated methods for sequencing genes have been used for the last ~25 years to re-examine ciliates using molecular data.

Current sets of morphological, molecular, morphogenetic, and ecological data for major taxa of ciliates are very uneven in content because of this incremental evolution of methodologies over the last century. Many species/genera are still known only from minimal morphological descriptions of living cells in older papers or monographs with no physical material of any sort available for reexamination. For some species, there are 'modern' descriptions of morphology and morphogenesis done with silver staining techniques that have become standard since the 1970's. For a still smaller number of species, there are molecular sequences available from databases like GenBank and EMBL, but the only coding area for which there is extensive coverage is the gene for small-subunit (SSU) rRNA.

The use of molecular methods to describe and biodiversity of ciliates has progressed more slowly than with macroscopic eukaryotes.

Development of methods for rapid sequencing of genes led quickly to a realization that much of the biodiversity of ciliates probably is not discoverable by morphological techniques alone [**110**]. Many studies, beginning with classic investigations that revealed "*Paramecium aurelia*" as a large complex of genetically and reproductively isolated sibling species [**116**], have demonstrated the existence of morphologically similar, but genetically distinct, species of ciliates [**50, 64, 111**]. Molecular phylogenetic studies of ciliate taxa also uncovered more than a few instances of incongruence between morphological and genetic characters or convergence in morphology among unrelated species that upset long-held ideas of evolutionary and taxonomic relationships. For example, heterotrichs were regarded as a highly derived group of ciliates based on their complex morphology but were revealed as a basal group most closely related to karyorelictids, the stem group of the entire phylum Ciliophora by molecular characters [**52, 60, 112**]. Likewise, mobilids (e.g., *Trichodina* spp.) were long thought to be members of the subclass Peritrichia because they shared a distinctive, expanded oral apparatus but recently were found to be a subclass in their own right and not closely related to peritrichs sensu stricto [**138**].

Research on biodiversity of ciliates using molecular methods has proceeded relatively slowly compared to "macroscopic" eukaryotes for several reasons. First and foremost is the difficulty of obtaining material from which to extract DNA in many cases. Museum and herbarium specimens often can be used as sources of DNA for investigations of animals, plants, or fungi. By contrast, ciliates must be collected and isolated from fresh material because there are generally no specimens in museums or other repositories that can be used as sources of DNA.

Second, an accurate, verifiable foundation of morphological and biogeographical data upon which to build molecular studies is mostly absent. For macroscopic eukaryotes, there is a wealth of such data that can be extracted from the literature, and type/voucher specimens allow verification of structural features. By contrast, investigators of ciliate biodiversity must "start from scratch" in most cases. For a majority of ciliate species, only a few details of gross morphology can be gleaned from the literature, there may be only one published description, and there are probably no type/voucher specimens available (no requirement for deposition of type slides until recently). Researchers on molecular phylogeny or ecology

of ciliates, then, either must generate the morphological data themselves or be content with results that may be built at least partly on sequences of taxonomically unidentified taxa with no links to the literature.

Archived material of ciliates in the form of type slides, identified cultures, fixed cells, or DNA samples is available from a limited number of sources compared to animals, plants, or fungi. Four relatively large collections currently receive depositions of type and voucher slides originating from taxonomic studies of ciliates. These are housed in the Natural History Museum–United Kingdom (NHMUK), the (Smithsonian) National Museum of Natural History (NMNH), the Oberösterreichische Landesmuseen (OLM), and the Laboratory of Protozoology (Ocean University of China). Other slides of stained material are scattered throughout a variety of museum, laboratory, and personal collections. A large collection of fixed cells and DNA samples is housed in the laboratories of Weibo Song at Ocean University of China (OUC) and Xiaofeng Lin at South China Normal University, and a much smaller collection is kept at PI Clamp's laboratory. Both of these collections are maintained for the use of researchers in their respective labs, and there are no formal agreements for sharing material outside of the labs except those between individual collaborators. Cultures of free-living ciliates are included in the American Type Culture Collection (ATCC) and the Culture Collection of Algae and Protozoa (CCAP), and National Tetrahymena Stock Center at Cornell University (TSC). However, roughly 50% of the 616 strains in the ATCC are species of *Tetrahymena* (351 strains) or *Paramecium* (219 strains), 31 of 60 strains In the CCAP are also species in these two genera, and all of the strains in the TSC are species of *Tetrahymena*. Thus, these three collections are quite valuable to geneticists, biochemists, or cell biologists but are of limited value to broader studies of biodiversity.

Other factors that make molecular investigation of ciliate biodiversity difficult derive from the genetic structure of the organisms themselves. One of these is their diversity of genomic architecture. Macronuclear genomes are radically different from the diploid genome typical of eukaryotes [**115**], and some entire subclasses have a "scrambled genome" with parts of many coding regions split between different chromosomes [**71, 86, 103, 104**]. Also, there is evidence that particular genes have evolved at very different rates in ciliates compared to other eukaryotes [**13, 87**]. Finally, genes that code for structural proteins or enzymes in ciliates may differ substantially from the same sequences in other eukaryotes. One prominent example is the gene coding for cytochrome oxidase I [**19, 50, 127**]. Obtaining multigene data sets of ciliates can be an especially difficult, time-consuming process because PCR primers are harder to design when sequences similar to the target are completely lacking. The PI's lab just spent 3 years generating a set of sequences for ~ 50 species of peritrichs that includes tubulin, actin, histone H4, elongation factor 1-α, and heat-shock protein 70, in addition to RNA-coding genes [**see Results from Current NSF Project**]. New primers had to be designed and laboriously refined for each of the protein-coding genes.

The gene coding for SSU rRNA is the only one with a large coverage among species of ciliates represented in databases like GenBank because it can be amplified reliably with universal primers. Far fewer sequences of other RNA-coding regions of ciliates are available even though they also can be amplified with universal primers, and protein-coding sequences are very poorly represented. The number of SSU rRNA sequences seems to be substantial for some of the larger, better known taxa at first glance (**Fig. 1**), but this is illusory because relatively few identifiable species are represented in each taxon and sequences are thus of limited usefulness to studies of biodiversity (**Fig. 1**). In the Heterotrichea, Peniculia, and Hymenostomatia (**Fig. 1, taxa in red**), the majority of sequences are from different strains or sibling species of just a few "model organisms" (e.g. *Stentor* and *Blepharisma* spp., *Paramecium aurelia* complex, *Tetrahymena* spp.). In the Stichotrichia, Hypotrichia, Colpodea, and Scuticociliatia (**Fig. 1, taxa in red**), the majority of ssu rRNA sequences are from unidentified samples that were used in a handful of environmental investigations centered on single localities. Sequences not identifiable beyond the level of family or genus might have some value to purely phylogenetic analyses [**139**], but sequences must represent populations in which the morphology is known and were sampled from multiple localities to be truly useful in studies investigating questions such as species boundaries or the existence of cryptic species.

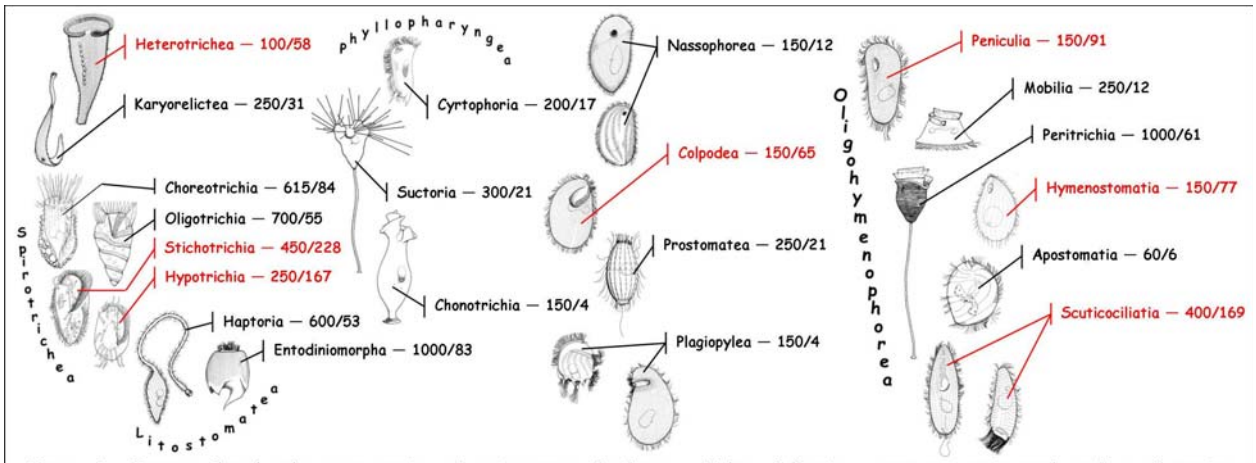

Figure 1. Status of molecular systematics of major taxa of ciliates. Values following names are estimated number of species in each taxon and ssu rRNA sequences available from GenBank. Sequences of taxa shown in red include either many unidentified environmental sequences or many sequences of a few model organisms. Images from Lynn (2008)

The number of researchers with training in taxonomy of ciliates is declining in most areas of the world, and workers are scattered unevenly across several countries and 4 continents.

Taxonomy is the core discipline of systematics upon which all investigations of biodiversity depend, but the numbers of researchers with a working knowledge of ciliate taxonomy are steadily declining as investigators retire or die without being replaced. In general, research on biodiversity of ciliates, especially free-living taxa, suffers from the same problem that afflicts work on other groups of organisms—training in taxonomy has not been supported as strongly as have other areas of biological research [**22, 91**]. Also, the practice of taxonomy has become more complex because cross-training in a variety of morphological and molecular techniques has become a requirement for modern work. Added to this is the necessity, discussed above, that ciliate taxonomists must be experts at field collecting. It is difficult for a single individual to acquire all of these skills, but this is essential if he/she expects to train students of their own. Without properly trained taxonomists, studies of biodiversity can be attempted but may not lead to meaningful analyses and discovery of new information in areas like phylogeny, ecology, functional genomics, or evolution of development [**22**].

4. Why form an RCN specifically for ciliate biodiversity? Why not an RCN for prostistan biodiversity instead?

Even though there are only 7500–8000 described species of ciliates (estimates of the true number of free-living species range from 3000-30000), they comprise a phylum-level group whose members are equivalent in complexity (expressed at the organellar level) to the average animal (expressed at the tissue-organ level) and more diverse in terms of basic morphology (filter-feeders, active predators, stationary predators, grazing herbivores, endosymbionts, ectosymbionts, parasites) than all but a few phyla of animals. By contrast, protists are a polyphyletic cluster of several 'supergroups' encompassing more than 30 apparent phyla [**2**] that have more diversity of organellar structure, cellular physiology, and life cycles than all other eukaryotic kingdoms combined. Therefore, an RCN for biodiversity of ciliates is equivalent in scope to one targeting a moderately large, diverse phylum of animals, but an RCN for protistan diversity would be unlikely at the outset to cohere into a manageable group because of its broad scope and be too diffuse in its goals to achieve sensible, discrete objectives. Furthermore, the RCN–BC as it exists now (**Table 1**) already has begun to grow, evolve, and function in a productive, cooperative way (e.g., many members contributed ideas to this proposal), and even after growing further, it still will be able to maintain the focus that will make it more likely to achieve its objectives than a much broader group.

5. A partnership between U.S. and Chinese collaborators will create the Research Coordination Network for Biodiversity of Ciliates

Chinese researchers are emerging as leaders in the investigation of biodiversity of ciliates

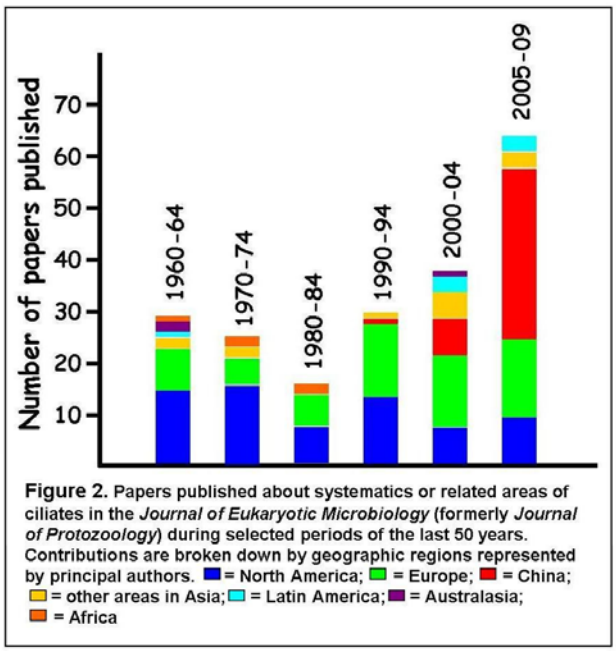

Figure 2. Papers published about systematics or related areas of ciliates in the *Journal of Eukaryotic Microbiology* (formerly *Journal of Protozoology*) during selected periods of the last 50 years. Contributions are broken down by geographic regions represented by principal authors. = North America; = Europe; = China; = other areas in Asia; = Latin America; = Australasia; = Africa

Specialists in taxonomy of ciliates are distributed unevenly across the world, with many areas (e.g., Africa, Australia, South Asia) still having few or no active workers [**62**]. China is the single country where relatively large numbers of young researchers are being trained in different areas of investigation into biodiversity of ciliates (molecular and/or morphological phylogenetics, taxonomy, and ecology). To a lesser degree, young researchers in these areas are being trained in Europe, but North America, particularly the U.S., has fallen behind in training and employment of specialists that could advance investigation of ciliate biodiversity. These trends can be illustrated by looking at papers on systematics and evolution of ciliates in one of the principal journals of protistology, the *Journal of Eukaryotic Microbiology*, over the last 50 years (**Fig. 2**). Papers by European authors have increased slightly while those by North American authors have declined significantly. By contrast, papers by Chinese authors have grown by leaps and bounds, from only one in the early 1990s to more than 50% of the total papers on biodiversity of ciliates published during the last 5 years. Papers from researchers in other Asian countries, especially Korea, also increased but at nothing like the dramatic pace in China.

Young researchers from Chinese labs have come to the U.S. and Europe for training in phylogenetic methodologies, but there has been little exchange in the other direction (**Fig. 3, green arrows**). For instance, the PI has had one postdoc and four short-term visitors (3 graduate students and one junior faculty) from China in his lab over the last three years. The protistology lab at the NHMUK has hosted a number of graduate students and at least one visiting faculty member from China for varying periods of time over the last several years. The lab of Thorsten Stoeck at the University of Kaiserslautern is yet another such example. By contrast, the PI has carried two undergraduate researchers to Chinese labs as part of his summer trips for field work, and Chinese visitors have participated in training students while at his lab (see **Results from previous NSF projects**). Other than this, there has not been any real reciprocation of Chinese visits even though several labs in different areas of China (**Table 1**) are actively engaged in cutting-edge investigations of ciliate biodiversity and are more than willing to host visiting researchers or engage in collaborative research. In summary, Chinese investigators have emerged as leading figures in the investigation of biodiversity of ciliates and have much expertise to offer to the field as a whole; however, the potential for partnerships with Chinese labs to advance the general field of inquiry is not being fully realized and will be enhanced by establishment of the RCN-BC.

An existing group of researchers will be the nucleus of the network.

Since the early 2000's, a rapidly growing group of Chinese, British, American, German, Russian, and Brazilian collaborators have been working together on research projects in key areas of biodiversity of ciliates. **Figure 3** and **Table 1** illustrate the general links within the group. Members of the group have collaborated on major projects, single publications, and individual visits of young researchers. Weibo Song's lab at OUC and Alan Warren's lab at the NHMUK have been doing research on biodiversity of ciliates in China funded by the Darwin Initiative, the Royal Society, and NSF–China. This has included visits of several graduate students to the NHMUK. Xiaozhong Hu from OUC did a two-year project on systematics of marine benthic ciliates at the NHMUK funded by an EU Marie Curie International Research

Fellowship. Additional research by the OUC and NMHUK has been carried out in collaboration with Khaled Al-Rasheid, funded by the Center of Excellence in Biodiversity Research of King Saud University, and Yuri Mazei, funded by the Royal Society, NSF-China and the Russian Foundation for Basic Research. The PI's lab at N.C. Central University (NCCU) collaborated with the OUC lab; Wei Miao's lab at the Institute of Hydrobiology, Chinese Academy of Science (CAS, Wuhan); and Xiaofeng Lin's lab at South China Normal University on a 3-year, NSF-funded project on systematics of peritrich ciliates (see **Results from previous NSF projects)**. Ping Sun, a Ph.D. graduate of the OUC lab, was the postdoc trained on the peritrich project and has just begun working with Mann Kyoon Shin at Ulsan U. in Korea. Finally, the PI, Daode Ji (Yantai University), Laura Utz (Universidade Federal do Rio Grande do Sul, Porto Alegre, Brazil), and Horst Schödel are collaborating on a pending proposal to NSF (DEB) to investigate systematics of basal taxa of peritrich ciliates.

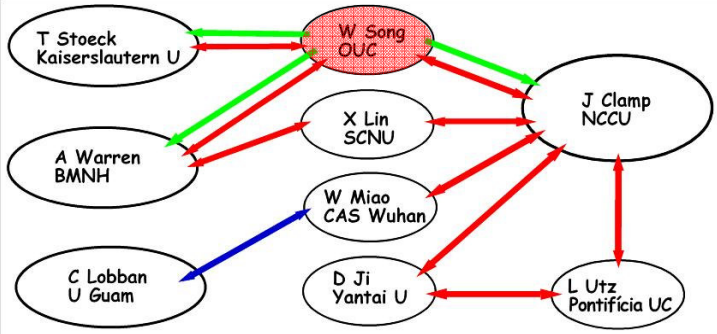

Figure 3. Some current interactions between members of the RCN–BC.

= Publications & major collaborative research project(s)
= visits or residencies of young researchers for training & collaboration
= Publications only

Steering Committee

The RCN–BC will be directed by an international steering committee of outstanding researchers from the U.S., China, and other areas of the world (**Fig. 4, Table 1**). The steering committee will plan meetings, evaluate proposals from members for collaborative exchanges, and make decisions about the functioning of the RCN–BC as needed. Members of the committee have diverse, complementary backgrounds and represent different areas of expertise related to the general investigation of ciliate biodiversity. Also, two (Drs. Utz and Dunthorn) still qualify as "younger investigators" and will lend their knowledge of challenges faced by researchers currently in the early stages of their careers to the committee.

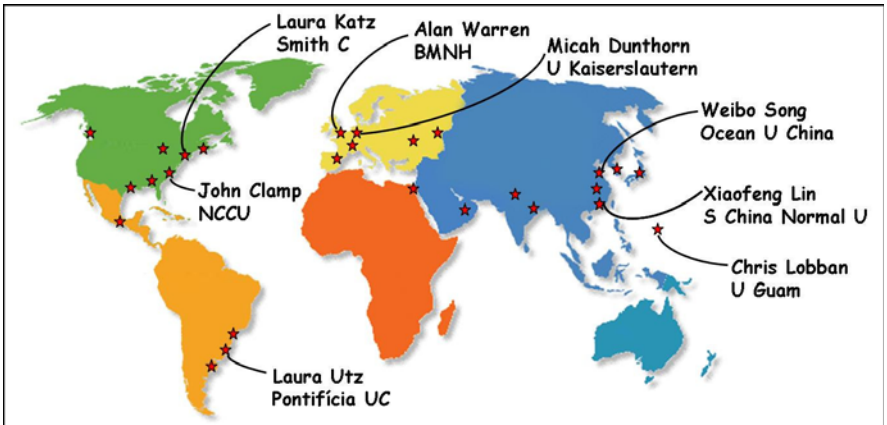

Figure 4. ★ = Geographic locales of Research Coordination Network for Biodiversity of Ciliates. Members of steering committee are labeled.

Members of the committee are an active, productive, interdisciplinary group of researchers involved in international collaborations and representing the fields of systematics, phylogeny, ecology, and genomic evolution. Briefly, they are the following (**biosketches provided in supplementary material**):

U.S	**John Clamp**	Professor, Department of Biology, N.C. Central U.
	Laura Katz	Elsie Damon Simonds Professor, Dept. of Biological Sciences, Smith College
	Chris Lobban	Professor, Division of Natural Science, U. Guam
	Micah Dunthorn	Alexander von Humboldt Postdoctoral Fellow, U. Kaiserslautern, Germany
CH	**Weibo Song**	Professor, Ocean U. of China, Qingdao, China
	Xiaofeng Lin	Professor, South China Normal U., Guangzhou, China
	Alan Warren	Researcher, Department of Zoology, Natural History Museum, UK
	Laura Utz	Staff Scientist, Pontifícia U. Católica do Rio Grande do Sul, Brazil

Table 1. Members of Research Coordination Network for Biodiversity of Ciliates. **AR**, Argentina; **AU**, Austria; **BR**, Brazil; **CA**, Canada; **CH**, China; **DE**, Germany; **EG**, Egypt; **IN**, India; **JP**, Japan; **MX**, Mexico; **RU**, Russia; **SA**, Saudi Arabia; **SK**, South Korea; **SP**, Spain; **UK**, United Kingdom; **UR**, Ukraine; **US**, United States. **LH**, laboratory head; **R**, researcher; **TR**, trainee. Participants highlighted in gray form the **Steering Committee**. Highlighted roles denote members of the existing group of collaborators.

	Participants	Institution	Status	Role(s)
US	John Clamp	NC Central U	Senior faculty	R, PI, LH
	Parke Rublee	UNC-Greensboro	Senior faculty	R
	Stephen Landers	Troy U	Senior faculty	R
	Laura Landweber	Princeton U	Senior faculty	R, LH
	Linda Hufnagel	U Rhode Island	Senior faculty	R
	Laura Katz	Smith College	Senior faculty	R, LH
	Diana Lipscomb	George Washington U	Senior faculty	R, LH
	George McManus	U Connecticut	Senior faculty	R, LH
	Rebecca Zufall	U Houston	Junior faculty	R, LH
	Helene Peters	Clearwater Christian College	Junior Faculty	R
	Dimaris Acosta-Mercado	U Puerto Rico-Mayagüez	Junior faculty	R
	Chris Lobban	U Guam	Senior faculty	R
CH	Weibo Song	Ocean U. China	Senior faculty	R, LH
	Xiaozhong Hu	Ocean U. China	Senior faculty	R
	Shan Gao	Ocean U. China	Postdoc	R, TR
	Jun Gong	Chinese Acad Sci (CAS), Yantai	Senior faculty	R, LH
	Kuidong Xu	Inst Oceanology, CAS, Qingdao	Senior faculty	R, LH
	Xiaofeng Lin	S. China Normal U	Senior faculty	R, LH
	Jiqui Li	S. China Normal U	Mid-level faculty	R
	Zhenzhen Yi	S. China Normal U	Junior faculty	R, TR
	Daode Ji	Yantai University	Junior faculty	R
	Liqiong Li	China Agricultural U, Yantai	Junior faculty	R
	Lifang Li	Shandong U, Weihai	Junior faculty	R
	Xiangrui Chen	Ningbo U	Junior faculty	R
	Chen Shao	Xi'an Jiaotong U	Junior faculty	R
	Yuanjun Zhao	Chongqing Normal U	Senior faculty	R, LH
	Fahui Tang	Chongqing Normal U	Junior Faculty	R
	Wei Miao	Inst Hydrobiology, CAS, Wuhan	Senior faculty	R, LH
	Yuhe Yu	Inst Hydrobiology, CAS, Wuhan	Senior faculty	R, LH
	Yingchun Gong	Inst Hydrobiology, CAS, Wuhan	Junior faculty	R
	QIngyun Yan	Inst Hydrobiology, CAS, Wuhan	Postdoc	R, TR
CA	Denis Lynn	U British Columbia	Emeritus	R
	Michaela Strüder-Kypke	U Guelph	Postdoc	R
	Eleni Gentekaki	Dalhousie U	Postdoc	R, TR
MX	Rosaura Mayen-Estrada	U Nac Aut Mexico	Senior faculty	R
BR	Laura Utz	Pontifícia U C RGdS	Junior faculty	R
	Eduardo Eizirik	Pontifícia U C RGdS	Mid-level faculty	R, LH
	Inácio Da Silva-Neto	U F Rio de Janeiro	Senior faculty	R
	Thiago Da Silva Paiva	U F Rio de Janeiro	Postdoc	R, TR
	Barbara Borges	U F Rural da Amazonia	Junior faculty	R
AR	Gabriela Küppers	U Nacional de La Plata	Senior faculty	R
	María Claps	U Nacional de La Plata	Senior faculty	R
	Rosa Pettigiosso	U Nacional del Sur	Senior faculty	R
	Florencio Varela	U Nacional del Sur	Senior faculty	R
	Luciana Santoferrara	U Buenos Aires	Senior faculty	R
UK	Alan Warren	UK Nat Hist Museum	Senior staff	R, LH
	David Montagnes	U Liverpool	Senior faculty	R
	Bland Finlay	Queen Mary U, London	Senior faculty	R, LH

	Genoveva Esteban	Queen Mary U, London	Senior faculty	R
SP	Mercedes Martín-Cereceda	U Complutense Madrid	Junior faculty	R
DE	Thorsten Stoeck	U Kaiserslautern	Senior faculty	R, LH
	Micah Dunthorn	U Kaiserslautern	Postdoc	R
	Horst Schödel	Wasserwirtsch Kronach	Senior staff	R
AU	Helmut Berger	Tech Büro für Ökologie	Consultant	R
	Erna Aescht	Oberosterreiche Landesmuseum	Senior staff	R
	Sabine Agatha	U Salzburg	Junior faculty	R
RU	Yuri Mazei	Penza State Pedagogical U	Senior faculty	R, LH
UR	Igor Dovgal	Schmalhausen Inst	Senior staff	R
	Elena Boshko	Schmalhausen Inst	Mid-level staff	R
SA	Khaled Al-Rasheid	King Saud U	Senior faculty	R, LH
EG	Tarek Moawat	Suez Canal University	Mid-level faculty	R
IN	Tapas Chatterjee	Indian Sch Learning, Dhanbad	Senior faculty	R
	Komal Kamra	Khalsa College, U Delhi	Senior faculty	R
SK	Joong Ki Choi	Inha U	Senior faculty	R, LH
	Mann Kyoon Shin	Ulsan U	Senior faculty	R, LH
	Ping Sun	Ulsan U (formerly NCCU)	Postdoc	R, TR
	Dapeng Xu	Ulsan U (formerly NCCU)	Postdoc	R, TR
JP	Yasushi Kusuoka	Lake Biwa Museum	Senior staff	R
	Manabu Hori	Yamaguchi U	Mid-level faculty	R

The RCN–BC is a partnership between Chinese and US laboratories to build a close-knit, international community of researchers in <u>all</u> aspects of biodiversity of ciliates

The principal partners in this proposal are PI John Clamp and Weibo Song (OUC). The proposal for the RCN–BC developed from a discussion between us at OUC in July, 2010 and draws heavily on the leadership provided by him and other Chinese researchers in the biodiversity of ciliates (**see Table 1**). <u>The participation of Chinese researchers will be vital to the success of the RCN–BC</u>. Researchers in the U.S. and other countries will profit from the opportunity to visit laboratories in China and interact with their young, energetic, well-trained researchers, and Chinese researchers will be able to broaden their collaborations and contribute their expertise to U.S. labs and others. In both cases, these relationships are likely to lead to development of new methods of analysis and result in many more publications than would have been the case otherwise. The PI has hosted young Chinese researchers in his lab during the last 3 years and has made 4 visits to China for collaboration since 2006and, therefore, can attest to the likelihood of these types of results. The partnership between US and Chinese labs will energize the RCN–BC and quickly broadcast its benefits to the rest of the international community to create a general acceleration of progress on research into biodiversity of ciliates. Most current participants are researchers in either systematics or phylogeny, as might be expected; however, our group includes the disciplines of ecology (Acosta-Mercado, Rublee, Lobban, Montagnes, Finlay, Esteban, Martín-Cereceda, Jiqui li), functional genomics (Miao), genomic evolution (Katz, Zufall), and morphogenesis (Shao). In addition, there is one member (Chatterjee) who is an acarologist who collaborates with protistologists in investigation of epizoic ciliates of halicarid mites.

The RCN–BC will solicit new members actively and carry out activities to promote research on biodiversity of ciliates world-wide.

The RCN–BC will be built around a fast-evolving group of close-knit collaborators that already exists. More than 20 members were added to the original group during development of this proposal (**Table 1**). The RCN–BC will continue to expand to include every specialist on biodiversity of ciliates and related areas who wishes to participate. A website, symposia and workshops (at least one of which will be held as part of a professional meeting), and short presentations at professional meetings (e.g., posters that highlight RCN–BC activities) will serve as major vehicles for publicizing the RCN–BC and attracting new members or users. Beyond this, the network will expand through individual, new collaborations started by RCN–BC members with persons not yet involved in the RCN. **Essentially, we are proposing**

to take the informal network that already exists and convert it into a cohesive formal group that will become a self-sustaining incubator for research on biodiversity of ciliates. The principal partners for now will be Chinese and U.S. researchers, but we must grow to achieve a 'critical mass' of participants to be successful.

The RCN–BC will be more than a group of users—all registered members will be active participants. "Users" will be persons such as the public or students who access the open area of our web site in search of information about ciliate biodiversity or to contact the RCN for information. By contrast, "Members" will be persons who are either engaged or wish to engage in ongoing research and training collaborations with other members. They will be eligible for funding to attend meetings or make visits to another laboratory and will have password-accessible access to the nonpublic area of the RCN–BC website (**Table 2**). Also, they will be included in an RCN–BC members listserv that will be used to inform them about opportunities of various kinds.

6. Objectives of the Research Coordination Network for Biodiversity of Ciliates

The RCN–BC will incrementally increase knowledge transfer in taxonomy, phylogeny, biogeography, ecology, genetics, genomic architecture, and functional genomics of major groups of ciliated protists by doing the following:

Connect investigators of different facets of ciliate biodiversity with one another

Investigators will meet and interact with one another in symposia, workshops, and on the web. Some activities (symposium, targeted paper sessions) will be planned for meetings of professional societies such as the International Society of Protistologists (ISOP) to create opportunities for collaboration and disseminate information about the use, benefits, and progress of the RCN–BC.

Provide opportunities for researchers (graduate students to postdoc level and beyond) to attend international meetings or workshops and visit labs of other researchers for collaboration

Travel funding from the RCN–BC will enable researchers to attend meetings of professional societies or workshops, where they will present their research and meet potential mentors or collaborators. This will overcome the usual barrier to making contacts and forming relationships faced by researchers, especially those in the critical period spanning graduate study to junior faculty status, when they may be financially unable to attend large meetings. Special targets will be young researchers from underrepresented areas of the world (e.g., Africa, South America, Australasia, South Asia, Middle East).

We will promote exchange of researchers between major labs in the U.S., China, and Europe for collaboration on specific research projects with another investigator. Researchers in other areas of the world will be encouraged to form collaborations with Chinese and/or U.S. participants. Proposals from young researchers (e.g., grad students, junior faculty) will be favored, but those from older members of the RCN–BC will be considered depending on their merit (e.g., using new methods of analyses, studies combining more than one discipline, investigations in understudied geographic areas, training in techniques and/or methodologies of analysis that are unavailable in their home institutions).

The Center of Excellence in Biodiversity Research of King Saud University (KSU) has committed to providing substantial funds for supporting exchange of young researchers between KSU and other labs (**see letter from Khaled Al-Rasheid**). This continues and expands on the collaborations in which KSU has engaged with Chinese researchers (especially at OUC) and others over the last decade.

Consult with museum professionals, journal editors, and the International Commission for Zoological Nomenclature (ICZN) to create a new system for depositing type and revisionary material of ciliates and other protists

The RCN–BC will create a formal system for depositing fixed samples of cells or DNA that can be used for new extractions of DNA or new morphological work in addition to conventional type slides as part

of the description of new species or revision of taxa. To be truly useful, a type must be available for reexamination using contemporary methods as much as possible. Deposition of type and voucher slides of ciliates and other protists is certainly useful and definitely should be continued; however, individual stained preparations cannot be used for molecular work or observations using different morphological methods (e.g., new staining methods). Culture collections cannot meet the need for new material because of fiscal limitations. What is needed is a new protocol for deposition of type material. The RCN–BC will invite curatorial staff from the three major museums that now accept protistan type material to a workshop in year 3 of the project to help develop protocols for deposition and curation of material other than type slides. The ICZN, editors of journals publishing papers on taxonomy of ciliates or other protists, and the two major culture collections also will be consulted, with the objective of producing a standard that can be accepted and practiced consistently by the entire community of protistan systematists, not just those working on ciliates.

Create an on-line system for social networking and data-sharing

The RCN–BC will create and develop a web site using the Scratchpad application hosted by the Natural History Museum UK (**http://scratchpads.eu**) for exchanging ideas and information among researchers, posting information about past and upcoming events hosted by the network, registration and orientation of new members, and sharing supplemental data submitted by registered members (sequence alignments, environmental data, locality data, protocols for techniques, phylogenies).

Supplemental data, if shared at all, is published in limited form as on-line addenda to papers or scattered among many websites, particularly individual laboratory websites that may have a short lifespan. Deposition of supplemental data on the RCN–BC website will help integrate unpublished data from diverse sources, make metadata of various kinds accessible, make it easier for studies of different kinds to complement one another, and facilitate the conception of collaborative, interdisciplinary projects. The RCN–BC website is intended to be one that will be "portable" enough to be passed on to a new host if the original one becomes inactive to ensure long-term maintenance of access to deposited data. Scratchpad is designed specifically to make it easy to restructure a site on another host if necessary.

7. Proposed activities of the RCN–BC

Workshops and symposia

In Year 1, we propose to host a workshop organized by the PI and held in Durham, NC at the National Evolutionary Synthesis Center (NESCent) that will focus on innovative methodologies for phylogenetic analysis and formation of evolutionary hypotheses (**see letter from Alan Rodrigo**). Presenters at this workshop will include researchers on evolution of genes and genomes in addition to leaders in molecular phylogenetics. Objectives will be to generate new ideas for analyzing evolution of ciliates and new proposals for interdisciplinary projects that will tie together areas such as phylogenetics, genome evolution, functional genomics, and functional ecology.

In Year 2, the RCN-BC will sponsor a symposium at the XIV International Congress of Protozoology (**see letter from Denis Lynn**) to be held in Vancouver, BC entitled "The Future of Biodiversity Studies of Ciliates." Speakers at this symposium will review recent investigations in different areas of biodiversity studies (e.g., phylogeny, ecology, biogeography) and chart future directions, concentrating especially on the most difficult groups (e.g., scuticociliates, stichotrichs).

In Year 3, we will hold a workshop that will focus on use of museums for protistological research and new protocols for deposition of type and revisionary material. Presenters will include curators and researchers from the NHMUK, NMNH, OLM, and OUC who have been responsible for type slide collections. Also, we plan to involve editors of major journals that accept papers on taxonomy of ciliates and representatives from the International Commission on Zoological Nomenclature.

In Year 4, the Laboratory of Protozoology, OUC (Weibo Song) will host a workshop on current trends and future directions in biodiversity studies of ciliates that will bring together participants from

OUC, the Chinese Academy of Sciences, and other Chinese institutions with participants from other countries. This meeting will feature presentations about interdisciplinary collaborations and focus on development of proposals for interdisciplinary research on biodiversity of ciliates.

In Year 5, we will organize a workshop hosted by Chris Lobban at the University of Guam that will focus on ciliates of reefs and other understudied habitats. Presenters at this workshop will include researchers on ciliates occurring in tropical ecosystems and other poorly known but promising areas (e.g., polar regions, desert biomes). It will concentrate on methodologies and strategies specific to interdisciplinary study of reef ecosystems and other understudied habitats and chart future directions for research. Participants also will be encouraged to work on collaborative proposals.

Participants in all meetings will be expected to produce review papers that will be submitted as a set from each meeting to a peer-reviewed journal. In general, meetings will provide opportunities for specialists on different groups of ciliates and different disciplines of study to exchange ideas and techniques, discuss current work, and plan collaborative projects.

Development of a listserv for biodiversity of ciliates

We will maintain an email listserv for the membership of the RCN-BC to disseminate news (e.g., solicitations for collaborative research, meetings) and solicit discussion on topics of interest. A separate listserv will be built to provide more general news to members of the public who might be interested in new developments in research on biodiversity of ciliates (e.g., university faculty members, students).

Development of a "white-paper" on biodiversity studies of ciliates

A white paper that will outline and describe challenges and opportunities that exist in the field of ciliate biodiversity is a priority for the RCN-BC. We will put this document together at the outset of the project through discussions on our listserv and as a side-discussion during the workshop planned for Year 1 at NESCent. It will be a guide for identifying priorities for research projects and funding as well as a strategic plan for charting the progress of the RCN-BC and plotting its future course. The white paper will include major unanswered questions and intellectual challenges, technical and bioinformatic challenges, and proposals for addressing these challenges. Some challenges facing researchers in biodiversity of ciliates have been identified during development of the present proposal; however, other issues undoubtedly will emerge and evolve along with the RCN-BC itself. Therefore, this white paper will be an 'active' document updated on a regular basis through input from the membership of the RCN-BC.

Funding young investigators to attend international professional meetings and present their research

Visits between labs to engage in collaborative research on biodiversity of ciliates

Members of the RCN-BC will be funded each year for short-term travel (1-6 months) to the lab of another researcher to engage in a collaborative research project. We especially intend to enhance the career opportunities of younger researchers (i.e., graduate students, postdocs, junior faculty). Experience shows that the ability to travel to another person's lab is one of the most important components of collaborative research. It is expected that proposals for collaborative visits will originate from previous contact between researchers and demonstrate how traveling to another lab will enhance the quality of a project. Also, proposals for projects that emphasize training in new methodologies and/or bring together two or more research disciplines in a single study of biodiversity will be given preference.

A web site (Table 2) will be created and maintained by a part-time IT specialist.

The website will be created and hosted with the Scratchpad application provided by the NHMUK. It will have links that will **(1)** disseminate information about biodiversity studies of ciliates and background on groups of ciliates or researchers on ciliates to the public, researchers on other types of organisms, and students (k-12, university-level); **(2)** provide access to other important sites and web pages of individual

members; **(3)** advertise activities and opportunities offered by the RCN–BC or its registered members (e.g., workshops, symposia, postdoc and graduate fellowships, REU's, calls for collaboration); **(4)** provide news about past activities of the RCN; and **(5)** promote sharing of supplemental data submitted by researchers on biodiversity of ciliates. There will be a password-accessible Member's Forum to allow registered members of the RCN–BC to discuss questions related to research on biodiversity of ciliates or activities of the RCN-BC, and new registrations of RCN members will be solicited on the web site. In summary, the website will be an evolving, formally structured resource for information on topics related to research on biodiversity of ciliates that will be useful to a wide range of people and be a vehicle for wider networking that will accelerate the pace of collaborative research. Scratchpad has been designed specifically for the type of networking and sharing that is the core of the RCN-BC and provides a way for us to quickly create and activate this part of the project in Year 1 using an information specialist based at the PI's institution to manage its development and activity.

Table 2. Proposed structure of a RCN-BC website. All links will be public except for Member's Forum.

Major Links	Topics/Content
Background/Public Outreach	Ciliates as part of the community of micro-organisms
	Who studies biodiversity of ciliates and why is this important?
Resources	Members of the RCN-BC—individual profiles
	Key protocols and literature sources
	Important websites (e.g., NMNH, NHMUK, OLM, NCBI, ISOP, individual lab sites)
	Opportunities (job listings, solicitations for postdocs and grad students, funding possibilities, link to upcoming events)
	Ask a biodiversity expert (questions from the public)
	Host a biodiversity outreach event—how to present biodiversity of protists to the public
Join the RCN-BC	Form for member information
RCN-BC activities	Original proposal & roster of Steering Committee White paper
	RCN-BC events (workshops, symposia, meetings, applications for travel to meetings and collaboration)
	RCN-BC news (synopses of past events such as workshops/symposia)
	Working groups for research in specific areas
Member's Forum (password required)	Posting of discussions/input from members
	"Collaborations desired" postings
Data repository	Posts of supplementary data from investigators (nonmembers allowed to register and contribute)

Formation of 'working groups' to address research problems in specific areas

We will encourage groups of researchers with common interests to form working groups to address specific areas of research or sponsor interdisciplinary. Each working group will have at least one point person responsible for maintaining communication among the group and managing a section of the RCN-BC website allotted to the working group. We anticipate that these working groups will facilitate collaborations, generate interest in research on specific topics, and grow into satellite networks that will take a lead in submitting proposals for research or for symposia/workshops at professional meetings.

Our first working group, which will be a model for others, will address the challenge of investigating geographical distributions of ciliates (especially free-living species). The extent to which ciliates have biogeographies in the classic sense has been actively debated, with some workers

advocating broad distributions of all or most free-living species [**27, 29–31**] and others advocating restricted distributions and endemism for many species [**11, 32, 34–44**]. This discussion has sparked some active investigations into the biogeography of ciliates [**132; e.g., 50, 115, 134**], but the actual distributions of most ciliates remain cryptic. Predictive models such as Ecological Niche Modeling (ENM) that use the Genetic Algorithm for Rule-set Prediction (GARP) [**121**] and Maxent [**100**] are potential tools for estimating species distributions, which should be one of the goals of any broad initiative in biodiversity. Overall, ENMs offer a powerful way to understand coarse-scale environmental correlates of presence and absence of species across complex landscapes [**28**]. Recently, ENM has been explored as a means of estimating the dimensions of ecological niches of species based on incomplete sampling across distributions [**5**]. Widespread evolutionary conservatism in niche characteristics has been demonstrated, allowing, for example, projections of species' responses to climate change [**98**].

As yet, ENM has been used to predict the geographical distributions of only one free-living unicellular eukaryote *Didymosphenia geminata* [**73**], but this methodology certainly has been effective in revealing distributions of a wide range of plant and animal taxa [**85, 95**], viruses [**148, 149**], and diseases caused by pathogenic protists [**96, 97**]. The first RCN–BC working group will have the goal of creating the means to apply ENM to the study of ciliate biodiversity. Mercedes Martin-Cereceda (U. Complutense Madrid) will be the point person who will recruit and coordinate additional members. The ENM working group will serve as a model for how to use the resources of the RCN–BC and will have the following major objective: consulting with representatives of the NMNH, NHMUK, OLM, and OUC to develop a proposal for assembly of a single database of verifiable locality occurrences of key ciliate taxa using data from type slides.

Such a database would provide a preliminary set of environmental data for investigations and could be housed on the RCN–BC web site as part of its 'data repository' (Table 2) to make it accessible to everyone. Data could be used to identify ecological parameters associated with the occurrence of ciliate protists and develop rasterized layers summarizing environmental variables for each parameter will be developed. Locality data and environmental data layers then can be used to generate robust predictive ENMs of the geographic distributions of the ciliate species, and shifts in the distributions of the species due to future changes in climate or land use patterns can be estimated.

8. Anticipated outcomes of the Research Coordination Network for Biodiversity of Ciliates

The RCN–BC can be expected to yield the following results:

- increased collaboration between specialists leading not only to more investigations of ciliate biodiversity per se but also proposals for more innovative, interdisciplinary studies

- proposals for new collaborations, ideas for new methodologies, and new approaches to analysis resulting from workshops and a symposium

- proposals for research on biodiversity of ciliates in understudied parts of the world

The broad, international scope of the RCN–BC will make it the perfect vehicle for generating new work on biodiversity of ciliates in areas of the world about which little is known about the fauna of ciliates. We already have members from India, Egypt, Saudia Arabia, Brazil, Argentina, and Mexico, all of which are areas that qualify as "understudied." The RCN–BC website will be the primary vehicle for connecting Chinese, U.S. and European researchers with those in understudied areas.

- broader training of young researchers through collaborative research to make them more competitive for jobs that will allow them to continue their investigations into ciliate biodiversity.

- a new system for deposition of type or voucher material of ciliates that can be used for new molecular or morphological observations

- Formation of working groups to focus on specific research areas or large projects, beginning with a working group to investigate geographical distribution of using ENMs

- a model for networking to achieve progress in investigations of biodiversity of other protistan taxa

Many problems that complicate investigations of biodiversity in ciliates are common to other taxa of protists, and strategies that evolve within the RCN–BC will apply to work on other protists

- development of key species of ciliates as research models

The recognition that "emerging model organisms" will make important contributions to a wide range of fields must be paralleled by an ability to identify and describe the emerging models. Protists, especially ciliates, have long been recognized as useful models for a range of applied fields including population dynamics [**49**], aging [**12, 16**], development [**46, 83, 118**], surrogate hosts for disease [**119**], nutrition [**63**], cell biology [**55**], physiology [**80**], toxicology [**54, 79**], adaptation and evolution [**8, 56, 71, 74, 105**], and teaching [**3**].

However, many of the taxa that are used for models will vary at the species and subspecies level. A combination of morphological and molecular tools thus will be required to ensure that model organisms are truly unique taxonomic units. Through the RCN–BC, we will place specific emphasis on bringing taxonomy to the non-taxonomic fields that already and potentially will use ciliates as models.

- contributions to functional ecology of ciliates

As with model species, there are a few key taxa that play major roles in ecosystems. Furthermore, it is clear that ciliates exhibit species-specific functional traits (e.g. bacterivory, algivory, predation). Consequently, there is a need to identify taxa that occur in field samples taken during ecological studies. However, the ability of ecologists to recognize and identify species of ciliates has not progressed to any meaningful degree over the last several decades, even as the recognition that they need to identify taxa has steadily increased.

To address this challenge, the RCN–BC will develop links with ecologists through websites and active collaborations. Specifically, we will examine methodologies that provide ecologists with tools to identify taxa using pragmatic methods (e.g., bar-coding, Lugol's iodine FISH probes) and promote the formation of working groups to advance progress in development of methods and help ecologists master taxonomic techniques needed in their research..

- contributions to knowledge of evolution of genomic processes and genetic characters

Ciliates have long been used as model systems for discoveries of key genomic processes found across the eukaryotic tree of life, including self-splicing RNAs [**72**], telomeres [**15**], and the role of RNAs in shaping germline and somatic genomes [**18, 68, 90**]. These processes are widely distributed among eukaryotes and often have important roles in human biology [**92, 93**]. Describing diverse lineages of ciliates and providing a phylogenetic framework for interpreting character evolution are both critical to understanding the evolution of these genome features, providing an opportunity for the RCN–BC to foster interdisciplinary 'cross-fertilization.'

9. Broader impacts

Students from under-represented minority groups will be included in some activities

PI Clamp's institution, NCCU, is an HBCU (Historically Black College or University) with a majority enrollment of African-American students. Chris Lobban is a member of the faculty at the University of Guam, where the majority of students are Chamorro (Chamoru) Pacific Islanders. Both ethnic groups are poorly represented in any field of evolutionary biology, and it is one of the objectives of the RCN–BC to include minority students (undergraduate and graduate) and faculty members in the

workshops that will be held in year 1 near NCCU and in year 5 at the University of Guam to give them exposure to the field. Hosting workshops near these two institutions will enable students and faculty to attend presentations and meet participants without cost. Also, we plan to have some participants give invited seminars at NCCU and the University of Guam in conjunction with the workshop. The workshops will be structured to include presentations that will be of interest to anyone engaged in studies of biodiversity to solicit attendance by persons who might not be interested in research on ciliates but would, nonetheless, be interested in studying biodiversity of another group of organisms.

In addition, PI Clamp developed a database of contact information for all Minority Serving Institutions (MSI) in the U.S. as well as any other colleges or universities with significant minority enrollments while on sabbatical at NESCent in 2005–2006. During the first part of year 1, this database will be updated so we can use it to build a listserv for advertising the RCN–BC to MSI's and informing contacts at MSI's about the RCN-BC and other opportunities in evolutionary biology, such as internships.

The RCN–BC will form a new section of the International Society of Protistologists that will give it a voting representative on the executive committee of ISOP and formal status for sponsoring symposia, paper sessions, workshops, and other activities under the aegis of the Society.

Agroup of 30 or more members of ISOP can form a section of the Society (**supplementary documents**). Many members of the proposed RCN–BC are already members of ISOP, and thus, it will be easy to meet constitutional requirements for becoming a new section.

Forming a new section to promote studies of biodiversity of ciliates will benefit both ISOP and the RCN–BC (**see letter from George McManus**). We propose to sponsor a symposium at the XIV International Congress of Protozoology in Vancouver, BC (**see letter from Denis Lynn)**, in which ISOP will be a major participant, in Year 2 of the project. This symposium will help draw attendees interested in studies of biodiversity to the Congress. It is also likely that members of the RCN–BC will present oral papers or posters at this meeting. If we are associated with ISOP as a section, we can solicit funding from the Society to host future symposia. In the end, we intend formation the new section of ISOP to be a model for formation of other topic-oriented sections of ISOP that will help generate more interest in the Society and boost participation in annual meetings.

Sponsoring a section of ISOP will allow the RCN–BC to solicit funding from sources other than NSF for enterprises such as sponsored symposia in the short term and help ensure the long-term survival of the RCN–BC. Over the long-term, being a section of ISOP provides a pathway for the RCN–BC to becoming self-sustaining because the section will continue to work for the its objectives and manage its assets (e.g., website) beyond the end of funding from NSF. As a section of ISOP, we will be able to apply for funds, receive endowments, assess dues, and host regional meetings of ISOP.

10. Results from current NSF project: John C. Clamp, (DEB-0716348) A Taxonomic Revision and Phylogenetic Investigation of Five Groups of Species in the Genus *Vorticella* (Protista, Ciliophora, Oligohymenophorea). In 3 years, hundreds of samples of peritrichs were collected from aquatic habitats and ephemeral wetlands in North America, China, and Austria. In all, sequences of small-subunit rRNA of ~70 species of peritrichs were obtained from samples, including ~45 species of *Vorticella*. Sequences of ITS1-5.8S-ITS2 were obtained for most species and sequences of HSP 70, H4 histone, α–tubulin, and EF1-α for ~55 species. *Vorticella* species in all 5 complexes, other *Vorticella* spp., and at least 9 other genera are in this data set. Also, protargol and silver-nitrate preparations were made of most isolates. Two papers reporting results of phylogenetic analyses using sequences of RNA-coding regions and their 2^{o} structures are in press, a revision of *Vorticella* and the Vorticellidae is in review, and other papers reporting results of analyses of morphology, identification of molecular characters in RNA-coding regions, phylogenetic analyses based on protein-coding genes, and new taxa are in preparation. Four foreign collaborators visited NCCU to work with the postdoc and PI. Four undergraduate researchers and one graduate student participated in research activities, with one master's thesis produced and three co-authored papers in preparation. One undergraduate spent part of summer, 2008 in China doing field work and was supported for the rest of the summer by an REU supplement. Another undergraduate accompanied the PI on sampling trips to Austria in summer, 2009 and to China in summer, 2010.

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134. Weisse T & Rammer S. 2006. Pronounced ecophysiological clonal differences of two common freshwater ciliates, *Coleps spetai* (Prostomatida) and *Rimostrombidium lacustris* (Oligotrichida), challenge the morphospecies concept. *Journal of Plankton Research*, **28**:55–63.

135. Weissman P, Lonsdale DJ & Yen J. 1993. The effect of peritrich ciliates on the production of *Acartia hudsonica* in Long Island Sound. *Limnology and Oceanography*, **38**:613–622.

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138. Zhan Z, Xu K, Warren A & Gong Y. 2009. Reconsideration of phylogenetic relationships of the subclass Peritrichia (Ciliophora, Oligohymenophorea) based on small subunit ribosomal RNA gene sequences, with the establishment of a new subclass Mobilia Kahl, 1933. *Journal of Eukaryotic Microbiology*, **56**:552–558.

139. Yi Z, Dunthorn M, Song W & Stoeck T. 2010. Increasing taxon sampling using both unidentified environmental sequences and identified cultures improves phylogenetic inference in the Prorodontida (Ciliophora, Prostomatea). *Molecular Phylogenetics and Evolution*, **57**:937–941.

John C. Clamp

Department of Biology
North Carolina Central University, Durham, NC, U.S.A. 27707
(919) 530-6395 jclamp@nccu.edu

(a) Professional Preparation

Methodist College	Biology and Chemistry	B.S. 1970
North Carolina State University	Zoology and Botany	M.S. 1972
North Carolina State University	Zoology and Cell Biology	Ph. D. 1984

(b) Appointments

August 1992-Present. Professor, Department of Biology, North Carolina Central University
July 2005-June 2006. Sabbatical Scholar, National Evolutionary Synthesis Center (NESCent, NSF-funded), Durham, NC
August 1984-May 1992. Adjunct Assistant Professor, Department of Biology, N. C. Central University
August 1981-May 1984. Visiting Lecturer, Department of Biology, N. C. Central University
September 1977-December 1979. Instructor, Medical Secretarial Department, Hardbarger Junior College of Business, Raleigh, NC
August 1976-May 1978. Visiting Lecturer, Department of Biology, N.C. Central University

(c) 5 Most Relevant Publications:

1. Clamp JC & Williams D. 2006. A molecular phylogenetic investigation of *Zoothamnium* (Ciliophora, Peritrichia, Sessilida). *Journal of Eukaryotic Microbiology*, **53**:494-498.

2. Williams D & Clamp JC. 2007. A molecular phylogenetic investigation of *Opisthonecta* (Ciliophora, Peritrichia, Sessilida. *Journal of Eukaryotic Microbiology,* **54**:317–323.

3. Clamp JC, Bradbury PC, Strüder-Kypke M & Lynn DH. 2008. Phylogenetic position of the apostome ciliates (Phylum Ciliophora, Subclass Apostomatia) tested using small subunit rRNA gene sequences**.** *Denisia***, 23:**395–402.

4. Clamp JC. 1991. Revision of the Family Lagenophryidae Bütschli, 1889 and description of the Family Usconophryidae n. fam. (Ciliophora, Peritricha). *Journal of. Protozoology*, **38**: 355-377.

5. Clamp JC. 1982. *Ellobiophrya conviva* n. sp., a commensal of marine ectoprocts, and a revision of the Family Ellobiophryidae (Ciliophora, Peritricha). *J*ournal of *Protozool*ogy*,* **29**:149-156.

5 Other Significant Publications:

1. Sun P, Clamp JC & Xu D. Analysis of the secondary structure of its transcripts in peritrich ciliates (Ciliophora, Oligohymenophorea): implications for structural evolution and phylogenetic reconstruction. *Molecular Phylogenetics and Evolution*, **accepted—revision completed**.

2. Sun P, Clamp JC & Xu D. Molecular phylogeny of the family Vorticellidae (Protista, Ciliophora, Peritrichia) using combined datasets with a special emphasis on the three

morphologically similar genera *Carchesium, Epicarchesium and Apocarchesium*. *International Journal of Systematic and Evolutionary Microbiology*, **in press**.

3. Zhang Q, Fan X, Clamp JC, Al-Rasheid KAS & Song W. 2010. Description of *Paratetrahymena parawassi* n. sp. using morphological and molecular evidence and a phylogenetic analysis of *Paratetrahymena* and other taxonomically ambiguous genera in the order Loxocephalida (Ciliophora, Oligohymenophorea). J*ournal of Eukaryotic Microbiology*, **57**:483–493.

4. Yi Z, Song W, Clamp JC, Chen Z, Gao S & Zhang Q. 2009. Reconsideration of systematic relationships within the order Euplotida (Protista, Ciliophora) using new sequences of the gene coding for small-subunit rRNA and testing the use of combined data sets to construct phylogenies of the *Diophrys*-complex. *Molecular Phylogenetics and Evolution*, **50**:599–607.

5. Clamp, JC & Kane, JR. 2003. Redescription of four species of lagenophryid peritrichs (Ciliophora) from Australia and New Guinea, with descriptions of two new species. *Records of the Australian Museum*, **55**:153–168.

(d) Synergistic Activities

1. North Carolina Academy of Science: Past-President (2004-2005); Chair, Membership Committee (present); President (2003-2004); President-Elect (2002-2003); Elected Member, Board of Directors (2000-2002); Chair, Annual Meeting Committee (2000-2002); Chair of Local Arrangements Committee for Annual Meeting (1996-1997).
2. International Society of Protistologists: Chair; Awards Committee (2003-2006); Chair, Constitution & By-Laws Committee (1995-present); steering committee East Regional Section (2000-2003); Represented East Regional Section on Executive Committee (2001-2003); member, Nominating Committee (1998).
3. North Carolina Central University: Chair, Biology Undergraduate Curriculum Committee (1999-2005), Chair, Biology Facilities and Equipment Committee (1993-present); Biology Tenure and Promotion Committee (2006-present); Reappointment, Tenure and Promotion Appeal Committee, Faculty Senate; courses in Ecology, Zoology, Protozoology, Human Anatomy and Physiology, Vertebrate Morphogenesis, Physiology of Animals, Scientific Writing; active researcher and mentor to graduate and undergraduate researchers.
4. Board of Reviewers, Journal of Eukaryotic Microbiology, (1997-present) and active reviewer for many other scientific journals (~6-12 manuscripts/year)
5. External member of Ph.D. committees: Katiarcyna Konior (U. Illinois, Chicago), Helene Peters (U. of the Free State, S. Africa); mentored 4 Ph.D. students at Ocean U. of China, Qingdao, P.R.C. during last 2 years--this is equivalent to serving on graduate committees.

(e) Collaborators & Other Affiliations

1. Collaborators: Daniel Williams, Ping Sun, Dapeng Xu (N.C. Central U.); Weibo Song, Zhen Zhen Yi, Shan Gao, Miao Miao, Qianqian Zhang (Ocean U. China); Daode Ji (Yantai Univ.); Wei Miao, Chengjie Fu (Chinese Acad. Sci., Wuhan); Chris Lobban, U. of Guam; D. Wayne Coats, Smithsonian Env. Res. Center; Howard E. Buhse, Jr., Suzanne McCutcheon, Emmanuel Vacchiano, John Maciejewski (U. of Illinois at Chicago); Denis Lynn, Michaela Strüder-Kypke, Eleni Gentekaki (U. of Guelph); Stephen Landers, Troy Univ.; John Kane; Wilhelm Foissner (U. Salzburg); Alan Warren (Museum of Nat. History).
2. Graduate Advisor: Phyllis C. Bradbury, M.S. & Ph. D.
3. Graduate Students: Anthony Cooley, Daniel Williams, Randy Brown, LaKeisha Copeland.

SUMMARY PROPOSAL BUDGET

YEAR 1

FOR NSF USE ONLY		
PROPOSAL NO.	DURATION (months) Proposed	Granted
AWARD NO.		

ORGANIZATION
North Carolina Central University

PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR
John Clamp

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. **John Clamp - PI**	0.00	0.00	0.00	$ **0**	$
2.					
3.					
4.					
5.					
6. (**0**) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	0.00	0.00	0.00	**0**	
7. (**1**) TOTAL SENIOR PERSONNEL (1 - 6)	0.00	0.00	0.00	**0**	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (**0**) POST DOCTORAL SCHOLARS	0.00	0.00	0.00	**0**	
2. (**1**) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	12.00	0.00	0.00	**22,000**	
3. (**0**) GRADUATE STUDENTS				**0**	
4. (**1**) UNDERGRADUATE STUDENTS				**2,000**	
5. (**0**) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)				**0**	
6. (**0**) OTHER				**0**	
TOTAL SALARIES AND WAGES (A + B)				**24,000**	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)				**6,160**	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)				**30,160**	
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)					
Desktop Computer (incl. monitor) $ **1,000**					
Laser Printer **400**					
TOTAL EQUIPMENT				**1,400**	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)				**32,000**	
2. FOREIGN				**14,000**	
F. PARTICIPANT SUPPORT COSTS					
1. STIPENDS $ **0**					
2. TRAVEL **0**					
3. SUBSISTENCE **0**					
4. OTHER **0**					
TOTAL NUMBER OF PARTICIPANTS (**0**) TOTAL PARTICIPANT COSTS				**0**	
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES				**1,000**	
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION				**4,000**	
3. CONSULTANT SERVICES				**0**	
4. COMPUTER SERVICES				**0**	
5. SUBAWARDS				**0**	
6. OTHER				**0**	
TOTAL OTHER DIRECT COSTS				**5,000**	
H. TOTAL DIRECT COSTS (A THROUGH G)				**82,560**	
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)					
Modified Direct Costs (Rate: 40.0000, Base: 82560)					
TOTAL INDIRECT COSTS (F&A)				**33,024**	
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)				**115,584**	
K. RESIDUAL FUNDS				**0**	
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				$ **115,584**	$

M. COST SHARING PROPOSED LEVEL $ **0** AGREED LEVEL IF DIFFERENT $

PI/PD NAME
John Clamp

ORG. REP. NAME*

FOR NSF USE ONLY		
INDIRECT COST RATE VERIFICATION		
Date Checked	Date Of Rate Sheet	Initials - ORG

***ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET**

SUMMARY PROPOSAL BUDGET

YEAR 2

FOR NSF USE ONLY		
PROPOSAL NO.	DURATION (months) Proposed	Granted
AWARD NO.		

ORGANIZATION
North Carolina Central University

PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR
John Clamp

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. **John Clamp - none**	0.00	0.00	0.00	$ **0**	$
2.					
3.					
4.					
5.					
6. (**0**) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	0.00	0.00	0.00	**0**	
7. (**1**) TOTAL SENIOR PERSONNEL (1 - 6)	0.00	0.00	0.00	**0**	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (**0**) POST DOCTORAL SCHOLARS	0.00	0.00	0.00	**0**	
2. (**1**) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	12.00	0.00	0.00	**22,660**	
3. (**0**) GRADUATE STUDENTS				**0**	
4. (**0**) UNDERGRADUATE STUDENTS				**0**	
5. (**0**) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)				**0**	
6. (**0**) OTHER				**0**	
TOTAL SALARIES AND WAGES (A + B)				**22,660**	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)				**6,345**	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)				**29,005**	
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)					
TOTAL EQUIPMENT				**0**	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)				**32,000**	
2. FOREIGN				**14,000**	
F. PARTICIPANT SUPPORT COSTS					
1. STIPENDS $ **0**					
2. TRAVEL **0**					
3. SUBSISTENCE **0**					
4. OTHER **0**					
TOTAL NUMBER OF PARTICIPANTS (**0**) TOTAL PARTICIPANT COSTS				**0**	
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES				**1,000**	
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION				**4,000**	
3. CONSULTANT SERVICES				**0**	
4. COMPUTER SERVICES				**0**	
5. SUBAWARDS				**0**	
6. OTHER				**0**	
TOTAL OTHER DIRECT COSTS				**5,000**	
H. TOTAL DIRECT COSTS (A THROUGH G)				**80,005**	
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) **Modified Direct Costs (Rate: 40.0000, Base: 80005)**					
TOTAL INDIRECT COSTS (F&A)				**32,002**	
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)				**112,007**	
K. RESIDUAL FUNDS				**0**	
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				$ **112,007**	$

M. COST SHARING PROPOSED LEVEL $ **0** AGREED LEVEL IF DIFFERENT $

PI/PD NAME
John Clamp

ORG. REP. NAME*

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INDIRECT COST RATE VERIFICATION		
Date Checked	Date Of Rate Sheet	Initials - ORG

 ***ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET**

SUMMARY PROPOSAL BUDGET

YEAR 3

FOR NSF USE ONLY		
PROPOSAL NO.	DURATION (months) Proposed	Granted
AWARD NO.		

ORGANIZATION
North Carolina Central University

PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR
John Clamp

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. **John Clamp - none**	0.00	0.00	0.00	$ **0**	$
2.					
3.					
4.					
5.					
6. (**0**) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	0.00	0.00	0.00	**0**	
7. (**1**) TOTAL SENIOR PERSONNEL (1 - 6)	0.00	0.00	0.00	**0**	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (**0**) POST DOCTORAL SCHOLARS	0.00	0.00	0.00	**0**	
2. (**1**) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	12.00	0.00	0.00	**23,340**	
3. (**0**) GRADUATE STUDENTS				**0**	
4. (**1**) UNDERGRADUATE STUDENTS				**2,000**	
5. (**0**) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)				**0**	
6. (**0**) OTHER				**0**	
TOTAL SALARIES AND WAGES (A + B)				**25,340**	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)				**6,535**	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)				**31,875**	
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)					
TOTAL EQUIPMENT				**0**	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)				**32,000**	
2. FOREIGN				**14,000**	
F. PARTICIPANT SUPPORT COSTS					
1. STIPENDS $ **0**					
2. TRAVEL **0**					
3. SUBSISTENCE **0**					
4. OTHER **0**					
TOTAL NUMBER OF PARTICIPANTS (**0**) TOTAL PARTICIPANT COSTS				**0**	
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES				**1,000**	
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION				**4,000**	
3. CONSULTANT SERVICES				**0**	
4. COMPUTER SERVICES				**0**	
5. SUBAWARDS				**0**	
6. OTHER				**0**	
TOTAL OTHER DIRECT COSTS				**5,000**	
H. TOTAL DIRECT COSTS (A THROUGH G)				**82,875**	
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) **Modified Direct Costs (Rate: 40.0000, Base: 82875)**					
TOTAL INDIRECT COSTS (F&A)				**33,150**	
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)				**116,025**	
K. RESIDUAL FUNDS				**0**	
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				$ **116,025**	$

M. COST SHARING PROPOSED LEVEL $ **0** AGREED LEVEL IF DIFFERENT $

PI/PD NAME
John Clamp

ORG. REP. NAME*

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INDIRECT COST RATE VERIFICATION		
Date Checked	Date Of Rate Sheet	Initials - ORG

 ***ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET**

SUMMARY PROPOSAL BUDGET

YEAR 4

FOR NSF USE ONLY		
PROPOSAL NO.	DURATION (months) Proposed	Granted
AWARD NO.		

ORGANIZATION
North Carolina Central University

PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR
John Clamp

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. **John Clamp - none**	0.00	0.00	0.00	$ **0**	$
2.					
3.					
4.					
5.					
6. (**0**) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	0.00	0.00	0.00	**0**	
7. (**1**) TOTAL SENIOR PERSONNEL (1 - 6)	0.00	0.00	0.00	**0**	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (**0**) POST DOCTORAL SCHOLARS	0.00	0.00	0.00	**0**	
2. (**1**) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	12.00	0.00	0.00	**24,040**	
3. (**0**) GRADUATE STUDENTS				**0**	
4. (**0**) UNDERGRADUATE STUDENTS				**0**	
5. (**0**) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)				**0**	
6. (**0**) OTHER				**0**	
TOTAL SALARIES AND WAGES (A + B)				**24,040**	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)				**6,731**	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)				**30,771**	
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)					
TOTAL EQUIPMENT				**0**	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)				**12,000**	
2. FOREIGN				**20,000**	
F. PARTICIPANT SUPPORT COSTS					
1. STIPENDS $ **0**					
2. TRAVEL **0**					
3. SUBSISTENCE **0**					
4. OTHER **0**					
TOTAL NUMBER OF PARTICIPANTS (**0**) TOTAL PARTICIPANT COSTS				**0**	
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES				**1,000**	
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION				**4,000**	
3. CONSULTANT SERVICES				**0**	
4. COMPUTER SERVICES				**0**	
5. SUBAWARDS				**0**	
6. OTHER				**0**	
TOTAL OTHER DIRECT COSTS				**5,000**	
H. TOTAL DIRECT COSTS (A THROUGH G)				**67,771**	
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) **Modified Direct Cost (Rate: 40.0000, Base: 67771)**					
TOTAL INDIRECT COSTS (F&A)				**27,108**	
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)				**94,879**	
K. RESIDUAL FUNDS				**0**	
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				$ **94,879**	$

M. COST SHARING PROPOSED LEVEL $ **0** AGREED LEVEL IF DIFFERENT $

PI/PD NAME
John Clamp

ORG. REP. NAME*

FOR NSF USE ONLY		
INDIRECT COST RATE VERIFICATION		
Date Checked	Date Of Rate Sheet	Initials - ORG

 ***ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET**

SUMMARY PROPOSAL BUDGET

YEAR 5

FOR NSF USE ONLY		
PROPOSAL NO.	DURATION (months) Proposed	Granted
AWARD NO.		

ORGANIZATION
North Carolina Central University

PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR
John Clamp

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. **John Clamp - none**	0.00	0.00	0.00	$ **0**	$
2.					
3.					
4.					
5.					
6. (**0**) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	0.00	0.00	0.00	**0**	
7. (**1**) TOTAL SENIOR PERSONNEL (1 - 6)	0.00	0.00	0.00	**0**	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (**0**) POST DOCTORAL SCHOLARS	0.00	0.00	0.00	**0**	
2. (**1**) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	12.00	0.00	0.00	**24,761**	
3. (**0**) GRADUATE STUDENTS				**0**	
4. (**0**) UNDERGRADUATE STUDENTS				**0**	
5. (**0**) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)				**0**	
6. (**0**) OTHER				**0**	
TOTAL SALARIES AND WAGES (A + B)				**24,761**	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)				**6,933**	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)				**31,694**	
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.)					
TOTAL EQUIPMENT				**0**	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)				**32,000**	
2. FOREIGN				**14,000**	
F. PARTICIPANT SUPPORT COSTS					
1. STIPENDS $ **0**					
2. TRAVEL **0**					
3. SUBSISTENCE **0**					
4. OTHER **0**					
TOTAL NUMBER OF PARTICIPANTS (**0**) TOTAL PARTICIPANT COSTS				**0**	
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES				**1,000**	
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION				**4,000**	
3. CONSULTANT SERVICES				**0**	
4. COMPUTER SERVICES				**0**	
5. SUBAWARDS				**0**	
6. OTHER				**0**	
TOTAL OTHER DIRECT COSTS				**5,000**	
H. TOTAL DIRECT COSTS (A THROUGH G)				**82,694**	
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) **Modified Direct Costs (Rate: 40.0000, Base: 82694)**					
TOTAL INDIRECT COSTS (F&A)				**33,078**	
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)				**115,772**	
K. RESIDUAL FUNDS				**0**	
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				$ **115,772**	$

M. COST SHARING PROPOSED LEVEL $ **0** AGREED LEVEL IF DIFFERENT $

PI/PD NAME
John Clamp

ORG. REP. NAME*

FOR NSF USE ONLY		
INDIRECT COST RATE VERIFICATION		
Date Checked	Date Of Rate Sheet	Initials - ORG

 ***ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET**

SUMMARY PROPOSAL BUDGET

Cumulative

FOR NSF USE ONLY		
PROPOSAL NO.	DURATION (months) Proposed	Granted
AWARD NO.		

ORGANIZATION
North Carolina Central University

PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR
John Clamp

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)	NSF Funded Person-months CAL	ACAD	SUMR	Funds Requested By proposer	Funds granted by NSF (if different)
1. **John Clamp - PI**	0.00	0.00	0.00	$ **0**	$
2.					
3.					
4.					
5.					
6. ( ) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	0.00	0.00	0.00	**0**	
7. (**1**) TOTAL SENIOR PERSONNEL (1 - 6)	0.00	0.00	0.00	**0**	
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. (**0**) POST DOCTORAL SCHOLARS	0.00	0.00	0.00	**0**	
2. (**5**) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	60.00	0.00	0.00	**116,801**	
3. (**0**) GRADUATE STUDENTS				**0**	
4. (**2**) UNDERGRADUATE STUDENTS				**4,000**	
5. (**0**) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)				**0**	
6. (**0**) OTHER				**0**	
TOTAL SALARIES AND WAGES (A + B)				**120,801**	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)				**32,704**	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)				**153,505**	
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING $5,000.) $ **1,400**					
TOTAL EQUIPMENT				**1,400**	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)				**140,000**	
2. FOREIGN				**76,000**	
F. PARTICIPANT SUPPORT COSTS					
1. STIPENDS $ **0**					
2. TRAVEL **0**					
3. SUBSISTENCE **0**					
4. OTHER **0**					
TOTAL NUMBER OF PARTICIPANTS (**0**) TOTAL PARTICIPANT COSTS				**0**	
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES				**5,000**	
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION				**20,000**	
3. CONSULTANT SERVICES				**0**	
4. COMPUTER SERVICES				**0**	
5. SUBAWARDS				**0**	
6. OTHER				**0**	
TOTAL OTHER DIRECT COSTS				**25,000**	
H. TOTAL DIRECT COSTS (A THROUGH G)				**395,905**	
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)					
TOTAL INDIRECT COSTS (F&A)				**158,362**	
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)				**554,267**	
K. RESIDUAL FUNDS				**0**	
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				$ **554,267**	$

M. COST SHARING PROPOSED LEVEL $ **0** AGREED LEVEL IF DIFFERENT $

PI/PD NAME
John Clamp

ORG. REP. NAME*

FOR NSF USE ONLY		
INDIRECT COST RATE VERIFICATION		
Date Checked	Date Of Rate Sheet	Initials - ORG

C ***ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET**

Salaries. No salary is requested for PI Clamp. He will be able to fulfill commitments to the project without pay by allotting time from the non-teaching part of his university duties. His responsibilities will be to supervise the information technology specialist and student assistants (see below), maintain communications with the Steering Committee, and perform routine grant administration. In general, he will be responsible for overseeing the project and ensuring that activities are carried out as specified in the proposal.

Salary and benefits for a ½-time information technology (IT) specialist are requested for all five years of the project. He or she will be classified as a Business & Technology Applications Technician in the HR system of the state of North Carolina and will be a core participant in the proposed research coordination network, with both technical and administrative/supervisory responsibilities. The IT specialist will perform the following tasks: **(1)** creation of the RCN website using the Scratchpad application hosted by the Museum of Natural History, UK, **(2)** management of the RCN website; **(3)** assisting the PI with routine tasks, including maintaining communications between participants in the network and making travel arrangements for invited participants of workshops or symposia and researchers attending professional meetings or engaging in an exchange with another laboratory.

Stipends. Stipends for one undergraduate or graduate assistant in Years 1 and and Year 3 (~ 100 hours commitment in each case) are requested to provide us with a person to update a list of contacts in biology departments of Minority Serving Institutions (MSIs) and other institutions with significant enrollments (≥ 20%) of under-represented minorities that was compiled by the PI while on sabbatical at the National Evolutionary Synthesis Center in 2005-2006. This list will be the basis for a critical listserv that will be used for informing faculty and students at MSIs of opportunities offered by the RCN and drawing as many of them as possible into the social networking that will be provided by our website. It is a list of evolutionary biologists or chairs of biology departments in each MSI that needs to be updated from information on MSI web sites and then tested with emails for accuracy and to obtain permission to include contacts on the MSI listserv. This will involve a significant number of hours of work owing to the number of years that have passed since the existing list was compiled. It will need to be updated again midway through the 5-year span of the project to prevent it from falling too far out of date, hence our request for the same stipend in year 3.

Travel. Support is requested for three major categories of travel that are vital to achieving major objectives of the Research Coordination Network: **(1)** bringing participants to workshops (years 1, 3, 5) and one symposium (year 2), **(2)** attendance of young investigators at international meetings of protistologists to present their research and network with other investigators, **(3)** exchange of young investigators and other researchers between laboratories for collaboration on specific research projects and/or to benefit from training in laboratory techniques or methodologies of analysis not available in their home laboratories. All of these activities are key aspects of the RCN because they will promote exchange of information and interaction between specialists to create new projects and researchers with broader perspectives.

Equipment. Funds for one desktop computer + monitor, laser printer, and accessories are requested for use by the IT specialist. There is an office available for the IT specialist (see Facilities) but it is not provided with a computer and peripherals by the university.

Office supplies. Funds for office supplies (e.g., printer toner cartridges, paper + other incidentals) are requested for the IT specialist based on an estimate of administrative needs and the need to print materials for use in workshops during some years.

Costs incidental to Workshops. Small amounts of money are requested in years 1, 3, and 5 for expenses, such as refreshments and coffee, needed for proposed workshops.

Publication costs. Funds are requested in each year for page charges or other publication costs for review papers stemming from workshops and symposia.

Indirect costs. Indirect costs are requested at the rate of 40% of Modified Direct Costs in accordance with the current agreement between NSF and N.C. Central University.

Current and Pending Support

(See GPG Section II.C.2.h for guidance on information to include on this form.)

The following information should be provided for each investigator and other senior personnel. Failure to provide this information may delay consideration of this proposal.

Investigator: John Clamp	Other agencies (including NSF) to which this proposal has been/will be submitted.

Support: ☒ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title: A Taxonomic Revision and Phylogenetic Investigation of Five Groups of Species in the Genus Vorticella (Protista, Ciliophora, Oligohymenophorea)

Source of Support: National Science Foundation
Total Award Amount: $ 360,000 Total Award Period Covered: 09/01/07 - 08/31/11
Location of Project: North Carolina Central University
Person-Months Per Year Committed to the Project. Cal: 0.00 Acad: 2.25 Sumr: 2.50

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title: Phylogenetic Investigation of Peritrich Ciliates in the Families, Epistylididae, Operculariidae, and Zoothamniidae--Evolution in the Basal Clades of the Subclass

Source of Support: National Science Foundation
Total Award Amount: $ 487,829 Total Award Period Covered: 09/01/11 - 08/31/14
Location of Project: North Carolina Central University
Person-Months Per Year Committed to the Project. Cal: 0.00 Acad: 2.25 Sumr: 2.50

Support: ☐ Current ☒ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title: A Research Coordination Network for Biodiversity of Ciliates

Source of Support: National Science Foundation
Total Award Amount: $ 554,267 Total Award Period Covered: 10/01/11 - 09/30/16
Location of Project: North Carolina Central University
Person-Months Per Year Committed to the Project. Cal: 0.00 Acad: 1.00 Sumr: 0.50

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:
Total Award Amount: $ Total Award Period Covered:
Location of Project:
Person-Months Per Year Committed to the Project. Cal: Acad: Sumr:

Support: ☐ Current ☐ Pending ☐ Submission Planned in Near Future ☐ *Transfer of Support

Project/Proposal Title:

Source of Support:
Total Award Amount: $ Total Award Period Covered:
Location of Project:
Person-Months Per Year Committed to the Project. Cal: Acad: Summ:

*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.

FACILITIES AND RESOURCES

Office Spaces:

PI. Clamp occupies an office space in the Lee Biology Building that is equipped with a Dell computer linked to a Hewlett Packard LaserJet printer and an Epson 4490 scanner. There is one office space in Lee Biology Building across the hall from PI Clamp's office that is available for use by the Information Specialist that will be hired (see Budget and Justification). This is a private office equipped with a networked telephone and internet access.

(Other Facilities and Resources should not be required owing to the nature of the project [Research Coordination Network].)

Data Management Plan

This proposal is for a Research Coordination Network, and thus, participants will not be engaged in gathering new data. Therefore, no plan for managing such data is necessary.

AGREEMENT

Re: Collaboration between protistological groups at the Ocean University of China and North Carolina Central University

This is to certify an agreement between the Laboratory of Protozoology, Ocean University of China and the laboratory of Dr. John Clamp, N.C. Central University to collaborate on a joint project entitled: "A Research Coordination Network for Biodiversity of Ciliates."

The main objectives of the project are as follows:

1. establish a Research Coordination Network (RCN) that will facilitate communication among all researchers on all aspects of biodiversity of ciliated protists worldwide

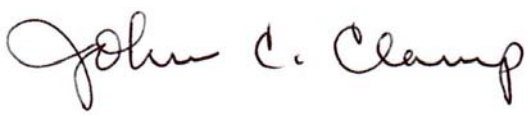
2. help the RCN grow into a self-sustaining enterprise that will increase the rate of progress in the entire field and foster development of new strategies and methodologies through a website, workshops, symposia, and opportunities for travel

3. provide opportunities for investigators, especially graduate students and postdoctoral scholars, to present their research at meetings, receive specialized training, and form research collaborations.

Financial support for this project is being sought from the National Science Foundation (U.S. NSF) and the Natural Science Foundation of China (NSF China). If granted, funds from the U.S. NSF will be administered from N.C. Central University with routine decisions about activities being made by an international steering committee, including both Dr. John Clamp and Prof. Dr. Weibo Song (OUC). It will be the responsibility of OUC to administer any funds from NSF China according to the supplementary budget submitted with the proposal.

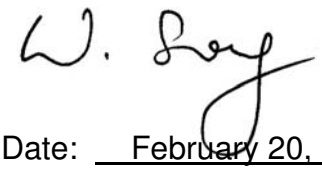
This agreement will be valid from the date of signature by both partners.

Dr. John C. Clamp
Department of Biology
N.C. Central University
Durham, NC 27707 U.S.A.



Date: February 22, 2011

Prof. Dr. Weibo Song
Laboratory of Protozoology
Ocean University of China
Qingdao 266003 China



Date: February 20, 2011