

**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: Kipling W Will

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 received 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 opportunities; 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).

**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: N. Maggi Kelly

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 received 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 opportunities; 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).

**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: Michelle S Koo

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 received 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 opportunities; 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).

**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: Michael W Nachman

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 received 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 opportunities; 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:

Not Listed

REVIEWERS NOT TO INCLUDE:

Not Listed

UC Berkeley ADBC Integrated Conflicts of Interests List for Applicants.

A		B	C	D	E
Name of person with whom there is a conflict for the person in column "D".		Institution of person in column "A"	Type of conflict. Collaborator (incl. Postdocs), PhD Advisor, PhD Advisee, Co-Author, Co-Editor, Spouse, Other Relative.	PI, coPI, Senior Personnel, any individual or organization providing a letter of collaboration (Last name, first, name)	Institution of PI, coPI or Senior Personnel on project
Last Name	First Name				
Ackerly	David	UC Berkeley	Collaborator	Koy, Kevin	University of California, Berkeley
Adler	Nancy E	Kaiser Department of Research	Co-author	Kelly, Nina Maggi	University of California, Berkeley
Agnarsson	Ingi	U Puerto Rico	Collaborator	Gillespie, Rosemary	University of California, Berkeley
Allen	Geraldine		PhD Advisee	Fielder, Peggy	University of California, Office of the President
Allen-Diaz	Barbara	University of California, Berkeley	Co-author	Kelly, Nina Maggi	University of California, Berkeley
Alvarado	Guillermo	Universidad de Costa Rica	Co-Author	McLeod, Samuel	Natural History Museum of Los Angeles County
An	Li	San Diego State University	Co-author	Kelly, Nina Maggi	University of California, Berkeley
Anderson	Tamara	unknown	graduate advisee	Guralnick, Robert	University of Colorado, Boulder
Anderson	Gerry L.	Private Consultant	Co-author	Kelly, Nina Maggi	University of California, Berkeley
Arnedo	Miquel A.	University of Barcelona	Co-Author	Gillespie, Rosemary	University of California, Berkeley
Aronson	James	Centre d'Ecologie Fonctionnelle et Evolutive, Montpellier, France	Co-Author	Fielder, Peggy	University of California, Office of the President
Asher	John	American Museum of Natural History	Collaborator	Koo, Michelle	University of California, Berkeley
Ashmole	Philip	U. Edinburgh	Collaborator	Gillespie, Rosemary	University of California, Berkeley
Badenoch	Nathan	National Agricultural and Forestry Research Institute Lao PDR	Co-author	Kelly, Nina Maggi	University of California, Berkeley
Baldocchi	Dennis	University of California, Berkeley	Co-author	Kelly, Nina Maggi	University of California, Berkeley
Balukjian	Bradley	University of California, Berkeley	Ph.D. Advisee	Gillespie, Rosemary	University of California, Berkeley
Barnes	Lawrence	Natural History Museum of Los Angeles County	Co-Author	McLeod, Samuel	Natural History Museum of Los Angeles County
Barnosky	Tony	UC Berkeley	Co-Author	Gillespie, Rosemary	University of California, Berkeley
Bart	Hank	Tulane University	author/ed./collaborator	Guralnick, Robert	University of Colorado, Boulder
Basset	Patrick	Lausanne University Hospital, Lausanne, Switzerland	Collaborators	Nachman, Michael	University of California, Berkeley
Baye	Peter	Independent Consultant (California)	Co-Author	Fielder, Peggy	University of California, Office of the President
Beaman	Reed	Yale University	author/ed./collaborator	Guralnick, Robert	University of Colorado, Boulder
Beissinger	Stephen	Univ. of California, Berkeley	Collaborator	Koo, Michelle	University of California, Berkeley
Benedict	Laurn	Univ. of Northern Colorado	Collaborator	Koo, Michelle	University of California, Berkeley
Benjamin	Suresh	Inst. Fundamental St., Sri Lanka	Co-Author	Gillespie, Rosemary	University of California, Berkeley
Benson	Gracie	UC Berkeley	PhD Advisee	Fielder, Peggy	University of California, Office of the President
Benson Martin	Gracie	University of California Berkeley	PhD Advisee	Fielder, Peggy	University of California, Office of the President
Berry	William	University of California, Berkeley (deceased)	PhD Advisor	McLeod, Samuel	Natural History Museum of Los Angeles County
Beth	Lisa	SF State Univ.	PhD Advisee	Fielder, Peggy	University of California, Office of the President
Bidartondo	Martin	Royal Botanic Gardens, Kew	Co-Author	Fielder, Peggy	University of California, Office of the President
Bidegaray-Batista	Leticia	University of Barcelona	Co-Author	Gillespie, Rosemary	University of California, Berkeley
Black	Eric	Alcoa Global Primary Products-Growth, Pittsburgh, PA	Co-Author	Fielder, Peggy	University of California, Office of the President
Blackledge	Todd	University of Akron	Co-Author	Gillespie, Rosemary	University of California, Berkeley

Blanchard	Sam	University of California, Berkeley	Co-author	Kelly, Nina Maggi	University of California, Berkeley
Blanchard	Sam	UC Berkeley	Co-Author	Koy, Kevin	University of California, Berkeley
Bloom	David	Univ. of California, Berkeley	Collaborator	Koo, Michelle	University of California, Berkeley
Bonhomme	Francois	University of Montpellier	Collaborators	Nachman, Michael	University of California, Berkeley
Boursot	Pierre	University of Montpellier	Collaborators	Nachman, Michael	University of California, Berkeley
Bowers	Deane	CU Boulder	author/ed./collaborator	Guralnick, Robert	University of Colorado, Boulder
Bowie	Rauri	Univ. of California, Berkeley	Collaborator	Koo, Michelle	University of California, Berkeley
Bowie	Verna	UC Berkeley	Collaborator	Koy, Kevin	University of California, Berkeley
Boyde	Bryttin	Univ. South Carolina School of Medicine	Coauthor	Farrell, Aisling	Natural History Museum of Los Angeles County
Brennan	Matthew	Private Consultant	Co-author	Kelly, Nina Maggi	University of California, Berkeley
Brown	Dan G.	University of Michigan	Co-author	Kelly, Nina Maggi	University of California, Berkeley
Brown	Greg	University of Queensland, Australia	Co-author	Kelly, Nina Maggi	University of California, Berkeley
Brown	Wes	University of Michigan	PhD Advisor	Nachman, Michael	University of California, Berkeley
Byrd	Kristin	USGS	PhD advisee	Kelly, Nina Maggi	University of California, Berkeley
Callaway	John C.	University of San Francisco	Co-author	Kelly, Nina Maggi	University of California, Berkeley
Campbell	Polly	Oklahoma State University	Collaborators	Nachman, Michael	University of California, Berkeley
Carnaval	Anna	City College New York	author/ed./collaborator	Guralnick, Robert	University of Colorado, Boulder
Case	Victoria	SF State Univ.	PhD Advisee	Fielder, Peggy	University of California, Office of the President
Casquet	Juliane	University of Paul Sabatier, Toulouse	Ph.D. Advisee	Gillespie, Rosemary	University of California, Berkeley
Cellense	Nico	Univ. of Florida	author/ed./collaborator	Guralnick, Robert	University of Colorado, Boulder
Cerling	Thure	University of Utah	Coauthor	Harris, John	Natural History Museum of Los Angeles County
Cherney	Michael	University of Michigan	Coauthor	Farrell, Aisling	Natural History Museum of Los Angeles County
Cherney	M.	University of Michigan	Coauthor	Harris, John	Natural History Museum of Los Angeles County
Chesser	Terry	Smithsonian National Museum of Natural History	Collaborators	Nachman, Michael	University of California, Berkeley
Chousou-Polydouri	Natalia	University of California, Berkeley	Ph.D. Advisee	Gillespie, Rosemary	University of California, Berkeley
Christiansen	Per	University of Aalborg Denmark	Coauthor	Harris, John	Natural History Museum of Los Angeles County
Churchill	Gary	The Jackson Laboratory	Collaborators	Nachman, Michael	University of California, Berkeley
Cicero	Carla	Univ. of California, Berkeley	Co-Author	Koo, Michelle	University of California, Berkeley
Clague	David	Monterey Bay Aquarium Research Institute	Co-Editor	Gillespie, Rosemary	University of California, Berkeley
Claridge	Elin	Gump Research Station, Moorea	Ph.D. Advisee	Gillespie, Rosemary	University of California, Berkeley
Clemens	William	University of California, Berkeley (emeritus)	PhD Advisor	McLeod, Samuel	Natural History Museum of Los Angeles County
Cleve	Casey	Private Consultant	Co-author	Kelly, Nina Maggi	University of California, Berkeley
Coates	David	Conservation Science Center, Department of Parks and Wildlife, Westren Australia	Co-Author	Fielder, Peggy	University of California, Office of the President
Coddington	Jonathan	Smithsonian	Collaborator	Gillespie, Rosemary	University of California, Berkeley
Collins	Brandon	USDA Forest Service	Co-author	Kelly, Nina Maggi	University of California, Berkeley
Connors	John	Arizona State University	Co-author	Kelly, Nina Maggi	University of California, Berkeley
Coop	Graham	UC Davis	Collaborators	Nachman, Michael	University of California, Berkeley
Cotoras	Darko	University of California, Berkeley	Ph.D. Advisee	Gillespie, Rosemary	University of California, Berkeley
Cox	Shelley	George C. Page Museum	Coauthor	Farrell, Aisling	Natural History Museum of Los Angeles County

Cox	Shelley	George C. Page Museum	Coauthor	Harris, John	Natural History Museum of Los Angeles County
Cracraft	Joel	American Museum of Nat. Hist.	author/ed./collaborator	Guralnick, Robert	University of Colorado, Boulder
Crews	Sarah	City College, Berkeley	Ph.D. Advisee	Gillespie, Rosemary	University of California, Berkeley
Crooks	Stephen	Private Consultant	Co-author	Kelly, Nina Maggi	University of California, Berkeley
Croom	Henrietta	U. South, Sewanee	Collaborator	Gillespie, Rosemary	University of California, Berkeley
Croucher	Peter	UC Berkeley	Co-Author	Gillespie, Rosemary	University of California, Berkeley
Croxen	Fred	Arizona Western College	Coauthor	Farrell, Aisling	Natural History Museum of Los Angeles County
Crumb	Esa	Wetlands and Waters Resources, Inc., San Rafael, CA	Co-Author	Fielder, Peggy	University of California, Office of the President
Culpepper	Meghan	UC Berkeley	Ph.D. Advisee	Will, Kipling	University of California, Berkeley
Daane	Kent	UC Berkeley	Collaborator	Gillespie, Rosemary	University of California, Berkeley
Daitch	David	unknown	graduate advisee	Guralnick, Robert	University of Colorado, Boulder
Dale	Larry	Lawrence Berkeley National Laboratory	Co-Author	Koy, Kevin	University of California, Berkeley
Davis	Frank	University of California Santa Barbara	Collaborator	Fielder, Peggy	University of California, Office of the President
Davis	Edward	Univ. of Oregon	Co-Author	Koo, Michelle	University of California, Berkeley
Daws	Matthew I	Royal Botanic Gardens, Kew	Co-Author	Fielder, Peggy	University of California, Office of the President
Deadman	Peter	University of Michigan	Co-author	Kelly, Nina Maggi	University of California, Berkeley
Dean	Mathew	University of Southern California	Collaborators	Nachman, Michael	University of California, Berkeley
DeChant	Tim	University of Chicago	PhD advisee	Kelly, Nina Maggi	University of California, Berkeley
Deck	John	Univ. of California, Berkeley	Collaborator	Koo, Michelle	University of California, Berkeley
DeLasaux	Michael	University of California Cooperative Extension	Co-author	Kelly, Nina Maggi	University of California, Berkeley
Delmer	Cyril	CNRS	Coauthor	Harris, John	Natural History Museum of Los Angeles County
Denslow	Michael	Appalachian State University	author/ed./collaborator	Guralnick, Robert	University of Colorado, Boulder
Detto	Matteo	University of California, Berkeley	Co-author	Kelly, Nina Maggi	University of California, Berkeley
Dick	Christopher	Univ. of Michigan	author/ed./collaborator	Guralnick, Robert	University of Colorado, Boulder
Dixon	Kingsley	Botanic Garden & Parks Authority, Perth, Australia	PhD Advisee	Fielder, Peggy	University of California, Office of the President
Donadeo	Brett	Univ. South Carolina School of Medicine	Coauthor	Farrell, Aisling	Natural History Museum of Los Angeles County
Drill	Sabrina	University of California Cooperative Extension	Co-author	Kelly, Nina Maggi	University of California, Berkeley
Easterday	Kelly	University of California Berkeley	PhD Advisee	Fielder, Peggy	University of California, Office of the President
Easterday	Kelly	UC Berkeley	PhD Advisee	Fielder, Peggy	University of California, Office of the President
Edwards	Will	Maquarie Univ., New South Wales, Australia	PhD Advisee	Fielder, Peggy	University of California, Office of the President
El Adli	Joseph	University of Michigan	Coauthor	Farrell, Aisling	Natural History Museum of Los Angeles County
El Adli	J.	University of Michigan	Coauthor	Harris, John	Natural History Museum of Los Angeles County
Elliott	Stephen	Center for Urban Horticulture University of Washington, Seattle	Co-Author	Fielder, Peggy	University of California, Office of the President
Emerson	Brent	University of East Anglia	Co-Author	Gillespie, Rosemary	University of California, Berkeley
Entwisle	Barbara	University of North Carolina, Chapel Hill	Co-author	Kelly, Nina Maggi	University of California, Berkeley
Erb	Peter	CU Boulder	graduate advisee	Guralnick, Robert	University of Colorado, Boulder
Espeland	Erin K.	USDA-ARS Northern Plains Agricultural Laboratory Pest Management Research Unit, Sidney, MT	Co-Author	Fielder, Peggy	University of California, Office of the President
Espinosa	Edgar	Museo Nacional de Nicaragua	Co-Author	McLeod, Samuel	Natural History Museum of Los Angeles County

Esposito	Lauren	University of California, Berkeley	Collaborator	Gillespie, Rosemary	University of California, Berkeley
Evans	Tom P.	Indiana University	Co-author	Kelly, Nina Maggi	University of California, Berkeley
Evenhuis	Neil	Bishop Museum, Honolulu	Collaborator	Gillespie, Rosemary	University of California, Berkeley
Ewing	Kern	Center for Urban Horticulture University of Washington, Seattle	Co-Author	Fielder, Peggy	University of California, Office of the President
Fahmi	Simon	University of California Irvine	Coauthor	Farrell, Aisling	Natural History Museum of Los Angeles County
Fahmi	S.	University of California Irvine.	Coauthor	Harris, John	Natural History Museum of Los Angeles County
Farrell	Aisling	George C. Page Museum	Coauthor	Harris, John	Natural History Museum of Los Angeles County
Ferrand	Nuno	University of Porto	Collaborators	Nachman, Michael	University of California, Berkeley
Ferranto	Shasta	University of California, Berkeley	Co-author	Kelly, Nina Maggi	University of California, Berkeley
Fet	Elizabeth	Marshall University	Coauthor	Harris, John	Natural History Museum of Los Angeles County
Fisher	Daniel	University of Michigan	Coauthor	Farrell, Aisling	Natural History Museum of Los Angeles County
Fisher	Brian	California Academy Sciences	Collaborator	Gillespie, Rosemary	University of California, Berkeley
Fisher	Dan	University of Michigan	Coauthor	Harris, John	Natural History Museum of Los Angeles County
Fitts	Gary	Lawrence Berkeley National Laboratory	Co-Author	Koy, Kevin	University of California, Berkeley
Flemons	Paul	Australia Museum	author/ed./collaborator	Guralnick, Robert	University of Colorado, Boulder
Fornwall	Mark	USGS	author/ed./collaborator	Guralnick, Robert	University of Colorado, Boulder
Fox	Jefferson	East-West Center, Hawaii, USA	Co-author	Kelly, Nina Maggi	University of California, Berkeley
Francis	Clint	NESCent/Duke	author/ed./collaborator	Guralnick, Robert	University of Colorado, Boulder
Franco	Guido	California Energy Commission	Collaborator	Koy, Kevin	University of California, Berkeley
Fraser	Ceridwen	Australian National University	Collaborator	Gillespie, Rosemary	University of California, Berkeley
Fuller	Ben	University of California Irvine.	Coauthor	Farrell, Aisling	Natural History Museum of Los Angeles County
Fuller	Ben	University of California Irvine.	Coauthor	Harris, John	Natural History Museum of Los Angeles County
Gaimari	Steven	California Dept of Food & Agriculture	Collaborator	Gillespie, Rosemary	University of California, Berkeley
Galey	Brian	University of California, Berkeley	Co-author	Kelly, Nina Maggi	University of California, Berkeley
Galey	Brian	UC Berkeley	Collaborator	Koy, Kevin	University of California, Berkeley
Gallego	Ana H.	Universidad Politécnica de Madrid, Spain	Co-author	Kelly, Nina Maggi	University of California, Berkeley
Gann	George	Institute for Regional Conservation, Miami, FL	Co-Author	Fielder, Peggy	University of California, Office of the President
Garb	Jessica E.	University of Massachusetts, Lowell	Ph.D. Advisee	Gillespie, Rosemary	University of California, Berkeley
García	Ramiro	Museo Nacional de Nicaragua	Co-Author	McLeod, Samuel	Natural History Museum of Los Angeles County
Garcia-Feced	Celia	Joint Research Centre of Ispra, Italy	Co-author	Kelly, Nina Maggi	University of California, Berkeley
Geoghegan	Jacqueline	Indiana University	Co-author	Kelly, Nina Maggi	University of California, Berkeley
Geraads	Denis	CNRS Museum National d'Histoire Naturelle	Coauthor	Harris, John	Natural History Museum of Los Angeles County
Geraldes	Armando	University British Columbia	Collaborators	Nachman, Michael	University of California, Berkeley
Gerhart	Laci	University of Kansas	Coauthor	Farrell, Aisling	Natural History Museum of Los Angeles County
Gerhart	Lesley	University of Kansas	Coauthor	Harris, John	Natural History Museum of Los Angeles County
Gershenz	Norman	SF State Univ.	PhD Advisee	Fielder, Peggy	University of California, Office of the President
Getz	Christy		Co-author	Kelly, Nina Maggi	University of California, Berkeley
Gheerbrant	E.	CNRS Museum National d'Histoire Naturelle	Coauthor	Harris, John	Natural History Museum of Los Angeles County
Gibbons	David	Royal Society for the Protection of Birds, UK	Co-Author	Fielder, Peggy	University of California, Office of the President

Gillespie	Rosemary	UC Berkeley	author/ed./collaborator	Guralnick, Robert	University of Colorado, Boulder
Gillespie	Rosemary	Univ. of California, Berkeley	Collaborator	Koo, Michelle	University of California, Berkeley
Gillespie	Rosemary	UC Berkeley	Collaborator	Koy, Kevin	University of California, Berkeley
Gillespie	Rosemary	University of California, Berkeley	collaborator	Nishida, Gordon	University of California, Berkeley
Gillespie	Rosemary	UC Berkeley	Collaborator	Will, Kipling	University of California, Berkeley
Goedert	James	University of Washington	Co-Author	McLeod, Samuel	Natural History Museum of Los Angeles County
Gold	David	University of California Los Angeles	Coauthor	Farrell, Aisling	Natural History Museum of Los Angeles County
Gold	David	University of California Los Angeles.	Coauthor	Harris, John	Natural History Museum of Los Angeles County
Gong	Peng	University of California, Berkeley	Co-author	Kelly, Nina Maggi	University of California, Berkeley
González	Alda	CEPAVE, La Plata, Argentina)	Co-Author	Gillespie, Rosemary	University of California, Berkeley
Good	Jeff	University of Montana	PhD Advisee	Nachman, Michael	University of California, Berkeley
Goodacre	Sara	Nottingham University	Co-Author	Gillespie, Rosemary	University of California, Berkeley
Gosliner	Terry	California Academy Sciences	Collaborator	Gillespie, Rosemary	University of California, Berkeley
Graham	Heather	SF State Univ.	PhD Advisee	Fielder, Peggy	University of California, Office of the President
Gratzfeld	Joachim	Royal Botanic Gardens, Kew	Co-Author	Fielder, Peggy	University of California, Office of the President
Gregory	Joseph	University of California, Berkeley (deceased)	PhD Advisor	McLeod, Samuel	Natural History Museum of Los Angeles County
Grewell	Brenda	USDA-ARS Exotic & Invasive Weeds Research Unit, University of California, Davis	Co-Author	Fielder, Peggy	University of California, Office of the President
Griswold	Charles	California Academy Sciences	Co-Author	Gillespie, Rosemary	University of California, Berkeley
Griswold	Charles	California Academy of Sciences	Collaborator	Will, Kipling	University of California, Berkeley
Gross	Stephen	Lawrence Berkeley National Laboratory	Co-author	Kelly, Nina Maggi	University of California, Berkeley
Gross	Joyce	UC Berkeley	Collaborator	Koy, Kevin	University of California, Berkeley
Groves	Colin	Australian National University	Coauthor	Harris, John	Natural History Museum of Los Angeles County
Gryzmala	Traci	UC Berkeley	Ph.D. Advisee	Will, Kipling	University of California, Berkeley
Guo	Qinghua	University of California, Merced	PhD advisee	Kelly, Nina Maggi	University of California, Berkeley
Guralnick	Rob	U. Colorado Boulder	Co-Author	Gillespie, Rosemary	University of California, Berkeley
Guralnick	Robert	Univ. of Colorado, Boulder	Collaborator	Koo, Michelle	University of California, Berkeley
Gutmann	Myron	National Agricultural and Forestry Research Institute Lao PDR	Co-author	Kelly, Nina Maggi	University of California, Berkeley
Hadly	Liz	Stanford University	Co-Author	Gillespie, Rosemary	University of California, Berkeley
Hamilton	Michael	UC Natural Reserve System	Collaborator	Fielder, Peggy	University of California, Office of the President
Hamilton	Martin	Royal Botanic Gardens, Kew	Co-Author	Fielder, Peggy	University of California, Office of the President
Hardman	David	Royal Botanic Gardens, Kew	Co-Author	Fielder, Peggy	University of California, Office of the President
Hardwick	Kate	Royal Botanic Gardens, Kew	Co-Author	Fielder, Peggy	University of California, Office of the President
Harris	John	George C. Page Museum	Coauthor	Farrell, Aisling	Natural History Museum of Los Angeles County
Harris	Jim	Cranfield University, UK	Co-Author	Fielder, Peggy	University of California, Office of the President
Hartstone-Rose	Adam	Univ. South Carolina School of Medicine	Coauthor	Farrell, Aisling	Natural History Museum of Los Angeles County
Hauser	Thomas	CU Boulder	author/ed./collaborator	Guralnick, Robert	University of Colorado, Boulder
Heddle	Mandy L.	Bowling Green State University	Ph.D. Advisee	Gillespie, Rosemary	University of California, Berkeley
Heidorn	Bryan	University of Arizona	author/ed./collaborator	Guralnick, Robert	University of Colorado, Boulder

Helen	Aleida	Univ. of Western Australia, Nedlands	PhD Advisee	Fielder, Peggy	University of California, Office of the President
Hembry	David	University of California, Berkeley	Ph.D. Advisee	Gillespie, Rosemary	University of California, Berkeley
Herzog	M.	USGS	Co-author	Kelly, Nina Maggi	University of California, Berkeley
Hill	Andrew	Vizzuality	Co-Author	Gillespie, Rosemary	University of California, Berkeley
Hill	Andrew	University of Colorado	graduate advisee	Guralnick, Robert	University of Colorado, Boulder
Hinman	Sarah	UC Berkeley	Collaborator	Koy, Kevin	University of California, Berkeley
Hobbs	Richard	University of Western Australia	Co-Author	Fielder, Peggy	University of California, Office of the President
Hoekstra	Hopi	Harvard University	Collaborators	Nachman, Michael	University of California, Berkeley
Hogg	Brian	USDA	Ph.D. Advisee	Gillespie, Rosemary	University of California, Berkeley
Holden	Anna	Natural History Museum of Los Angeles County	Coauthor	Harris, John	Natural History Museum of Los Angeles County
Holmes	Pat M.	Environmental Resource Management Dept. City of CapeTown, South Africa	Co-Author	Fielder, Peggy	University of California, Office of the President
Hopper	Stephen	University of Western Australia	Collaborator, Co-Author	Fielder, Peggy	University of California, Office of the President
Hormiga	Gustavo	George Washington University	Collaborator	Gillespie, Rosemary	University of California, Berkeley
Howard	Carrie	George C. Page Museum	Coauthor	Farrell, Aisling	Natural History Museum of Los Angeles County
Howard	Carrie	George C. Page Museum	Coauthor	Harris, John	Natural History Museum of Los Angeles County
Howarth	Francis G.	Bishop Museum, Honolulu	Collaborator	Gillespie, Rosemary	University of California, Berkeley
Hulbert	Richard	Florida Museum of Natural History	Coauthor	Farrell, Aisling	Natural History Museum of Los Angeles County
Huntsinger	Lynn	University of California, Berkeley	Co-author	Kelly, Nina Maggi	University of California, Berkeley
Huszeynov	Said	Azarbaijan Museum Azarbaijan	Coauthor	Harris, John	Natural History Museum of Los Angeles County
Irmis	Randall	University of Utah	Co-Author	McLeod, Samuel	Natural History Museum of Los Angeles County
Jacobs	David	University of California Los Angeles	Coauthor	Farrell, Aisling	Natural History Museum of Los Angeles County
Jadin	Robert	University of Colorado	graduate advisee	Guralnick, Robert	University of Colorado, Boulder
Jakubowski	Marek	University of California, Berkeley	PhD advisee	Kelly, Nina Maggi	University of California, Berkeley
Jetz	Walter	UCSD	author/ed./collaborator	Guralnick, Robert	University of Colorado, Boulder
John	Heraty	UC Riverside	Collaborator	Will, Kipling	University of California, Berkeley
Jones	Meirion	Botanic Gardens Conservation International, UK	Co-Author	Fielder, Peggy	University of California, Office of the President
Jones-Smith	Jessie	University of California, San Francisco	Co-author	Kelly, Nina Maggi	University of California, Berkeley
Jongsomjit	Dennis	PRBO Conservation Science	Co-author	Kelly, Nina Maggi	University of California, Berkeley
Karter	Andrew J.	Division of Research, Kaiser Permanente	Co-author	Kelly, Nina Maggi	University of California, Berkeley
Kavanaugh	David	California Academy Sciences	Collaborator	Gillespie, Rosemary	University of California, Berkeley
Kavanaugh	David	California Academy of Sciences	Co-Author	Will, Kipling	University of California, Berkeley
Kearns	Faith	Pew Foundation	Co-author	Kelly, Nina Maggi	University of California, Berkeley
Kelly	Maggi	UC Berkeley	Co-Author	Koy, Kevin	University of California, Berkeley
Kersten	Ellen	University of California, Berkeley	Co-author	Kelly, Nina Maggi	University of California, Berkeley
Kersten	Ellen	UC Berkeley	Co-Author	Koy, Kevin	University of California, Berkeley
Kimsey	Lynn	University of California, Davis	Collaborator	Gillespie, Rosemary	University of California, Berkeley
Kingdon	Jonathan	Oxford University	Coauthor	Harris, John	Natural History Museum of Los Angeles County
Knox	A. Kate	7K Environmental, Seattle, WA	Co-Author	Fielder, Peggy	University of California, Office of the President
Kohn	Michael	Rice University	Collaborators	Nachman, Michael	University of California, Berkeley

Koo	Michelle	UC Berkeley	Collaborator	Koy, Kevin	University of California, Berkeley
Koy	Kevin	University of California, Berkeley	Co-author	Kelly, Nina Maggi	University of California, Berkeley
Krieger	Jonathan	Kew Gardens	graduate advisee	Guralnick, Robert	University of Colorado, Boulder
Krushelnycky	Paul	USGS, Hawaii	Ph.D. Advisee	Gillespie, Rosemary	University of California, Berkeley
Kunimatsu	Y	Kyoto University Japan	Coauthor	Harris, John	Natural History Museum of Los Angeles County
Kushi	Lawrence H	Kaiser Department of Research	Co-author	Kelly, Nina Maggi	University of California, Berkeley
Lam	Athena	UC Berkeley	Co-Author	Gillespie, Rosemary	University of California, Berkeley
Laraia	Barbara A	University of California, Berkeley	Co-author	Kelly, Nina Maggi	University of California, Berkeley
Larsen	Peter	Lawrence Berkeley National Laboratory	Co-Author	Koy, Kevin	University of California, Berkeley
Leache	Adam	Univ. of Washington, Seattle	Co-Author	Koo, Michelle	University of California, Berkeley
Leakey	Meave G.	National Museums of Kenya	Coauthor	Harris, John	Natural History Museum of Los Angeles County
Lee	Lyndon	L.C. Lee & Associates, Inc., Seattle, WA	Co-Author	Fielder, Peggy	University of California, Office of the President
Lei	Shufei	University of California, Berkeley	PhD advisee	Kelly, Nina Maggi	University of California, Berkeley
Leung	Cindy H.	Harvard School of Public Health	Co-author	Kelly, Nina Maggi	University of California, Berkeley
Levin	N.	Johns Hopkins University	Coauthor	Harris, John	Natural History Museum of Los Angeles County
Lew	Stephen	Unaffiliated	Ph.D. Advisee	Will, Kipling	University of California, Berkeley
Lewis	Sarah	University of California, Berkeley	PhD advisee	Kelly, Nina Maggi	University of California, Berkeley
Lewis	Sarah	UC Berkeley	Co-Author	Koy, Kevin	University of California, Berkeley
Liebherr	James	Cornell Un.	Ph.D. Advisor	Will, Kipling	University of California, Berkeley
Lindberg	David	University of California at Berkeley	graduate advisor	Guralnick, Robert	University of Colorado, Boulder
Linderman	Marc	University of Iowa	Co-author	Kelly, Nina Maggi	University of California, Berkeley
Lipps	Jere	California State University, Fullerton	Co-Author	McLeod, Samuel	Natural History Museum of Los Angeles County
Liu	Desheng	Ohio State University	PhD advisee	Kelly, Nina Maggi	University of California, Berkeley
Liu	Jianguo	Michigan State University	Co-author	Kelly, Nina Maggi	University of California, Berkeley
Liu	Y	Univeristy of California, Merced	Co-author	Kelly, Nina Maggi	University of California, Berkeley
Long	Ryan	George C. Page Museum	Coauthor	Farrell, Aisling	Natural History Museum of Los Angeles County
Lozano	Francisco J.	Deimos, Inc. Spain	Co-author	Kelly, Nina Maggi	University of California, Berkeley
Lucas	Spencer	New Mexico Museum of Natural History & Science	Co-Author	McLeod, Samuel	Natural History Museum of Los Angeles County
Lughadha	Eimear Nic	Royal Botanic Gardens, Kew	Co-Author	Fielder, Peggy	University of California, Office of the President
Mabberley	David	Royal Botanic Gardens, Kew	Co-Author	Fielder, Peggy	University of California, Office of the President
MacKenzie	Andrew	Katanga Mining, Sandton, South Africa	Co-Author	Fielder, Peggy	University of California, Office of the President
Maddison	David	Oregon State University	author/ed./collaborator	Guralnick, Robert	University of Colorado, Boulder
Magdalena	Carlos	Royal Botanic Gardens, Kew	Co-Author	Fielder, Peggy	University of California, Office of the President
Malanson	George P.	University of Iowa	Co-author	Kelly, Nina Maggi	University of California, Berkeley
Malchow	Kurt	California Natural Resources Agency	Collaborator	Koy, Kevin	University of California, Berkeley
Manfree	Amber	University of California Davis	Co-Author	Fielder, Peggy	University of California, Office of the President
Manthi	Frederik	National Museums of Kenya.	Coauthor	Harris, John	Natural History Museum of Los Angeles County
Marrs	Robert	University of Liverpool, UK	Co-Author	Fielder, Peggy	University of California, Office of the President
Marshall	Charles	Univ. of California, Berkeley	Collaborator	Koo, Michelle	University of California, Berkeley

Marshall	Charles	UC Berkeley	Collaborator	Koy, Kevin	University of California, Berkeley
Martin	Andrew	CU Boulder	author/ed./collaborator	Guralnick, Robert	University of Colorado, Boulder
Martinez	Neo	Pacific Ecoinformatics, Berkeley	Co-Author	Gillespie, Rosemary	University of California, Berkeley
Matzke	Nick	UC Berkeley	Co-Author	Gillespie, Rosemary	University of California, Berkeley
Mayr	Gerald	Forschungsinstitut Senckenberg	Co-Author	McLeod, Samuel	Natural History Museum of Los Angeles County
McCormack	Gerald	Cook Islands Natural Heritage Trust	Co-Author	Gillespie, Rosemary	University of California, Berkeley
McCune	Tim	Yahoo! Inc Santa Monica	Coauthor	Farrell, Aisling	Natural History Museum of Los Angeles County
McDade	Lucinda	Rancho Santa Ana Botanic Garden	author/ed./collaborator	Guralnick, Robert	University of Colorado, Boulder
McGill	Brian	Univ. of Maine	author/ed./collaborator	Guralnick, Robert	University of Colorado, Boulder
McGuire	Jenny	Univ. of Washington, Seattle	Co-Author	Koo, Michelle	University of California, Berkeley
McGuire	Jimmy A.	Univ. of California, Berkeley	Co-Author	Koo, Michelle	University of California, Berkeley
McIntyre	Patrick	UC Berkeley	Collaborator	Koy, Kevin	University of California, Berkeley
McPherson	Brice M.	University of California, Berkeley	Co-author	Kelly, Nina Maggi	University of California, Berkeley
McShea	William	Smithsonian	author/ed./collaborator	Guralnick, Robert	University of Colorado, Boulder
Medeiros	Art	USGS	Collaborator	Gillespie, Rosemary	University of California, Berkeley
Medeiros	Matthew	USNM	Co-Author	Gillespie, Rosemary	University of California, Berkeley
Medieros	Matthew	UC Berkeley	Collaborator	Will, Kipling	University of California, Berkeley
Mena	Carlos F.	Universidad San Francisco de Quito, Ecuador	Co-author	Kelly, Nina Maggi	University of California, Berkeley
Merenlender	Adina	University of California Cooperative Extension	Co-author	Kelly, Nina Maggi	University of California, Berkeley
Messina	Joseph P.	Michigan State University	Co-author	Kelly, Nina Maggi	University of California, Berkeley
Miguel	Carneiro	University of Porto	PhD Advisee	Nachman, Michael	University of California, Berkeley
Miller	Jay D.	USDA Forest Service	Co-author	Kelly, Nina Maggi	University of California, Berkeley
Milliken	William	Royal Botanic Gardens, Kew	Co-Author	Fielder, Peggy	University of California, Office of the President
Mills	Anthony	Stellenbosch University, South Africa	Co-Author	Fielder, Peggy	University of California, Office of the President
Mindell	David	California Academy Sciences	Collaborator	Gillespie, Rosemary	University of California, Berkeley
Mitchell	Edward	Natural History Museum of Los Angeles County	Co-Author	McLeod, Samuel	Natural History Museum of Los Angeles County
Moffet	Howard H	Division of Research, Kaiser Permanente	Co-author	Kelly, Nina Maggi	University of California, Berkeley
Monahan	William	NPS, Fort Collins, CO	Collaborator	Koo, Michelle	University of California, Berkeley
Mooers	Arne	Simon Fraser University	Co-Author	Gillespie, Rosemary	University of California, Berkeley
Moran	Emilio F.	Indiana University	Co-author	Kelly, Nina Maggi	University of California, Berkeley
Mori	Sylvia	USDA Forest Service	Co-author	Kelly, Nina Maggi	University of California, Berkeley
Moritz	Max	University of California Cooperative Extension	Co-author	Kelly, Nina Maggi	University of California, Berkeley
Moritz	Craig	Australia National University	Co-Author	Koo, Michelle	University of California, Berkeley
Moritz	Craig	UC Berkeley	Collaborator	Koy, Kevin	University of California, Berkeley
Morrow	William	Lawrence Berkeley National Laboratory	Co-author	Kelly, Nina Maggi	University of California, Berkeley
Moyle	Peter	University of California Davis	Co-Author	Fielder, Peggy	University of California, Office of the President
Mukhtyar	Shruti	UC Berkeley	Collaborator	Koy, Kevin	University of California, Berkeley
Murrell	Zack	Appalachian State University	author/ed./collaborator	Guralnick, Robert	University of Colorado, Boulder
Myers	Phil	University of Michigan	PhD Advisor	Nachman, Michael	University of California, Berkeley

Nakamura	Jan	University of Hawaii Berkeley	Ph.D. Advisee	Gillespie, Rosemary	University of California, Berkeley
Nakamura	Gary	University of California Cooperative Extension	Co-author	Kelly, Nina Maggi	University of California, Berkeley
Nakatsukasa	M.	Kyoto University Japan	Coauthor	Harris, John	Natural History Museum of Los Angeles County
Nakaya	H.	Kagoshima University Japan.	Coauthor	Harris, John	Natural History Museum of Los Angeles County
Nickleach	Dana	University of California, San Francisco	Co-author	Kelly, Nina Maggi	University of California, Berkeley
Nippert	J. B.	Kansas State University	Coauthor	Harris, John	Natural History Museum of Los Angeles County
Nufio	Cesar	CU Boulder	author/ed./collaborator	Guralnick, Robert	University of Colorado, Boulder
Nur	Nadav	PRBO Conservation Science, USA	Co-author	Kelly, Nina Maggi	University of California, Berkeley
O'Connor	Mark	UC Berkeley	Collaborator	Koy, Kevin	University of California, Berkeley
O'Keefe	Robin	Marshall University	Coauthor	Harris, John	Natural History Museum of Los Angeles County
O'Connell	Mark	University of California, Berkeley	Co-author	Kelly, Nina Maggi	University of California, Berkeley
Ogle	Ginger	UC Berkeley	Collaborator	Koy, Kevin	University of California, Berkeley
Okamoto	Tomoko	JT Biohistory Research Hall, Osaka	Co-Author	Gillespie, Rosemary	University of California, Berkeley
Otegui	Javier	CU Boulder	post-doctoral advisor	Guralnick, Robert	University of Colorado, Boulder
Oxford	Geoffrey	York University, England	Co-Author	Gillespie, Rosemary	University of California, Berkeley
Page	Rod	University of Glasgow	author/ed./collaborator	Guralnick, Robert	University of Colorado, Boulder
Palumbi	Steven R.	Hopkins Marine Lab, California	Collaborator	Gillespie, Rosemary	University of California, Berkeley
Pardo Manuel de Villena	Fernando	University of North Carolina	Collaborators	Nachman, Michael	University of California, Berkeley
Parker	Dawn C.	Michigan State University	Co-author	Kelly, Nina Maggi	University of California, Berkeley
Parker	V. Thomas	San Francisco State University	Co-author	Kelly, Nina Maggi	University of California, Berkeley
Parr	Cyndy	Smithsonian	author/ed./collaborator	Guralnick, Robert	University of Colorado, Boulder
Parton	William	George Mason University	Co-author	Kelly, Nina Maggi	University of California, Berkeley
Passey	Ben	Johns Hopkins University	Coauthor	Harris, John	Natural History Museum of Los Angeles County
Patton	James	Univ. of California, Berkeley	Co-Author	Koo, Michelle	University of California, Berkeley
Patton	James	University of California, Berkeley (emeritus)	PhD Advisor	McLeod, Samuel	Natural History Museum of Los Angeles County
Pavlik	Bruce	Royal Botanic Gardens, Kew	Co-Author	Fielder, Peggy	University of California, Office of the President
Payseur	Bret	University of Wisconsin, Madison	PhD Advisee	Nachman, Michael	University of California, Berkeley
Peak	Jessica	SF State University	PhD Advisee	Fielder, Peggy	University of California, Office of the President
Pederson	Brent	Private Consultant	Co-author	Kelly, Nina Maggi	University of California, Berkeley
Peterson	Liesl	University of Colorado	graduate advisee	Guralnick, Robert	University of Colorado, Boulder
Platnick	Norman	American Museum Natural History	Collaborator	Gillespie, Rosemary	University of California, Berkeley
Polhemus	Dan	DLNR Hawaii	Collaborator	Gillespie, Rosemary	University of California, Berkeley
Pons	Joan	IMEDEA, Mallorca	Co-Author	Gillespie, Rosemary	University of California, Berkeley
Poot,	Pieter	Univ. of Victoria, British Columbia	PhD Advisee	Fielder, Peggy	University of California, Office of the President
Powell	Jerry	UC Berkeley	Collaborator	Will, Kipling	University of California, Berkeley
Power	Mary	UC Berkeley	Collaborator	Koy, Kevin	University of California, Berkeley
Prasartkul	Pramote	Institute for Population and Social Research, Mahidol University, Thailand	Co-author	Kelly, Nina Maggi	University of California, Berkeley
Pu	Ruiliang	University of South Florida	Co-author	Kelly, Nina Maggi	University of California, Berkeley
Pyenson	Nicholas	Smithsonian Institution	Co-Author	McLeod, Samuel	Natural History Museum of Los Angeles County

Ramsay	Margaret	Royal Botanic Gardens, Kew	Co-Author	Fielder, Peggy	University of California, Office of the President
Rapacciuolo	Giovanni	UC Berkeley	Collaborator	Koy, Kevin	University of California, Berkeley
Ray	Chris	CU Boulder	author/ed./collaborator	Guralnick, Robert	University of Colorado, Boulder
Reed-Eckhart	Melissa	CU Boulder	graduate advisee	Guralnick, Robert	University of Colorado, Boulder
Reilly	Sean	Univ. of California, Berkeley	Co-Author	Koo, Michelle	University of California, Berkeley
Riechert	Susan E.	University of Tennessee, Knoxville	Ph.D. Advisor	Gillespie, Rosemary	University of California, Berkeley
Riginos	Cynthia	University of Queensland	PhD Advisee	Nachman, Michael	University of California, Berkeley
Rindfuss	Ronald R.	University of North Carolina, Chapel Hill	Co-author	Kelly, Nina Maggi	University of California, Berkeley
Rivera	Malia	University of Hawaii, Honolulu	Ph.D. Advisee	Gillespie, Rosemary	University of California, Berkeley
Robeson	Heather	CU Boulder	graduate advisee	Guralnick, Robert	University of Colorado, Boulder
Robinson	Jacqueline	University of California Los Angeles	Coauthor	Farrell, Aisling	Natural History Museum of Los Angeles County
Robinson	Natalie	University of Colorado	graduate advisee	Guralnick, Robert	University of Colorado, Boulder
Robinson	J. R.	University of California Los Angeles	Coauthor	Harris, John	Natural History Museum of Los Angeles County
Robinson	Derek	University of Michigan	Co-author	Kelly, Nina Maggi	University of California, Berkeley
Roderick	George K.	University of California, Berkeley	Spouse	Gillespie, Rosemary	University of California, Berkeley
Roderick	George	UC Berkeley	Collaborator	Will, Kipling	University of California, Berkeley
Rowe	Kevin	Museum Victoria, Australia	Co-Author	Koo, Michelle	University of California, Berkeley
Rowe	Karen	Museum Victoria, Australia	Co-Author	Koo, Michelle	University of California, Berkeley
Rumsey	Susan	UC Natural Reserve System (retired)	Co-Author	Fielder, Peggy	University of California, Office of the President
Rundel	Phil	University of California Los Angeles	Collaborator	Fielder, Peggy	University of California, Office of the President
Runkle	Ben RK	University of Hamburg, Germany	Co-author	Kelly, Nina Maggi	University of California, Berkeley
Saegusa	H.	Museum of Nature and Human Activities Hyogo Japan	Coauthor	Harris, John	Natural History Museum of Los Angeles County
Salcedo	Tovah	Debashish Bhattacharya at Rutgers	PhD Advisee	Nachman, Michael	University of California, Berkeley
Sallans	Andrew	University of Virginia	author/ed./collaborator	Guralnick, Robert	University of Colorado, Boulder
Sanders	William	University of Michigan	Coauthor	Harris, John	Natural History Museum of Los Angeles County
Sandquist	Daryl	Cal State University Fullerton	Coauthor	Harris, John	Natural History Museum of Los Angeles County
Sans Fuentes	Mari	University of Barcelona	Collaborators	Nachman, Michael	University of California, Berkeley
Saornil	Javier V.	Universidad Politécnica de Madrid, Spain	Co-author	Kelly, Nina Maggi	University of California, Berkeley
Saunders	Mathew	Research Scientist at Rosetta, Inc.)	PhD Advisee	Nachman, Michael	University of California, Berkeley
Savage	Bob	University of Brisol	Ph.D. Advisor	Harris, John	Natural History Museum of Los Angeles County
Sawangdee	Yothin	Wageningen University, The Netherlands	Co-author	Kelly, Nina Maggi	University of California, Berkeley
Schildhauer	Mark	NCEAS/UCSB	author/ed./collaborator	Guralnick, Robert	University of Colorado, Boulder
Schile	Lisa M.	University of California, Berkeley	Co-author	Kelly, Nina Maggi	University of California, Berkeley
Schillinger	Dean	University of California, San Francisco	Co-author	Kelly, Nina Maggi	University of California, Berkeley
Schmidt	Steve	CU Boulder	author/ed./collaborator	Guralnick, Robert	University of Colorado, Boulder
Schuetzenmeister	Falk	UC Berkeley	Collaborator	Koy, Kevin	University of California, Berkeley
Schutz	Heidi	UC Riverside	graduate advisee	Guralnick, Robert	University of Colorado, Boulder
Scott	Eric	San Bernardino County Museum	Coauthor	Farrell, Aisling	Natural History Museum of Los Angeles County
Seago	Ainsley	CSIRO, Canberra	Ph.D. Advisee	Will, Kipling	University of California, Berkeley

Shaari	David	California State Parks	Co-author	Kelly, Nina Maggi	University of California, Berkeley
Shapiro	Leo	University of Maryland	Collaborator	Gillespie, Rosemary	University of California, Berkeley
Shaw	Christopher	George C. Page Museum	Coauthor	Farrell, Aisling	Natural History Museum of Los Angeles County
Siegel	Stuart	Wetlands and Water Resources	Co-author	Kelly, Nina Maggi	University of California, Berkeley
Sierwald	Petra	Field Museum, Chcago	Collaborator	Gillespie, Rosemary	University of California, Berkeley
Silver	Whendee	University of California, Berkeley	Co-author	Kelly, Nina Maggi	University of California, Berkeley
Sleeter	Ben	USGS	Collaborator	Koy, Kevin	University of California, Berkeley
Smith	Rhian	Royal Botanic Gardens, Kew	Collaborator	Fielder, Peggy	University of California, Office of the President
Smith	Paul	Royal Botanic Gardens, Kew	Co-Author	Fielder, Peggy	University of California, Office of the President
Smith	Arfon	Adler Planetarium	author/ed./collaborator	Guralnick, Robert	University of Colorado, Boulder
Smith	Adam	Missouri Botanical Gardens	Co-Author	Koo, Michelle	University of California, Berkeley
Soberón	Jorge	University of Kansas	author/ed./collaborator	Guralnick, Robert	University of Colorado, Boulder
Solounias	Nikos	New York College of Osteopathic Medicine	Coauthor	Harris, John	Natural History Museum of Los Angeles County
Sonnentag	Oliver	Harvard University	Co-author	Kelly, Nina Maggi	University of California, Berkeley
Southon	John	University of Californi	Coauthor	Farrell, Aisling	Natural History Museum of Los Angeles County
Southon	John	University of Californi	Coauthor	Harris, John	Natural History Museum of Los Angeles County
Spagna	Joseph	William Paterson University of New Jersey	Ph.D. Advisee	Gillespie, Rosemary	University of California, Berkeley
Spencer	Carol	Univ. of California, Berkeley	Co-Author	Koo, Michelle	University of California, Berkeley
Standiford	Richard B.	University of California Cooperative Extension	Co-author	Kelly, Nina Maggi	University of California, Berkeley
Stephens	Scott L.	University of California, Berkeley	Co-author	Kelly, Nina Maggi	University of California, Berkeley
Stewart	William	University of California Cooperative Extension	Co-author	Kelly, Nina Maggi	University of California, Berkeley
Storchova	Radka	Charles University, Prague, Czech Republic	Collaborators	Nachman, Michael	University of California, Berkeley
Storer	Andrew J.	Michigan Technological University	Co-author	Kelly, Nina Maggi	University of California, Berkeley
Storz	Jay	University of Nebraska	Collaborators	Nachman, Michael	University of California, Berkeley
Stralberg	Diana	University of Alberta	Co-author	Kelly, Nina Maggi	University of California, Berkeley
Stromberg	Mark	UC Natural Reserve System (retired)	Collaborator	Fielder, Peggy	University of California, Office of the President
Stuckey	Brian	CU Boulder	graduate advisee	Guralnick, Robert	University of Colorado, Boulder
Svihra	Pavel	University of California Cooperative Extension	Co-author	Kelly, Nina Maggi	University of California, Berkeley
Tabashnik	Bruce	U Arizona Tucson	Co-Author	Gillespie, Rosemary	University of California, Berkeley
Takeuchi	Gary	George C. Page Museum	Coauthor	Farrell, Aisling	Natural History Museum of Los Angeles County
Takeuchi	Gary	George C. Page Museum	Coauthor	Harris, John	Natural History Museum of Los Angeles County
Taylor	Nigel	Royal Botanic Gardens, Kew	Co-Author	Fielder, Peggy	University of California, Office of the President
Teh	Yit	St. Andrews University	Co-author	Kelly, Nina Maggi	University of California, Berkeley
Temple	Douglas	University of Minnesota	Co-author	Kelly, Nina Maggi	University of California, Berkeley
Thalman	Olaf	University of Turku Finland	Coauthor	Farrell, Aisling	Natural History Museum of Los Angeles County
Thalman	O.	University of Turku Finland	Coauthor	Harris, John	Natural History Museum of Los Angeles County
Thebaud	Christophe	University of Paul Sabatier, Toulouse	Collaborator	Gillespie, Rosemary	University of California, Berkeley
Thiers	Barbara	New York Botanic Garden	author/ed./collaborator	Guralnick, Robert	University of Colorado, Boulder
Thomer	Andrea	University of Illinois Urbana-Champaign	Coauthor	Farrell, Aisling	Natural History Museum of Los Angeles County

Tianyu	Wang	Beijing, China	Ph.D. Advisee	Will, Kipling	University of California, Berkeley
Timm	Robert	University of Kansas	Coauthor	Harris, John	Natural History Museum of Los Angeles County
Tingley	Morgan	Princeton University	Co-Author	Koo, Michelle	University of California, Berkeley
Trivedi	Clare	Royal Botanic Gardens, Kew	Co-Author	Fielder, Peggy	University of California, Office of the President
Tucker	Priscilla	University of Michigan	Collaborators	Nachman, Michael	University of California, Berkeley
Tuckett,	Renee	Western Australia, Nedlands,	PhD Advisee	Fielder, Peggy	University of California, Office of the President
Tuxen	Karin	K., Google, Inc.	PhD advisee	Kelly, Nina Maggi	University of California, Berkeley
Ueda	Ken-ichi	Private Consultant	Co-author	Kelly, Nina Maggi	University of California, Berkeley
Uno	Kevin	Johns Hopkins University	Coauthor	Harris, John	Natural History Museum of Los Angeles County
Valacovich	Yana	University of California Cooperative Extension	Co-author	Kelly, Nina Maggi	University of California, Berkeley
van Wagtenonk	Jan W.	USGS	Co-author	Kelly, Nina Maggi	University of California, Berkeley
VanDam	Matthew	UC Berkeley	Ph.D. Advisee	Will, Kipling	University of California, Berkeley
Vandergast	Amy	SDSU	Ph.D. Advisee	Gillespie, Rosemary	University of California, Berkeley
VanWey	Leah K.	University of Waterloo, Canada	Co-author	Kelly, Nina Maggi	University of California, Berkeley
Vargas	Rodrigo	University of California, Berkeley	Co-author	Kelly, Nina Maggi	University of California, Berkeley
Vasey	Michael	San Francisco State University	Co-author	Kelly, Nina Maggi	University of California, Berkeley
Verburg	Peter H.	Wageningen University, The Netherlands	Co-author	Kelly, Nina Maggi	University of California, Berkeley
Vermeij	Geerat	UC Davis	Co-Author	Gillespie, Rosemary	University of California, Berkeley
Vieglais	David	University of New Mexico	author/ed./collaborator	Guralnick, Robert	University of Colorado, Boulder
Vindum	Jens	California Academy of Sciences	Co-Author	Koo, Michelle	University of California, Berkeley
Visel	Axel	Lawrence Berkeley National Laboratory	Co-author	Kelly, Nina Maggi	University of California, Berkeley
von May	Rudolph	Univ. of California, Berkeley	Co-Author	Koo, Michelle	University of California, Berkeley
Vredenburg	Vance	San Francisco State University	Collaborator	Koo, Michelle	University of California, Berkeley
Wake	David	Univ. of California, Berkeley	Collaborator	Koo, Michelle	University of California, Berkeley
Wake	Marvalee	Univ. of California, Berkeley	Ph.D. Advisor	Koo, Michelle	University of California, Berkeley
Wake	David	University of California, Berkeley (emeritus)	PhD Advisor	McLeod, Samuel	Natural History Museum of Los Angeles County
Wall	Jeff	UC San Francisco	Collaborators	Nachman, Michael	University of California, Berkeley
Walsh	Stephen J.	University of North Carolina, Chapel Hill	Co-author	Kelly, Nina Maggi	University of California, Berkeley
Waltari	Eric	City College New York	graduate advisee	Guralnick, Robert	University of Colorado, Boulder
Ward	Joy	University of Kansas	Coauthor	Farrell, Aisling	Natural History Museum of Los Angeles County
Ward	Joy	University of Kansas	Coauthor	Harris, John	Natural History Museum of Los Angeles County
Wardell-Johnson	Grant	Curtin University	Collaborator	Fielder, Peggy	University of California, Office of the President
Wart	Sarah V.	University of California, Berkeley	Co-author	Kelly, Nina Maggi	University of California, Berkeley
Warton	Margaret	Division of Research, Kaiser Permanente	Co-author	Kelly, Nina Maggi	University of California, Berkeley
Waters	Jon	University of Otago, New Zealand	Collaborator	Gillespie, Rosemary	University of California, Berkeley
Way	Michael	Royal Botanic Gardens, Kew	Co-Author	Fielder, Peggy	University of California, Office of the President
Weaver	Kathleen	University of LaVerne	graduate advisee	Guralnick, Robert	University of Colorado, Boulder
Weirauch	Christiane	UC Riverside	Collaborator	Will, Kipling	University of California, Berkeley
Whaley	Oliver	Royal Botanic Gardens, Kew	Co-Author	Fielder, Peggy	University of California, Office of the President

Wheeler	Quentin	Arizona State University	author/ed./collaborator	Guralnick, Robert	University of Colorado, Boulder
Whital	Deb	USDA-Forest Service	Co-author	Kelly, Nina Maggi	University of California, Berkeley
Whittaker	Robert	Oxford University	Collaborator	Gillespie, Rosemary	University of California, Berkeley
Wieczorek	John	University of California at Berkeley	author/ed./collaborator	Guralnick, Robert	University of Colorado, Boulder
Will	Kipling	University of California, Berkeley	collaborator	Nishida, Gordon	University of California, Berkeley
Williamson	Mark	York University, England	Collaborator	Gillespie, Rosemary	University of California, Berkeley
Wilson	Jack	University of Texas	M.A. Advisor	Harris, John	Natural History Museum of Los Angeles County
Windam-Meyers	L.	USGS	Co-author	Kelly, Nina Maggi	University of California, Berkeley
Wlasiuk	Gabriela	Univ Arizona	PhD Advisee	Nachman, Michael	University of California, Berkeley
Wong	Kathleen	UC Natural Reserve System	Co-Author	Fielder, Peggy	University of California, Office of the President
Wood	Hannah	UC Davis	Ph.D. Advisee	Gillespie, Rosemary	University of California, Berkeley
Wood	David. L.	University of California, Berkeley	Co-author	Kelly, Nina Maggi	University of California, Berkeley
Wood	Julian K.	PRBO Conservation Science	Co-author	Kelly, Nina Maggi	University of California, Berkeley
Yates	Colin	Conservation Science Center, Department of Parks and Wildlife, Western Australia	Collaborator	Fielder, Peggy	University of California, Office of the President
Yen	Irene H	University of California, San Francisco	Co-author	Kelly, Nina Maggi	University of California, Berkeley
Zeledon	Esther	US Department of State	PhD advisee	Kelly, Nina Maggi	University of California, Berkeley
Zhao	Feng	University of Maryland	Co-author	Kelly, Nina Maggi	University of California, Berkeley
Zhu	Zhiliang	USGS	Collaborator	Koy, Kevin	University of California, Berkeley
Zug	George	Smithsonian Institution	Co-Author	Koo, Michelle	University of California, Berkeley

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 13-1					FOR NSF USE ONLY	
NSF 13-569		10/18/13		NSF PROPOSAL NUMBER		
FOR CONSIDERATION BY NSF ORGANIZATION UNIT(S) (Indicate the most specific unit known, i.e. program, division, etc.)					1411352	
EF - Digitization						
DATE RECEIVED	NUMBER OF COPIES	DIVISION ASSIGNED	FUND CODE	DUNS# (Data Universal Numbering System)	FILE LOCATION	
11/13/2013	1	08040000 EF	6895	124726725	11/13/2013 9:16pm	
EMPLOYER IDENTIFICATION NUMBER (EIN) OR TAXPAYER IDENTIFICATION NUMBER (TIN)		SHOW PREVIOUS AWARD NO. IF THIS IS <input type="checkbox"/> A RENEWAL <input type="checkbox"/> AN ACCOMPLISHMENT-BASED RENEWAL		IS THIS PROPOSAL BEING SUBMITTED TO ANOTHER FEDERAL AGENCY? YES <input type="checkbox"/> NO <input checked="" type="checkbox"/> IF YES, LIST ACRONYM(S)		
946002123						
NAME OF ORGANIZATION TO WHICH AWARD SHOULD BE MADE			ADDRESS OF AWARDEE ORGANIZATION, INCLUDING 9 DIGIT ZIP CODE			
University of California-Berkeley			University of California-Berkeley			
AWARDEE ORGANIZATION CODE (IF KNOWN)			Sponsored Projects Office			
0013128000			Berkeley, CA. 947045940			
NAME OF PRIMARY PLACE OF PERF			ADDRESS OF PRIMARY PLACE OF PERF, INCLUDING 9 DIGIT ZIP CODE			
University of California-Berkeley			University of California-Berkeley			
			Berkeley ,CA ,947045940 ,US.			
IS AWARDEE ORGANIZATION (Check All That Apply) (See GPG II.C For Definitions)		<input type="checkbox"/> SMALL BUSINESS	<input type="checkbox"/> MINORITY BUSINESS	<input type="checkbox"/> IF THIS IS A PRELIMINARY PROPOSAL THEN CHECK HERE		
		<input type="checkbox"/> FOR-PROFIT ORGANIZATION	<input type="checkbox"/> WOMAN-OWNED BUSINESS			
TITLE OF PROPOSED PROJECT Digitization TCN: Digitization and Integration of Ecoinformatics Data from the Californian Biome						
REQUESTED AMOUNT \$ 2,325,171	PROPOSED DURATION (1-60 MONTHS) 36 months	REQUESTED STARTING DATE 07/01/14	SHOW RELATED PRELIMINARY PROPOSAL NO. IF APPLICABLE			
CHECK APPROPRIATE BOX(ES) IF THIS PROPOSAL INCLUDES ANY OF THE ITEMS LISTED BELOW						
<input type="checkbox"/> BEGINNING INVESTIGATOR (GPG I.G.2)		<input type="checkbox"/> HUMAN SUBJECTS (GPG II.D.7) Human Subjects Assurance Number _____				
<input type="checkbox"/> DISCLOSURE OF LOBBYING ACTIVITIES (GPG II.C.1.e)		Exemption Subsection _____ or IRB App. Date _____				
<input type="checkbox"/> PROPRIETARY & PRIVILEGED INFORMATION (GPG I.D, II.C.1.d)		<input type="checkbox"/> INTERNATIONAL COOPERATIVE ACTIVITIES: COUNTRY/COUNTRIES INVOLVED (GPG II.C.2.j)				
<input type="checkbox"/> HISTORIC PLACES (GPG II.C.2.j)		_____				
<input type="checkbox"/> EAGER* (GPG II.D.2) <input type="checkbox"/> RAPID** (GPG II.D.1)		_____				
<input type="checkbox"/> VERTEBRATE ANIMALS (GPG II.D.6) IACUC App. Date _____		_____				
PHS Animal Welfare Assurance Number _____						
PI/PD DEPARTMENT ESPM, Organisms & Environment Division		PI/PD POSTAL ADDRESS 137 Mulford Hall				
PI/PD FAX NUMBER 510-642-7428		Berkeley, CA 947203112				
		United States				
NAMES (TYPED)	High Degree	Yr of Degree	Telephone Number	Email Address		
PI/PD NAME Kipling W Will	PhD	2000	510-642-4296	kipwill@berkeley.edu		
CO-PI/PD N. Maggi Kelly	PhD	1996	510-642-7272	maggi@berkeley.edu		
CO-PI/PD Michelle S Koo	MA	1994	510-642-3567	mkoo@berkeley.edu		
CO-PI/PD Michael W Nachman	PhD	1990	510-642-1792	mnachman@berkeley.edu		
CO-PI/PD						

CERTIFICATION PAGE

Certification for Authorized Organizational Representative (or Equivalent) or Individual Applicant

By electronically signing and submitting this proposal, the Authorized Organizational Representative (AOR) 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 conflict of interest (when applicable), drug-free workplace, debarment and suspension, lobbying activities (see below), nondiscrimination, flood hazard insurance (when applicable), responsible conduct of research, organizational support, Federal tax obligations, unpaid Federal tax liability, and criminal convictions as set forth in the NSF Proposal & Award Policies & Procedures Guide, Part I: the Grant Proposal Guide (GPG). 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

When the proposing organization employs more than fifty persons, the Authorized Organizational Representative (or equivalent) is required to complete the following certification regarding Conflict of Interest:

By electronically signing the Certification Pages, the Authorized Organizational Representative (or equivalent) is certifying that the organization 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) Section 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 organization's expenditure of any funds under the award, in accordance with the organization'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 Certification Pages, the Authorized Organizational Representative (or equivalent), 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 Certification Pages, the Authorized Organizational Representative (or equivalent) or Individual Applicant is providing the Debarment and Suspension Certification contained in Exhibit II-4 of the Grant Proposal Guide.

Certification Regarding Lobbying

This 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 Certification Pages, the Authorized Organizational Representative (or equivalent) 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 Certification Pages, the Authorized Organizational Representative (or equivalent) 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 Certification Pages, the Authorized Organizational Representative 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 AOR shall require that the language of this certification be included in any award documents for all subawards at all tiers.

CERTIFICATION PAGE - CONTINUED

Certification Regarding Organizational Support

By electronically signing the Certification Pages, the Authorized Organizational Representative (or equivalent) is certifying that there is organizational support for the proposal as required by Section 526 of the America COMPETES Reauthorization Act of 2010. This support extends to the portion of the proposal developed to satisfy the Broader Impacts Review Criterion as well as the Intellectual Merit Review Criterion, and any additional review criteria specified in the solicitation. Organizational support will be made available, as described in the proposal, in order to address the broader impacts and intellectual merit activities to be undertaken.

Certification Regarding Federal Tax Obligations

When the proposal exceeds \$5,000,000, the Authorized Organizational Representative (or equivalent) is required to complete the following certification regarding Federal tax obligations. By electronically signing the Certification pages, the Authorized Organizational Representative is certifying that, to the best of their knowledge and belief, the proposing organization:

- (1) has filed all Federal tax returns required during the three years preceding this certification;
- (2) has not been convicted of a criminal offense under the Internal Revenue Code of 1986; and
- (3) has not, more than 90 days prior to this certification, been notified of any unpaid Federal tax assessment for which the liability remains unsatisfied, unless the assessment is the subject of an installment agreement or offer in compromise that has been approved by the Internal Revenue Service and is not in default, or the assessment is the subject of a non-frivolous administrative or judicial proceeding.

Certification Regarding Unpaid Federal Tax Liability

When the proposing organization is a corporation, the Authorized Organizational Representative (or equivalent) is required to complete the following certification regarding Federal Tax Liability:

By electronically signing the Certification Pages, the Authorized Organizational Representative (or equivalent) is certifying that the corporation has no unpaid Federal tax liability that has been assessed, for which all judicial and administrative remedies have been exhausted or lapsed, and that is not being paid in a timely manner pursuant to an agreement with the authority responsible for collecting the tax liability.

Certification Regarding Criminal Convictions

When the proposing organization is a corporation, the Authorized Organizational Representative (or equivalent) is required to complete the following certification regarding Criminal Convictions:

By electronically signing the Certification Pages, the Authorized Organizational Representative (or equivalent) is certifying that the corporation has not been convicted of a felony criminal violation under any Federal law within the 24 months preceding the date on which the certification is signed.

AUTHORIZED ORGANIZATIONAL REPRESENTATIVE		SIGNATURE	DATE
NAME Christine Luppino		Electronic Signature	Nov 13 2013 7:42PM
TELEPHONE NUMBER 510-643-6113	EMAIL ADDRESS cluppino@berkeley.edu	FAX NUMBER 510-642-8236	
<p>* EAGER - EARly-concept Grants for Exploratory Research ** RAPID - Grants for Rapid Response Research</p>			

**Directorate for Biological Sciences
Emerging Frontiers
Digitization**

**Proposal Classification Form
PI: / Proposal Number: 1411352**

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)

- | | | |
|--|--|---|
| <input type="checkbox"/> Astronomy
<input type="checkbox"/> Chemistry
<input checked="" type="checkbox"/> Computer Science
<input type="checkbox"/> Earth Science | <input type="checkbox"/> Engineering
<input type="checkbox"/> Mathematics
<input type="checkbox"/> Physics | <input type="checkbox"/> Psychology
<input type="checkbox"/> Social Sciences
<input type="checkbox"/> None of the Above |
|--|--|---|

CATEGORY III: SUBSTANTIVE AREA (No selection required)

CATEGORY IV: INFRASTRUCTURE (No selection required)

CATEGORY V: HABITAT (No selection required)

CATEGORY VI: GEOGRAPHIC AREA OF THE RESEARCH (No selection required)

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

- | | | |
|---|---|---|
| <input type="checkbox"/> VIRUSES
<input type="checkbox"/> Bacterial
<input type="checkbox"/> Plant
<input type="checkbox"/> Animal
<input type="checkbox"/> PROKARYOTES
<input type="checkbox"/> Archaeobacteria
<input type="checkbox"/> Cyanobacteria
<input type="checkbox"/> Eubacteria
<input type="checkbox"/> PROTISTA (PROTOZOA)
<input type="checkbox"/> Amoebae
<input type="checkbox"/> Apicomplexa
<input type="checkbox"/> Ciliophora
<input type="checkbox"/> Flagellates
<input type="checkbox"/> Foraminifera
<input type="checkbox"/> Microspora
<input type="checkbox"/> Radiolaria
<input type="checkbox"/> FUNGI
<input type="checkbox"/> Ascomycota
<input type="checkbox"/> Basidiomycota
<input type="checkbox"/> Chytridiomycota | <input type="checkbox"/> Mitosporic Fungi
<input type="checkbox"/> Oomycota
<input type="checkbox"/> Yeasts
<input type="checkbox"/> Zygomycota
<input type="checkbox"/> LICHENS
<input type="checkbox"/> SLIME MOLDS
<input type="checkbox"/> ALGAE
<input type="checkbox"/> Bacillariophyta (Diatoms)
<input type="checkbox"/> Charophyta
<input type="checkbox"/> Chlorophyta
<input type="checkbox"/> Chrysophyta
<input type="checkbox"/> Dinoflagellata
<input type="checkbox"/> Euglenoids
<input type="checkbox"/> Phaeophyta
<input type="checkbox"/> Rhodophyta
<input checked="" type="checkbox"/> PLANTS
<input type="checkbox"/> NON-VASCULAR PLANTS
<input type="checkbox"/> BRYOPHYTA
<input type="checkbox"/> Anthocerotae (Hornworts)
<input type="checkbox"/> Hepaticae (Liverworts) | <input type="checkbox"/> Musci (Mosses)
<input type="checkbox"/> VASCULAR PLANTS
<input type="checkbox"/> FERNS & FERN ALLIES
<input type="checkbox"/> GYMNOSPERMS
<input type="checkbox"/> Coniferales (Conifers)
<input type="checkbox"/> Cycadales (Cycads)
<input type="checkbox"/> Ginkgoales (Ginkgo)
<input type="checkbox"/> Gnetales (Gnetophytes)
<input type="checkbox"/> ANGIOSPERMS
<input type="checkbox"/> Monocots
<input type="checkbox"/> Areaceae (Palmae)
<input type="checkbox"/> Cyperaceae
<input type="checkbox"/> Liliaceae
<input type="checkbox"/> Orchidaceae
<input type="checkbox"/> Poaceae (Graminae)
<input type="checkbox"/> Dicots
<input type="checkbox"/> Apiaceae (Umbelliferae)
<input type="checkbox"/> Asteraceae (Compositae)
<input type="checkbox"/> Brassicaceae (Cruciferae)
<input type="checkbox"/> Fabaceae (Leguminosae) |
|---|---|---|

<input type="checkbox"/>	Lamiaceae (Labiatae)	<input type="checkbox"/>	Pycnogonida (Sea Spiders)	<input type="checkbox"/>	Echinoidea (Sea Urchins, Sand Dollars)
<input type="checkbox"/>	Rosaceae	<input type="checkbox"/>	Scorpionida (Scorpions)	<input type="checkbox"/>	Holothuroidea (Sea Cucumbers)
<input type="checkbox"/>	Solanaceae	<input type="checkbox"/>	Araneae (True Spiders)	<input type="checkbox"/>	HEMICHORDATA (Acorn Worms, Pterobranchs)
<input type="checkbox"/>	ANIMALS	<input type="checkbox"/>	Pseudoscorpionida (Pseudoscorpions)	<input type="checkbox"/>	UROCHORDATA (Tunicata) (Tunicates, Sea Squirts, Salps, Ascideans)
<input checked="" type="checkbox"/>	INVERTEBRATES	<input type="checkbox"/>	Acarina (Free-living Mites)	<input type="checkbox"/>	CEPHALOCHORDATA (Amphioxus/Lancelet)
<input type="checkbox"/>	MESOZOA/PLACOZOA	<input type="checkbox"/>	Parasitiformes (Parasitic Ticks & Mites)	<input checked="" type="checkbox"/>	VERTEBRATES
<input type="checkbox"/>	PORIFERA (Sponges)	<input type="checkbox"/>	Crustacea	<input type="checkbox"/>	AGNATHA (Hagfish, Lamprey)
<input type="checkbox"/>	CNIDARIA	<input type="checkbox"/>	Branchiopoda (Fairy Shrimp, Water Flea)	<input type="checkbox"/>	FISHES
<input type="checkbox"/>	Hydrozoa (Hydra, etc.)	<input type="checkbox"/>	Ostracoda (Sea Lice)	<input type="checkbox"/>	Chondrichthyes (Cartilaginous Fishes) (Sharks, Rays, Ratfish)
<input type="checkbox"/>	Scyphozoa (Jellyfish)	<input type="checkbox"/>	Copepoda	<input type="checkbox"/>	Osteichthyes (Bony Fishes)
<input type="checkbox"/>	Anthozoa (Corals, Sea Anemones)	<input type="checkbox"/>	Cirripedia (Barnacles)	<input type="checkbox"/>	Sarcopterygia (Lobe-finned Fishes) (Coelacanth, Lungfish)
<input type="checkbox"/>	CTENOPHORA (Comb Jellies)	<input type="checkbox"/>	Amphipoda (Skeleton Shrimp, Whale Lice, Freshwater Shrimp)	<input type="checkbox"/>	Actinopterygia (Ray-finned Fishes)
<input type="checkbox"/>	PLATYHELMINTHES (Flatworms)	<input type="checkbox"/>	Isopoda (Wood Lice, Pillbugs)	<input type="checkbox"/>	AMPHIBIA
<input type="checkbox"/>	Turbellaria (Planarians)	<input type="checkbox"/>	Decapoda (Lobster, Crayfish, Crabs, Shrimp)	<input type="checkbox"/>	Anura (Frogs, Toads)
<input type="checkbox"/>	Trematoda (Flukes)	<input type="checkbox"/>	Hexapoda (Insecta) (Insects)	<input type="checkbox"/>	Urodela (Salamanders, Newts)
<input type="checkbox"/>	Cestoda (Tapeworms)	<input type="checkbox"/>	Apterygota (Springtails, Silverfish, etc.)	<input type="checkbox"/>	Gymnophiona (Apoda) (Caecilians)
<input type="checkbox"/>	Monogenea (Flukes)	<input type="checkbox"/>	Odonata (Dragonflies, Damselflies)	<input type="checkbox"/>	REPTILIA
<input type="checkbox"/>	GNATHOSTOMULIDA	<input type="checkbox"/>	Ephemeroptera (Mayflies)	<input type="checkbox"/>	Chelonia (Turtles, Tortoises)
<input type="checkbox"/>	NEMERTINEA (Rynchozoela) (Ribbon Worms)	<input type="checkbox"/>	Orthoptera (Grasshoppers, Crickets)	<input type="checkbox"/>	Serpentes (Snakes)
<input type="checkbox"/>	ENTOPROCTA (Bryozoa) (Plant-like Animals)	<input type="checkbox"/>	Dictyoptera (Cockroaches, Mantids, Phasmids)	<input type="checkbox"/>	Sauria (Lizards)
<input type="checkbox"/>	ASCHELMINTHES	<input type="checkbox"/>	Isoptera (Termites)	<input type="checkbox"/>	Crocodylia (Crocodilians)
<input type="checkbox"/>	Gastrotricha	<input type="checkbox"/>	Plecoptera (Stoneflies)	<input type="checkbox"/>	Rhynchocephalia (Tuatara)
<input type="checkbox"/>	Kinorhyncha	<input type="checkbox"/>	Phthiraptera (Mallophaga & Anoplura) (Lice)	<input type="checkbox"/>	AVES (Birds)
<input type="checkbox"/>	Loricifera	<input type="checkbox"/>	Hemiptera (including Heteroptera) (True Bugs)	<input type="checkbox"/>	Paleognathae (Ratites)
<input type="checkbox"/>	Nematoda (Roundworms)	<input type="checkbox"/>	Homoptera (Cicadas, Scale Insects, Leafhoppers)	<input type="checkbox"/>	Sphenisciformes (Penguins)
<input type="checkbox"/>	Nematomorpha (Horsehair Worms)	<input type="checkbox"/>	Thysanoptera (Thrips)	<input type="checkbox"/>	Procellariiformes (Albatrosses, Petrels, Fulmars)
<input type="checkbox"/>	Rotifera (Rotatoria)	<input type="checkbox"/>	Neuroptera (Lacewings, Dobsonflies, Snakeflies)	<input type="checkbox"/>	Pelecaniformes (Pelicans, Gannets, Boobies, Tropicbirds)
<input type="checkbox"/>	ACANTHOCEPHALA (Spiny-headed Worms)	<input type="checkbox"/>	Trichoptera (Caddisflies)	<input type="checkbox"/>	Ciconiiformes (Hérons, Bitterns, Egrets, Storks, Ibis, Flamingo)
<input type="checkbox"/>	PRIAPULOIDEA	<input type="checkbox"/>	Lepidoptera (Moths, Butterflies)	<input type="checkbox"/>	Anseriformes (Ducks, Geese, Screamers)
<input type="checkbox"/>	BRYOZOA (Ectoprocta) (Plant-like Animals)	<input type="checkbox"/>	Diptera (Flies, Mosquitoes)	<input type="checkbox"/>	Falconiformes (Vultures, Hawks, Eagles, Condors, Kites, Falcons)
<input type="checkbox"/>	PHORONIDEA (Lophophorates)	<input type="checkbox"/>	Siphonaptera (Fleas)	<input type="checkbox"/>	Galliformes (Megapodes, Turkeys, Quail, Pheasants, Peafowl, etc.)
<input type="checkbox"/>	BRACHIOPODA (Lamp Shells)	<input type="checkbox"/>	Coleoptera (Beetles)	<input type="checkbox"/>	Gruiformes (Cranes, Rails, Gallinules, Coots, Bustards, Crakes)
<input type="checkbox"/>	MOLLUSCA	<input type="checkbox"/>	Hymenoptera (Ants, Bees, Wasps, Sawflies)	<input type="checkbox"/>	Charadriiformes (Terns, Gulls, Stilts, Avocets, Plovers, Puffins, etc.)
<input type="checkbox"/>	Monoplacophora	<input type="checkbox"/>	Chilopoda (Centipedes)	<input type="checkbox"/>	Columbiformes (Pigeons, Doves)
<input type="checkbox"/>	Aplacophora (Solenogasters)	<input type="checkbox"/>	Diplopoda (Millipedes)	<input type="checkbox"/>	Psittaciformes (Parrots, Lories, Cockatoos, Kakapo, Conures, etc.)
<input type="checkbox"/>	Polyplacophora (Chitons)	<input type="checkbox"/>	Pauropoda	<input type="checkbox"/>	Cuculiformes (Cuckoos, Turacos, Anis, Coucal, Roadrunner, etc.)
<input type="checkbox"/>	Scaphopoda (Tooth Shells)	<input type="checkbox"/>	Symphyta (Symphyla)	<input type="checkbox"/>	Strigiformes (Owls)
<input type="checkbox"/>	Gastropoda (Snails, Slugs, Limpets)	<input type="checkbox"/>	PENTASTOMIDA (Linguatulida) (Tongue Worms)	<input type="checkbox"/>	Apodiformes (Hummingbirds, Swifts, Thornbills)
<input type="checkbox"/>	Pelecypoda (Bivalvia) (Clams, Mussels, Oysters, Scallops)	<input type="checkbox"/>	TARDIGRADA (Tardigrades, Water Bears)	<input type="checkbox"/>	Coraciiformes (Kingfishers, Todies, Bee-Eaters, Rollers, Hornbills, etc.)
<input type="checkbox"/>	Cephalopoda (Squid, Octopus, Nautilus)	<input type="checkbox"/>	ONYCHOPHORA (Peripatus)	<input type="checkbox"/>	Piciformes (Woodpeckers, Toucans, Jacamars, Barbets, Honeyguides)
<input type="checkbox"/>	ANNELIDA (Segmented Worms)	<input type="checkbox"/>	CHAETOGNATHA (Arrow Worms)	<input type="checkbox"/>	Passeriformes (Passerines)
<input type="checkbox"/>	Polychaeta (Parapodial Worms)	<input type="checkbox"/>	ECHINODERMATA	<input type="checkbox"/>	MAMMALIA
<input type="checkbox"/>	Oligochaeta (Earthworms)	<input type="checkbox"/>	Crinoidea (Sea Lilies, Feather Stars)		
<input type="checkbox"/>	Hirudinida (Leeches)	<input type="checkbox"/>	Asteroidea (Starfish, Sea Stars)		
<input type="checkbox"/>	POGONOPHORA (Beard Worms)	<input type="checkbox"/>	Ophiuroidea (Brittle Stars, Serpent Stars)		
<input type="checkbox"/>	SIPUNCULOIDEA (Peanut Worms)				
<input type="checkbox"/>	ECHIUROIDEA (Spoon Worms)				
<input type="checkbox"/>	ARTHROPODA				
<input type="checkbox"/>	Cheliceriformes				
<input type="checkbox"/>	Merostomata (Horseshoe Crabs)				

<input type="checkbox"/> Monotremata (Platypus, Echidna)	<input type="checkbox"/> Humans	<input type="checkbox"/> Perissodactyla (Odd-toed Ungulates) (Horses, Rhinos, Tapirs, etc.)
<input type="checkbox"/> Marsupalia (Marsupials)	<input type="checkbox"/> Rodentia	<input type="checkbox"/> Artiodactyla (Even-toed Ungulates) (Cattle, Sheep, Deer, Pigs, etc.)
<input type="checkbox"/> Eutheria (Placentals)	<input type="checkbox"/> Laboratory Rodents (Rat, Mouse, Guinea Pig, Hamster)	<input type="checkbox"/> Sirenia (Manatees, Dugongs)
<input type="checkbox"/> Insectivora (Hedgehogs, Moles, Shrews, Tenrec, etc.)	<input type="checkbox"/> Non-Laboratory Rodents	<input type="checkbox"/> Proboscidea (Elephants)
<input type="checkbox"/> Chiroptera (Bats)	<input type="checkbox"/> Lagomorphs (Rabbits, Hares, Pikas)	<input type="checkbox"/> Marine Mammals (Seals, Walrus, Whales, Otters, Dolphins, Porpoises)
<input type="checkbox"/> Edentata (Anteaters, Sloths, Armadillos)	<input type="checkbox"/> Tubulidenata (Aardvarks)	<input type="checkbox"/> TRANSGENIC ORGANISMS
<input type="checkbox"/> Primates	<input type="checkbox"/> Carnivora (Bears, Canids, Felids, Mustelids, Viverrids, Hyena, Procyonids)	<input type="checkbox"/> FOSSIL OR EXTINCT ORGANISMS
<input type="checkbox"/> Monkeys	<input type="checkbox"/> Ungulates	<input type="checkbox"/> NO ORGANISMS
<input type="checkbox"/> Apes (Gibbons, Orang-utan, Gorilla, Chimpanzee)		

CATEGORY VIII: MODEL ORGANISM (Select ONE)

<input checked="" type="checkbox"/> NO MODEL ORGANISM	MODEL ORGANISM (Input up to 9 characters) <input type="text"/>	
---	---	--

PROJECT SUMMARY

Overview:

A partnership of natural history museums, field stations, reserves, geospatial and informatic innovators is proposed to build an innovative, collaborative workflow to liberate data from about 945K specimens in the holdings of the Berkeley Natural History Museums (BNHM), Los Angeles County Museum (LACM), Page Museum and numerous remote collections at the University of California (UC) Reserves. These data cut across taxa, through time and over space across the California Biome. Central to the project are an estimated 600K specimens that will be newly digitized. An additional 345K specimens exist as dark records, i.e., incomplete digitized specimen records that need verification or exist in use-limiting formats, which will be normalized and completed. These data will be integrated into a powerful visualization and analytic tool, Holos Berkeley Ecoinformatics Engine, which also functions as the data quality workbench. This partnership is positioned to focus thematically on the California Biome as a model system for posing questions about global change due to the rich history of ongoing biotic, ecological and environmental datasets that this partnership represents.

Intellectual Merit :

The Californian Biome, which includes the Californian Floristic Province and adjacent transitional areas, is one of five major Mediterranean-type climates in the world. For the Californian Biome and other Mediterranean-climate regions, understanding organismal change over space and through time is particularly critical as such regions, especially California, represent extreme interactions of social, biophysical and ecological complexity and thus face immediate consequences of global change. The Holos platform will integrate these newly accessible data to address the shifting spatial structure of California's natural and managed resources across the biome. The specimens include neontological and paleontological specimens reaching back 50,000 years in the tar pit collections of the Page Museum and LACM. Coupled with ecological modeling and phylogenetic approaches, these data can be used for studies that examine the effects of past environments, geological events, and biogeographic and evolutionary processes. Data will be valuable for high-resolution investigations into significant change or stasis of communities and clades with regard to environmental change, disparate land use, and differing management regimes for organisms typical of Californian habitats.

Broader Impacts :

Beyond research, this proposal impacts educators and the public by providing access to multi-disciplinary, multi-temporal data for broad-scale analyses of patterns for species interactions, and community changes through historic and prehistoric time periods. The Holos platform will make such data available for land managers and state agencies who can better understand rates of change and predict future scenarios of climate or land use. The specimen data also will be available to the nearly 3,000 students and researchers who use the UC Reserves yearly, allowing comprehensive visualization of species records for a wide range of research projects. Our proposal includes training for undergraduate and graduate students on digitization, data quality, and georeferencing. The project will provide students with hands-on experience in museum curation, bioinformatics, spatial modeling, in a phylogenetic and ecological framework. The BNHM will collaborate with the Biology Scholars Program at UCB, which promotes and supports students from economic, gender, ethnic, and cultural groups historically underrepresented in biology, to recruit participants. Summer interns will be selected from a national solicitation of advanced undergraduate or recently graduated students to work alongside project staff to design and conduct a project focusing on streamlining workflow efficiencies or increasing data fitness for use. Public outreach will include the highly visible citizen science interactive participation at Notes from Nature, public displays and events at the Page Museum and bioblitzes at UC Reserves in partnership with the California Master Naturalist program. Working with existing ADBC projects, Notes from Nature, and iDigBio, methods and tools will be developed to increase the efficiency of transforming annotated specimens to digital data records, including extracting meaningful data from the massive amounts citizen scientist-transcribed data. Innovations and experiences will be shared with the biocollection community at large through publications, presentations, and by making workflow and software products freely available.

TABLE OF CONTENTS

For font size and page formatting specifications, see GPG section II.B.2.

	Total No. of Pages	Page No.* (Optional)*
Cover Sheet for Proposal to the National Science Foundation		
Project Summary (not to exceed 1 page)	1	_____
Table of Contents	1	_____
Project Description (Including Results from Prior NSF Support) (not to exceed 15 pages) (Exceed only if allowed by a specific program announcement/solicitation or if approved in advance by the appropriate NSF Assistant Director or designee)	15	_____
References Cited	3	_____
Biographical Sketches (Not to exceed 2 pages each)	34	_____
Budget (Plus up to 3 pages of budget justification)	17	_____
Current and Pending Support	28	_____
Facilities, Equipment and Other Resources	6	_____
Special Information/Supplementary Documents (Data Management Plan, Mentoring Plan and Other Supplementary Documents)	3	_____
Appendix (List below.) (Include only if allowed by a specific program announcement/ solicitation or if approved in advance by the appropriate NSF Assistant Director or designee)	_____	_____
Appendix Items:		

*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.

Digitization TCN: *Digitization and Integration of Ecoinformatic Data from the Californian Biome*

Summary: We propose a partnership of natural history museums, field stations and remote reserves, and geospatial and informatic innovators to build a collaborative and innovative workflow of digitizing and liberating data from about 945,000 specimens from the main holdings of the Berkeley Natural History Museums, Los Angeles County Museum, Page Museum and numerous remote collections in the University of California (UC) Natural Reserves. These data cut across taxa, through time and over space, across the California Biome. Central to the project are an estimated 600,000 specimens that will be newly digitized. An additional 345,000 specimens exist as dark records, i.e., digitized specimen records that are incomplete and need verification or exist in use-limiting formats, which will be corrected, normalized, and completed. These target data will be integrated into a powerful visualization and analytic tool, Holos, Berkeley Ecoinformatics Engine, already enabled to overlay species occurrences with rich environmental GIS layers to address the shifting spatial structure of California's natural resources. Coupled with ecological modeling and phylogenetic approaches, these data will be used for studies that look at the effects of past environmental and geological events, as well as biogeographic and evolutionary processes. We are uniquely positioned to focus thematically on the California Biome as a model system for posing questions about global change because of the rich history of ongoing biotic, ecological, and environmental datasets that this partnership represents. In addition, our proposal builds and expands on past innovations spearheaded by several NSF-funded projects such as CalBug, several herbaria-based TCN's, and VertNet and its founding projects, MaNIS, HerpNet and OrNIS, to maximize efficiencies and innovate new technologies that will benefit any digitization effort.

I. Intellectual Merit:

The Californian Biome is an ecologically important and historically cohesive region primarily consisting of the Californian Floristic Province and also including the transitional steppe or steppe-like zones leading into the western Great Basin and Desert Provinces. Much of the region has a Mediterranean-climate ecosystem, which occurs in only five regions of the world: California, central Chile, the Mediterranean Basin, the Greater Cape region of South Africa, and southwestern West Australia/south Australia. They are climatically characterized by dry summers and mild, wet winters, and support very rich, endemic floras and faunas. The Californian Biome also includes fog-zone coastal forests, inland montane areas where the majority of precipitation falls as winter snow, and adjacent arid regions. These drier inland areas exhibit winter rainfall regimes and although they transition to desert or steppe habitats, they have a Mediterranean-type climate in the broad sense. The large overlap between the California Biome and the Mediterranean climate allows for California-based research to be extrapolated and transferrable to other Mediterranean regions. Therefore, the digitization of California Biome specimens proposed here will have an impact around the globe, and provide both inspiration and guidance for biodiversity digitization efforts.

Habitat modification and climate change are occurring at unprecedented rates globally. California has played a lead role in establishing the science and policy necessary to understand and mitigate the impacts of such change. To this end, the UC's system of natural reserves, field stations, and research centers have enabled detailed studies of environmental change including climate change, wildfire, pollution, and nonnative invasive species. For the Californian Biome, understanding the change over space and through time is particularly critical as the region represents the extremes of social, biophysical and ecological complexity and is facing immediate consequences of global change. In combination, the Berkeley Natural History Museums (BNHM), the University of California Agriculture and Natural Resources Research and Extension Centers (ANR/REC), UC Natural Reserve System (NRS) reserves, UC Center for Forestry (CFF) sites (these remote field stations hereafter referred to collectively as UC Reserves) and the Los Angeles County Museum (NHMLAC) and George C. Page Museum (Page) are positioned to form a collaboration that can provide data from across taxa, through time and over space for the California Biome.

Digitization across multiple taxa. Digitization will include plants and animals, ranging from lichens and algae to saber-toothed cats. Modern specimens of some groups housed within the BNHM are largely digitized, specifically vascular plants and terrestrial vertebrates are well covered. At the UC Reserves, however, these groups are not digitized and thus not yet integrated with any larger data cache. The

digitization effort has three focal areas: 1) vertebrate, arthropod, and malacological fossils held in the NHMLAC and Page Museums; 2) neontological specimens of insects held in the Essig Museum; and 3) neontological and fossil specimens of plants, invertebrates, and vertebrates held at the UC Reserves.

Digitization of samples through time. This project aims to digitize specimens that cover the shallow time-slice of about 100 years, as represented in the BNHM neontological collections and the UC Reserves, as well as deeper time, back about 50,000 years, represented by California's tar pit deposits. This provides a view from the late Pleistocene, before human impact on the region, through to the present day. The tar pit and brea collections of the NHMLAC and Page Museums are an exceptional complement to the collections of the BNHM as they cover the greatest climatological changes of the last ice age and the period of Pleistocene megafaunal extinction.

The La Brea Tar Pits in Hancock Park are world-renowned for the abundance and diversity of fossils that were trapped and fortuitously preserved in natural asphalt seeps emanating from the Salt Lake Oilfield that underlies this area. Shallow surface seeps trapped unwary animals as well as the predators and scavengers attempting to exploit their carcasses. The process has resulted in one of the richest fossil assemblages yet known of the Late Pleistocene (Akersten et al 1983, Shaw and Quinn 1986, Stock 2001).

Digitization over space. The specimens to be digitized will center on samples from the more than 40 UC Reserves and the four Californian tar pit sites. Each of these provides a concentrated sampling of a single site over time, with sites covering the Californian Biome (Table 1). These collections are now scattered or undigitized and otherwise not integrated into any accessible data system. Species that are represented at these sites will be digitized for all BNHM specimens so that the ensemble sample will cover the entire range or nearly the entire range of all included species. The resulting data will be a view of the whole Californian Biome and capture broad-scale, correlated patterns as well as specific trophic interactions.

Potential data use and relevant hypotheses. Although the focus of the proposed project is digitization, the resulting high-quality data will be immediately useful for addressing many questions that range from community changes to the results of trophic interaction in a changing environment.

Community change. *Were humans or climate change the primary cause of the terminal Pleistocene megafaunal extinction?* This is a continuing debate that can be fruitfully addressed by looking across taxa and through time. Data garnered by this project will allow for a new view of the timing of changes in the broader flora and faunal elements, e.g., invertebrates and small mammals, adding to the relatively well-known megafauna data. By comparing these fossil data to recent community changes, we can see if the timing and magnitude of past changes in the megafauna is consistent with general trends in community change and thereby suggest the nature of the role of humans, if any, in megafaunal extinction events.

What will the future ecological communities of the Californian Biome look like? Within more recent history, specimens from the UC Reserves record environmental change in both natural and human modified landscapes. In particular, the controlled management regimes of the latter allow key insights into expected patterns of change under future climatic conditions. Coupled with the high-resolution networked climate sensor arrays currently deployed at some of the UC Reserves by Keck-funded projects (e.g., Keck HydroWatch at Angelo Coast Reserve), we hope to gain a more mechanistic insight to species and community responses to local climate change.

Trophic interactions. *How do climate change and faunal shifts tied to trophic interactions alter within population characteristics and species diversity?* A number of groups that are well represented in the proposed digitization samples will be excellent exemplars of trophic interactions over space and time. For example, Silphid beetle diversity, body size and community composition are known to be related to habitat (Anderson 1982) and climate (Merrick & Smith 2004; Martín-Vega et al. 2012) as well as available carcass size (Ikeda et al. 2006). Our cross-taxon approach will allow us to look at the long-term patterns for organisms like these that are thought to be sensitive to increasing temperatures and decreasing precipitation (Merrick & Smith 2004). Similarly, scarab dung beetle communities have been shown to shift

their species composition based and body size due to changes in the food resources available (Culot et al. 2013) and are known to track mammal introductions and extinctions (Hanski et al. 2008). The only insects thought to be extinct that are represented in the tar pit samples are two species of scarab dung beetles (Miller 1983), making it possible to look at present day trophic interactions using insect assemblages across UC Reserves and directly compare with tar pit samples.

II. Participating Units and Relationships to Ongoing Projects:

1) Natural history museum collections. Specimen-based data sharing and digitization protocols are well established in the BNHM <http://bnhm.berkeley.edu/>. Three of these long established collections figure prominently in this project, the **Essig Museum of Entomology (Essig)**, with over 6 million specimens total is the largest collection of Californian insects; the **UC and Jepson Herbaria (UCJeps)**, one of the largest and most active collections of plants in North America, with more than 2 million specimens and the **Museum of Vertebrate Zoology (MVZ)** which houses a one of the top ten university-based vertebrate collections including historic and important ancillary information (e.g., field notes, habitat and species photographs, tape-recorded vocalizations, etc.) connected to specimens and/or tissues. All three museums' collections reach back to the beginning of the 20th century with special emphasis on the California biome.

With the richness of historic collections, regionally focused on California, several current projects aim to leverage and develop technology in computational biology and environmental analyses to determine how populations and species have changed over time in concert with the changing environment. In particular, the **Berkeley Initiative for Global Change Biology (BiGCB)**, <http://globalchange.berkeley.edu> aims to use the resources across the institution (collections, field stations, expertise) to characterize the early warning signs that precede irreparable damage to ecosystems through development of a universal protocol for guiding global change research. Our approach is to build a framework for collaborative research, enabling the use of museum and archival resources and leading innovation in biodiversity informatics with new tools and technologies to understand biotic responses to climate change. The BiGCB received funding, first from the Gordon and Betty Moore Foundation, to capitalize on the breadth of UC Berkeley faculty expertise in biological sciences, leveraging the unique resources of the BNHM and field stations, which house specimens and related data that provide a century-long record of historical environmental change in California, to address issues of ecosystem change and response over extended time periods. Subsequently, we received funding from the W.M. Keck Foundation to build the informatics infrastructure, called Holos Berkeley Ecoinformatics Engine (see below), needed to access, visualize, and analyze the rich data associated with the museum collections and field stations, thus providing the foundation for building the next generation of models of the biotic response to global change. Our proposal to mobilize all records necessary to quantify the ecological effects of land use and climate change using historical collections fits perfectly within the BiGCB framework.

The **George C. Page Museum of La Brea Discoveries (Page)** in Hancock Park, Los Angeles, CA, which houses the collections of Rancho La Brea (RLB), is often referred to as "The Library of the Late Pleistocene" and is one of the world's most famous and extensive late Pleistocene fossil localities. These collections are unique for their large numbers of specimens (estimated over 3.5 million), the diversity of the biota (> 650 species), and for the exceptional quality of preservation. The Page Museum's collections represent species of animals and plants ranging in size from millipedes to mammoths and from tiny seeds to entire tree trunks. The fossils also include one of the oldest human skeletons yet found in North America (O'Keefe et al 2009). Because of these collections, Rancho La Brea is the most completely known late Pleistocene terrestrial ecosystem. It is the type locality of the Rancho La Brea North American Land Mammal Age (Savage 1951) and was designated a National Natural Landmark by the National Park Service in 1963. Rancho La Brea, colloquially known as 'the La Brea tar pits', is an important public place that exposes the public to paleontological and climate change science. Hancock Park is a free county park with millions of visitors every year. It is one of the top tourist destinations in Los Angeles. The Page Museum's paleontologists are actively excavating fossils on public view 7 days a week. They also interact daily with the public during Hancock Park tours and are often available to discuss their work with visitors

on an informal basis. All the excavated fossils are cleaned and curated on public view inside the Page Museum.

The **Vertebrate Paleontology Department of the Natural History Museum of Los Angeles County (NHMLAC VP)** houses one of the largest collections of vertebrate fossils in the country (estimated at over 1.5 million specimens), exclusive of the RLB collections housed at the Page Museum. The NHMLAC VP houses the collections of three other brea deposits in California that contain biota on par with RLB: McKittrick and Maricopa in the southern San Joaquin Valley, and Carpinteria along the southern California coast near Santa Barbara, respectively. These other brea deposits likewise add a deep time element in recording the California biota and importantly, they also provide an important check on the RLB provincialism.

2) UC Reserves The University of California Agriculture and Natural Resources Research and Extension Centers (ANR/REC), UC Natural Reserve System (NRS) field stations, UC Center for Forestry (CFF) sites have a history (some more than 60 years) of intensive observation and collection effort, with many ecological data sets compiled on plants and animals in the context of long term ecological monitoring throughout California. Since 1965, the University of California's Natural Reserve System has offered unique opportunities to study California's world-renowned, diverse ecosystems through a system of 38 natural reserves, field stations, and research centers. These sites support research, educational, and land management activities across more than 750,000 acres and provide particular access to millions of additional federal lands. The UC NRS provides strong legacies of data, land, specimens, and accumulated knowledge, and promotes convergence of disciplines and cross-fertilization typical of 21st century science (Michener et al. 2009). Such legacies (Brunt and Michener 2009) represent an essential framework for documenting and understanding the nature and pace of ecosystem, regional, and global changes in environmental conditions, ecological processes, and biodiversity. As California's population growth continues to be the highest in the country, projected to increase from 37 million to 48 million by 2020 (Johnson 2011), the UC NRS has never been more critical to understanding natural phenomena at multiple spatial scales, as well as informing stewardship of the state's resources.

3) Geospatial & Ecoinformatic projects. Through a collaboration between the biodiversity informatics experts in the BNHM, particularly the MVZ, and geospatial innovators at UC Berkeley's **Geospatial Innovation Facility (GIF)**, (<http://gif.berkeley.edu>), we launched **Holos, Berkeley Ecoinformatics Engine** (hereafter **Holos**, <http://ecoengine.berkeley.edu>) funded by the W. M. Keck Foundation in 2010 (see above). Our motivation is the cross-disciplinary exploration of biotic and abiotic data required to understand biotic response to global change. This exploration is enabled by new technologies to make large datasets accessible and dynamically visualized and mappable online. The Holos infrastructure is based on an open-access Application Programming Interface (API), or web services, that allows for flexible development of analytic, integrative tools. We base our approach on the understanding that the data being served is the most important part of this effort. We leverage the technologies and best practices developed by over a decade of leading informatics projects at the MVZ (e.g., MaNIS, HerpNet, ORNIS, and VertNet, <http://vertnet.org>) and now adopted by the Global Biodiversity Information Facility (GBIF, <http://www.gbif.org>) and iDigBio. The MVZ and the BNHM sister museums are dedicated to a publicly accessible "global museum database of natural history collections." This effort combined biodiversity assets and informatics with the computing and geospatial resources and the technologies and extensive experience at the GIF. The GIF has developed Cal-Adapt (<http://cal-adapt.org>) in partnership with the California Energy Commission and the LandCarbon Atlas (<http://landcarbon.org>), both projects which make accessible a rich array of climatic and environmental data in a spatial and analytic framework.

4) Notes from Nature (NfN) (<http://www.notesfromnature.org/>) was developed in 2013 by a collaboration between Zooniverse (<https://www.zooniverse.org/>) and scientists and developers at the UCB and Essig, the South Eastern Regional Network of Expertise and Collections (SERNEC) project, the Natural History Museum of London (NHML), and the University of Colorado Museum of Natural History. The online site allows citizen scientists to transcribe specimen data from images of original specimen labels or ledgers in an engaging fashion. Specimen data digitized by citizen scientists has helped increase the percentage of specimens digitized each year, at a lower cost and rate than if by technicians; early estimates from the

first 5 months of launching the project indicate about 5,000 total specimens are being transcribed per month. While citizen science transcriptions still need to be reconciled with existing museum databases, the process is allowing museums to speed up digitization rates and more quickly reduce the backlog of undigitized records.

III. Digitization Targets:

The total number of specimens to be digitized to completion is estimated to be about 945,000 (Table 1). **New specimens to be digitized.** The Essig Museum will digitize more than 376,000 specimens; the NHMLAC and Page museums will contribute 512,500 and the UC Reserves also will contribute nearly 56,000 specimens. A current review of UC Reserve collections (Table 1) revealed that 24 Reserves house collections relevant to this proposal, 16 of which have specimens to be digitized. We estimate that these collections represent an approximately 205,640 specimens that have been collected from the UC Reserves. Of these, nearly 150,700 have been digitized (the great majority are vascular plant specimens), and the remaining 55,820 are catalogued and vouchered specimens that have not been digitized; these are a focus of this proposal. Majority of these new records (up to 90%) lack geographic coordinates. In addition, across the BNHM partner collections, up to 47,000 specimens lack coordinates but are digitized.

Table 1. Digitization Targets.

Collection	Items to Digitize	Subtotal
Essig Museum of Entomology	Orthoptera: Acrididae, Stenopelmatidae	11120
	Dermoptera: Carcinophoridae	1800
	Blattodea: Kalotermitidae, Rhinotermitidae, Termitidae, Termopsidae	1600
	Hemiptera: Cimicidae, Corixidae, Notonectidae, Belostomatidae, Gerridae, Coreidae, Scutelleridae, Membracidae, Cicadellidae	43400
	Coleoptera: Anthicidae, Buprestidae, Carabidae, Cerambycidae, Coccinellidae, Dermestidae, Dytiscidae, Elateridae, Gyrinidae, Histeridae, Hydrophilidae, Leiodidae, Microsporidae, Scarabaeidae, Scolytinae, Silphidae, Staphylinidae, Tenebrionidae, Trogidae, Zopheridae	222838
	Hymenoptera: Chalcididae, Bethyilidae, Ichneumonidae, Formicidae, Vespidae, Pompilidae, Cynipidae, Megachilidae	95450
	Total	376,208
Page Museum and NHMLAC	Vertebrate Fossils: 140000 specimens to be digitized and 345000 digital records to complete & normalize	485000
	Arthropod Fossils: 15000 specimens	15000
	Malacology Fossils: 12000 specimens	12000
	Botany Fossils: 500 specimens	500
Total	512,500	
Relevant UC Reserves, RECS, ANR Sites NRS and Field	<i>Angelo Coast Range Reserve:</i> 300 plants; 50 mammals/birds; 150 insects	500
	<i>Blodgett Forestry Research Stn.:</i> 350 plants, 70 vertebrates, 500 insects	920
	<i>Bodega Marine Lab:</i> 950 plants, 60 lichens, 875 marine algae, 25 mammals, 200 fish, 5 herps, 1000 marine invertebrates, 385 terrestrial invertebrates	3500
	<i>Boyd Deep Canyon Desert Research Center:</i> 5000 plants	5000
	<i>Burns Pinyon Ridge Reserve:</i> 200 plants, 20 mammals, 30 herps, 100 birds, 50 insects	400
	<i>Chickering American River Reserve:</i> 500 plants	500
	<i>Coal Oil Point Natural Reserve:</i> 200 plants; 1800 insects	2000
	<i>Hastings Natural History Reserve (Carmel Valley):</i> 1000 plants; 50 herps; 50 birds; 200 mammals; 200 insects	1500
	<i>Hopland REC:</i> 800 plants, 400 vertebrates	1200

Steele/Burnand Anza-Borrego Desert Research Center: 3050 Plants, 3000 herps, 150 mammals, 300 insects, 30000 mixed fossil taxa	36500
Sagehen Creek Field Station: 250 birds/mammals; 500 insects	750
San Joaquin Marsh Res: 320 plants, 30 lichens, 50 vertebrates, 50 insects	400
Sedgwick Reserve: 150 insects	150
Valentine Eastern Sierra Reserve - Sierra Nevada Aquatic Research Laboratory: 200 plants, 500 benthic macroinvertebrates & zooplankton	700
Valentine Eastern Sierra Reserve - Valentine Camp: 300 plants	300
White Mountain Research Center.: 1500 plants	1500
Total	55820
Grand Total	944528

Completion of dark records. Early efforts to capture or catalog specimen data have resulted in many partially digitized or unchecked, but presumably complete records that are variously stored in spreadsheets and various databases. They are effectively not yet digitized as the data are not normalized into a standard form suitable for dissemination and analysis. The most notable source is the NHMLAC and Page Museum's 485,000 records that are already captured but need normalization and checking prior to importation. We will target these first as these data can be processed to full compliant records with minimal specimen handling and largely through programmatic means.

V. Activities and Workflow:

We face the challenge of integrating specimen datasets from differing natural history collections and practices, each requiring specialized handling, as well as specimen data in differing stages of digitization. To meet these challenges, we will develop a common data pipeline using DarwinCore standards and established best practices for integrating datasets from BNHM museums, NRS, RECS, Page and NHMLAC into HoloS, a rich workbench designed for integrating data for visualization and analysis. Three main objectives will be established in more or less synchrony to create our proposed data pipeline that will accommodate specimen digitization at whatever stage they currently are in and ensure that they are taken to fully vetted and georeferenced states that maximize fitness for use and accessibility.

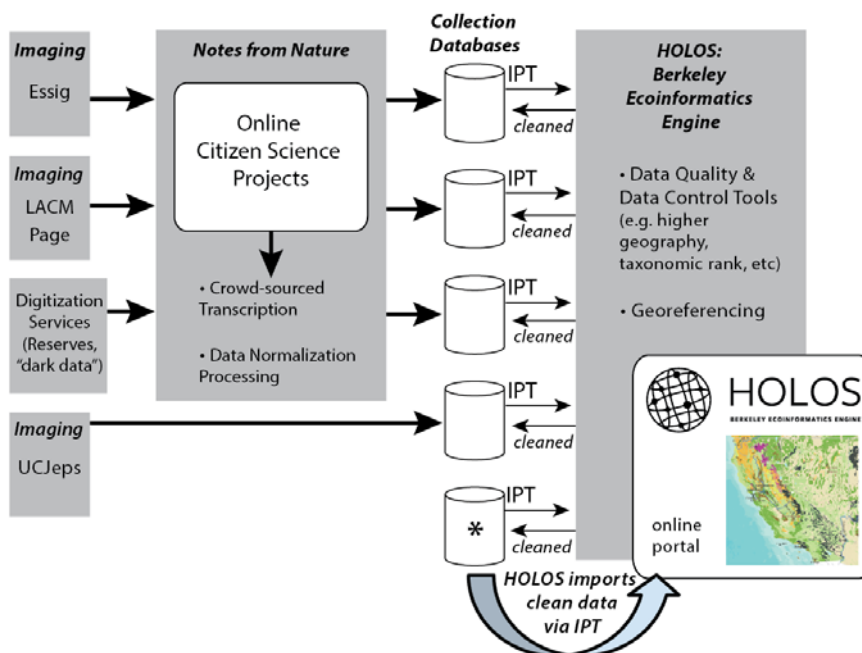


Figure 1. Proposed workflow: data enters initially from specimen digitizing services, which image specimens and labels then to transcription on Notes from Nature; transcribed data goes through data normalization before importing to collection databases where IPT archives will be created. These IPT datasets are sent to HoloS for quality control services and georeferencing; finally, data are accessed and visualized on HoloS.

Note: some imaging (e.g., herbaria sheets at UCJeps) will be transcribed directly into their collection database bypassing NfN processing and that some museums (*) also will have relevant specimen data going directly to Holos apps for georeferencing. Imaging of specimens at remote UC Reserves will involve appropriate BNHM (Essig, MVZ, UCMP, UCJeps) but are not listed individually.

a) Specimen digitizing service-- We propose a “specimen digitizing service” for the specimens currently stored in the remote UC Reserves. Teams trained by the project will be deployed to each target reserve with the necessary equipment to efficiently digitize invertebrate specimens and to retrieve vertebrate and plant specimens for imaging and data capture at the appropriate BNHM collection. Because the majority of the invertebrate specimens are insects (Table 1), the Essig Museum has specially designed, portable systems for imaging specimens and their label data at the UC Reserves without the risk of damage from transportation. This digitization system and the workflow were developed for the NSF-funded CalBug Project (NSF-DBI 0956389) to process over one million specimens and are described in a short series of online videos (<http://www.youtube.com/user/CalbugVideos/videos>). The digital images are then uploaded to the Notes from Nature (NfN) site for transcription by citizen scientists. Likewise, the NHMLAC and Page museums have specimens registered in handwritten ledgers, which will be scanned to create jpeg images. The ledger images will be uploaded to the NfN site for online, crowd-sourced transcribing (details below).

For plant specimens, herbarium sheets will be transported to UCJeps and imaged using protocols established and implemented for tens of thousands of specimens by two active digitization TCNs: “*The Macroalgal Herbarium Consortium: Accessing 150 Years of Specimen Data to Understand Changes in the Marine/Aquatic Environment*” (NSF-EF 1303909) and “*North American Lichens and Bryophytes: Sensitive Indicators of Environmental Quality and Change*” (NSF-EF 1205084). The herbarium sheet digital images are then uploaded to the UCJeps specimen database where they are transcribed by technicians and made available to Holos via IPT.

b) Citizen scientist volunteer data transcription-- Most of the specimen data to be digitized are from insects with small, highly abbreviated and idiosyncratic labels or handwritten as ledger entries such as for the tar pit fossils. This renders Optical Character Recognition (OCR) processing of limited value given current technology while the huge volume of specimens makes in-house transcription using only students and staff labor untenable. These challenges were addressed in the NSF-funded CalBug workflow that we propose to adopt and expand for this project. We outline the digitization of insect specimens in the following sequence of events: first, specimen and their labels are captured as digital images by trained project personnel as described above. The image filenames are batch processed following a standardized naming convention including a unique ID number for each specimen. Next, image files are uploaded using a custom error-checking script and a placeholder database record is created. Once image files are created, we propose to harness the volume capacity of crowdsourcing to transcribe label data through the citizen science project, Notes from Nature (NfN). Image files will be uploaded to NfN servers for access via a customized citizen science project. Data entry of label information can take place by multiple people online using a data entry form in the web browser of their choice. To ensure quality of specimen records derived from NfN volunteer transcribed data, each record is transcribed by four different individuals. The four records are compared using algorithms that take into account a combination of DarwinCore standards, additional database requirements of the museum, and similarity of multiple transcriptions of the same record. Several fields have controlled vocabularies with dropdown menu choices, which further helps ensure standardized data capture. The records that cannot be reconciled are segregated based on other criteria into those that can be returned for additional transcriptions and those that are problematic and must be individually interpreted or determined to be too deficient to use. (View a detailed video of the process <http://www.youtube.com/watch?v=eFrdQ5AWrqo>.) We will create a similar DarwinCore compliant NfN project specifically for the La Brea Tar Pit ledgers, which will allow a parallel crowd-sourcing project for transcription of the imaged ledgers of specimens. Programming staff on the project will assist the NHMLAC and Page in uploading ledger images to NfN, and also process their transcription results using the same data normalization filters as the Essig data.

c) Data quality and georeferencing services-- Data for all BNHM specimens will be entered into appropriate collection databases for Essig, UCJeps, MVZ and, for fossil material from UC Reserves, into the UC Museum of Paleontology (UCMP). Data from the NHMLAC and Page Museum will be entered into the NHMLAC specimen database. Once data are entered into a specific collection database, existing Integrated Publishing Toolkit (IPT) installations will allow quick, DarwinCore compliant archives (essentially zipped versions of the dataset with fields mapped to DarwinCore compliant terms) to be created. Holos easily imports these archives into an aggregation cache where we can maximize efficiencies and perform critical data vetting and georeferencing services in concert, and thereby increase fitness of use. Building tools in Holos, instead of idiosyncratic solutions for each collection database, also allows us to share more broadly with other digitization efforts and allow future interactions with iDigBio working groups. We propose the following services: 1) We plan to leverage the software developed by the NSF-funded VertNet project (on which Koo is Senior Personnel) that automates populating DarwinCore fields from lookup tables specifically for HigherGeography given locality information (e.g. populate county given state) and taxonomic rank given specific epithet (e.g. phylum, class, order, family or subfamily). Reports of specimen record modifications are returned to original collections for clean-up. 2) We will establish a workflow to reconcile taxonomic discrepancies and synonymies with look-up tables with a plugin tool developed based on Open Refine, an open source platform for working with large tables and filters. We also propose to have powerful data-driven graphing and charting tools in Holos that will, for example, display the hierarchical structure of taxonomic ranks using D3 javascript visualization software; this allows quick and dynamic examination of large amounts of datasets where outliers or suspicious ranks can be easily flagged and reported to the curators for consideration and clean-up. 3) Lastly, we will aggregate all the locality data and maximize efficiencies in georeferencing by adopting the lessons learned from the NSF-funded HerpNet and OrNIS projects by regionalizing localities and by using semi-automated tools such as GeoLocate for collaborative georeferencing. With localities clustered by higher geography and similarity of locality descriptions, the trained georeferencer will be able to georeference localities more efficiently by region and also use pre-existing coordinates to inform localities without them. The majority of the data sets we have targeted for digitization and integration lack latitude and longitude, and need georeferencing based on well-established protocols which include calculations for maximum uncertainty (see <http://manisnet.org/GeorefGuide.html>).

Advantages of the proposed digitization workflow. We are capitalizing on the collective expertise of large scale-digitization efforts, new methods of data capture through crowd-sourcing, fundamental training in georeferencing and new technologies for integration and visualization of geospatial and specimen records. The advantage of the proposal allows data from diverse sources, four Berkeley Natural History museums, the NHMLAC, Page, and UC Reserves to be incorporated into a single workflow using DarwinCore standards and coordinated effort to aggregate datasets into a common workbench provided by Holos. Specifically, we propose to adopt and improve data workflows and interactions with the NfN citizen science projects with lessons learned from the NSF CalBug project.

Where possible, our proposed workflows rely on coordinated effort from trained personnel such as dispatching teams of experts to use our proven imaging set-up that has already imaged nearly 300,000 specimens in the CalBug project. We learned that public engagement within the NfN portals is essential to keep citizen scientists productive. To engage with our citizen scientists, we will maintain blog postings, make timely responses to comments, all the while highlighting the importance of their efforts to biodiversity research and highlight new findings from the newly liberated datasets. The crowd-sourcing workflow is both advantageous as a means to do initial transcriptions efficiently and economically, and it ensures we keep the public involved throughout the process.

One of the main advantages of our proposed workflow is using Holos Berkeley Ecoinformatics Engine as the aggregation workbench for data quality and georeferencing services. Specifically, the open-access, API-based architecture of Holos allows us to create applications that are highly flexible and adaptable. Through our thorough documentation of the API's usage, iDigBio and other developers can easily adapt and customize all the data quality applications. We will coordinate with relevant iDigBio working groups to share these technologies. Already members of the BNHM interact with iDigBio with a healthy record of sharing our best practices and training protocols (e.g. Georeferencing Working Group, Minimum Information Standards, Authority Files & Standards, Archives Workshop Planning group).

Time Table and Goals.

Once the initial hiring of key project personnel are completed, particularly the Project Coordinator, much of the work will be initiated in the three collaborative institutions simultaneously. We will implement NfN website interfaces for the BNHM, NHMLAC and Page Museums, as well as begin the Essig data flow for crowd-sourced transcriptions. Over the summer of Year 1, we will deploy the first digitizing teams with mobile specimen digitizing stations to UC Reserves as well as inventory what will need to be shipped to UC Berkeley for on-site digitization at the museums. Holos data quality and georeferencing application development will begin using the existing data in BNHM databases, which still lack thorough vetting and georeferencing. We will assemble for a kick-off coordination meeting and training workshop to launch the efforts in Year 1.

Year 2 will continue implementation and maintenance of the NfN interfaces and pipeline for transcriptions, focusing on continued outreach interactions and events to ensure citizen scientists participation; we will focus on the data normalization and clean-up as we begin using and refining the data quality and georeferencing Holos applications. Integrated data will be visualized in the Holos website. Another coordination meeting and training workshop will be held that will include all partners. During the summer, we will deploy another set of digitizing teams to the UC Reserves. In addition, we will select and bring an Intern onto the project, who will work closely with the BNHM project personnel, training in data quality processes and developing a project to examine the data workflow or data quality steps.

Year 3 will continue the data workflow from NfN and other digitization activities in place with particular emphasis on georeferencing, especially the entomological data. Public and community outreach (as described in Broader Impacts) will be focused on in this last year. Page Museum will plan and incorporate digitization products into new outreach events. PI's will demonstrate the value of integrated datasets across taxa and time by promoting the partnership activities and products accessible in Holos with talks in established UC Berkeley campus venues (e.g., "MVZ Lunch Seminar", "Fossil Coffee", etc). In addition, a second intern will be selected to become trained in the biodiversity informatics and develop a project that will focus on reporting and collection feedback. All activities again will be coordinated from the annual partnership meeting at UC Berkeley.

Table 2. Timetable and goals

Year 1	Year 2	Year 3
<ul style="list-style-type: none"> • Hire Project Coordinator, and other project staff • Training and coordination meeting at UCB • NfN-Calbug interface enhancements • NfN NHMLAC and Page specimen ledger interface development and deployment • Teams deploy to UC Reserves to digitize and transport specimens • NfN Essig pipeline for data processing deployed • Holos app development for data quality and georeferencing initiated 	<ul style="list-style-type: none"> • Essig uses Calbug–NfN pipeline to digitize collections • NfN outreach events • NfN Essig pipeline for data processing with emphasis on data cleanup • Teams deploy to remaining UC Reserves to digitize and return transport specimens • Holos app development for data quality and georeferencing testing and deployment • collaborative georeferencing and training • Summer intern to focus on workflow efficiencies • Training and coordination meeting at UCB 	<ul style="list-style-type: none"> • Holos app deployment and refinement • Major collaborative georeferencing effort • NfN Essig pipeline for data processing • NfN outreach • Page Museum outreach events • PI's outreach through UC Berkeley campus venues (e.g., talks, etc) • Bioblitzes through UC Reserves and the California Master Naturalist program • Summer intern to focus on reporting and feedback to collections • Project meeting at UCB

Yearly Goals		
Complete new NfN interfaces and updates; UC Reserve specimens digitized and/or transported to UCB, normalize and migrate dark records (~345,000), complete aggregate new transcriptions for ~200,000 specimens; develop NfN transcription QA/QC filters.	Implement NfN transcription QA/QC filters to complete aggregate new transcriptions for ~300,000 specimens.	Complete final transcriptions (~100,000) and finalize all records with an emphasis on georeferencing and QA/QC across all data. Outreach events at Page, UCB and UC Reserves will demonstrate the importance of integrated datasets in the Holos website.

V. Project Management:

The project will be administered by a steering committee of the project PIs and senior personnel headed by Kipling Will (See Roles and Responsibilities.) Should Will be unable to continue to act as director of the project, the steering committee will appoint a replacement. Will's responsibilities will include overseeing the general direction of the project, allocating resources, and coordinating with iDigBio. An Project Coordinator will assist Will with day-to-day operations of the project. Will and the Project Coordinator will work together to evaluate the project's progress toward its stated goals. The project will have one in-person meeting per year with broad participation of all of our partners including faculty, staff, and students. The annual meeting will be a roundtable update on progress, a means to coordinate efforts and train participants in the methods and best practices. The steering committee will set the year's priorities during the annual meetings.

In addition, the steering committee will meet quarterly. It is important to note that the members of the steering committee routinely meet as part of other collaborative efforts (e.g., the Berkeley Natural History Museums executive committee), and will be in frequent contact with each other aside from the formal TCN project meetings. The technical participants will hold regularly meetings via web conferencing.

Roles and Responsibilities- Lead PI **Kipling Will**, Director of the Essig Museum of Entomology and Associate Professor/Insect Systematist, Environmental Science Policy and Management, currently co-leads the NSF CalBug project and spearheaded much of the workflow adopted here. He is a steering committee member of NfN and will continue to coordinate with the NfN programmer and the proposed work. He heads the proposed steering committee and will direct overall activities and direction.

Co-PI Maggi Kelly is the Faculty Director of the GIF and Professor of Environmental Science Policy and Management, and will assist in general project oversight especially liaising with the GIF director and engineers in their project activities. Her role as ANR Statewide Director for Informatics and GIS will allow direct coordination with the ANR and RECS sites and personnel.

Co-PI Michelle Koo, Staff Curator of Biodiversity Informatics at the Museum of Vertebrate Zoology, has helped developed the georeferencing best practices as well as trained and coordinated collaborative efforts through past NSF projects (e.g. HerpNet, VertNet) and will continue to adapt those for this project. Her role as co-PI on the Keck-funded Holos project will ensure coordination of the Holos application development and specimen digitization needs and visualizations. She also will liaise with relevant iDigBio working group members, VertNet project, and provide general project oversight.

Co-PI Michael Nachman, Director of the Museum of Vertebrate Zoology and Professor of Integrative Biology, will provide overall project coordination and planning. He will assist in active recruitment of undergraduate students for various roles and training opportunities that the project will provide.

Senior personnel:

Aisling Farrell, Collections Manager at the George C. Page Museum, will direct the digitization and image capture of catalog records and will supervise the Assistant Collections Manager at the George

C. Page Museum in these tasks. She will assist in the training of students and volunteers in error checking of data. She will coordinate outreach programs with the Museum's Public Programs department.

Rosemary Gillespie, Essig Museum of Entomology Curator and Professor, Environmental Science Policy and Management, currently co-leads the NSF CalBug project. She is a steering committee member of NfN and will assist in general project coordination.

John Harris, Director of Vertebrate Studies at the Natural History Museum of Los Angeles County and Chief Curator of the George C. Page Museum, will have oversight of the digitization and image capture of catalog records of the Rancho La Brea specimens housed at the Page Museum and of the McKittrick and Maricopa specimens housed at the Natural History Museum of Los Angeles County and of associated public programs. As a steering committee member, he will assist in general project oversight and coordination between NHMLAC and Page Museum and UCB units.

Kevin Key, Executive Director of the GIF, and will supervise the programming efforts. His role as co-PI on the Keck-funded Holos project will ensure seamless integration between the digitization efforts and the development of Holos apps built to maximize efficiencies in data quality and georeferencing testing and deployment.

Samuel McLeod, Collections Manager of Vertebrate Paleontology at the Natural History Museum of Los Angeles County (NHMLAC) will direct the digitization and image capture of catalog records and will supervise the newly employed Assistant Collections Manager at the NHMLAC in these tasks. He will assist in the training of students and volunteers in error checking of data. He will coordinate outreach programs with the Museum's Public Programs department.

Gordon Nishida, CalBug Data Coordinator, will act as the Essig Museum digitization and image capture manager. He will oversee the day to day image capture and pre-NfN pipeline activities. He will assist in training of students for digitization and will be responsible for the integration of vetted and georeferenced data into the Essig Museum's collection database. He also will work directly with the NfN outreach person and the project staff.

Application Programmers (TBN) will manage image uploads to NfN and process returned transcriptions. Will be responsible for implementing error checking of both newly digitized data and cleanup and migration of legacy data. These positions will coordinate the data side at UCB with interface development at U Colorado and will ensure migration of newly captured data to Holos so that all data will be accessible in both the existing API and website for researchers and the public.

A **Project Coordinator** (TBN) will be recruited to be responsible for day to day tasks such as hiring students and staff, managing the budget, organizing digitizing teams to visit remote reserves and stations; organizing training sessions; and planning meetings, and generally assist the PI in project implementation.

Notes for Nature (NfN) Outreach Coordinator (TBN) - This position is dedicated to interaction on the NfN talk and discussion boards, writing blogs to educate the general public and especially the NfN citizen scientist volunteers and answer questions related to the process of transcription and why these data matter. This person will plan and help stage events that bring in a stream of new users and engage the community at NfN. This Outreach Coordinator will be responsible for maintaining this interaction and actively coordinate between the project's science teams and the NfN community.

Robert Guralnick, University of Colorado, Boulder - Notes from Nature, will manage and oversee the programmer developing the NfN interface for Page and NHMLAC data ledgers and developing the new features of the existing Calbug interface. He will also actively collaborate with the project team in design phase and follow up adjustment and troubleshooting phase.

Notes from Nature Programmer (TBN), University of Colorado, will work under the supervision of Guralnick and will collaborate with the programming team at UCB and transcription workflow and interface efficiencies.

Unfunded Collaborator:

Peggy Fiedler, Director of the UC Natural Reserve System (NRS), will assist in coordinating the UC Reserves and their specimen digitization and directing onsite reserve logistics and personnel.

VI. Broader impacts:

A primary goal of this TCN is to leverage our existing technologies and expertise to produce workflow efficiencies for digitizing the rich biotic records that will demonstrate the analytic power of integrated ecological and biological datasets for as broad an audience as possible. We explicitly plan opportunities for training the next generation of biodiversity data users and field scientists in all stages and aspects of this project.

a) Importance to land managers and state agencies-- Resource managers and conservation agencies are increasingly recognizing the importance of using specimen collection data along with the traditional species-level information in biodiversity assessment, especially for understanding rates of change and predicting future scenarios of climate or land use change. Holos allows mapping multi-disciplinary, multi-temporal data (e.g., listed animal and plant occurrence data) with relevant base maps (e.g., future climate scenarios) making accessible historic collections for policy and management decisions.

b) Training programs-- Previous NSF grants administered in the BNHM (e.g., CalBug, MaNIS, HerpNet, ORNIS, VertNet) have established a strong training ethic for students and staff at several stages, which we will continue for both the direct activities of the proposal and the experience of creating and using informatics tools essential for data use and sharing. Training workshops are planned for imaging specimens at Essig and remote UC Reserves, data vetting, and georeferencing, and are integral to the project. Georeferencing will be done by undergraduates and graduate students, the latter of whom also will have supervisory roles. This project provides students with educational, hands-on experience in museum methods and practices, phylogenetics, and ecology, coupled with the use of bioinformatics and geospatial modeling as applied to habitat modification and climate change. To broaden exposure to different aspects of the project students will have periodic rotations between museums. Annual meetings of all project partners will expose students to the diversity of roles and applications. In addition, the MVZ, Essig, and UCJeps will collaborate with the Biology Scholars Program at UCB, which promotes and supports students from economic, gender, ethnic, and cultural groups historically underrepresented in biology, to recruit undergraduates and interns.

We will also select two summer interns (in Year 2 and Year 3, respectively) from a national solicitation of advanced undergraduate or recently graduated students, who will work alongside project staff to understand the workflow of digitization from imaging to data vetting and georeferencing to output and use. Each intern will design and conduct a project that will focus on streamlining workflow efficiencies or increase fitness for use of the data itself. Products of their internship in the form of application tools will be highlighted and made accessible on the Holos website and incorporated into training workshops and shared with iDigBio for more broad dissemination.

c) Biocollection community-- Working with existing ADBC efforts, this project will develop methods and tools to greatly increase the efficiency of going from an annotated biological specimen to a digital data record, including means to extract meaningful data from the massive amounts citizen scientist volunteer transcribed data. This represents a new and challenging bottleneck to the process of gathering useful biological data that will give us a high resolution of biotic change. The project participants will share innovations and experiences with the biocollection community through publications, presentations and by making workflow and software products freely available.

d) Research and education community--An unprecedented amount of data is accessible from online sources but their ease of use and fitness of use is often not predictable or reliable. Our proposal focuses on both ease of access and fitness of use by using Holos as an online searchable access portal for data that has been vetted through our data quality and georeferencing services. This project will make accessible multi-disciplinary, multi-temporal data for the Californian Biome capturing broad-scale correlative patterns for species interactions, species and community changes through historic and prehistoric time periods, and provide basis for future predictions.

e) Public outreach-- The project partners, demonstrably dedicated to science outreach and education, are committed to involving the public in the process of science.

- 1) Beyond the digitization of occurrence data this project will leverage the highly visible citizen science interface at Notes from Nature for transcribing the large volume of specimen data. Citizen scientist volunteers from around the world share their time to capture data from images of label and ledgers, and through this become more engaged in the process of science, leading to a better understanding of the importance of evidence-based stewardship of the natural world. Our NfN outreach coordinator will be dedicated to public engagement.
- 2) The Page Museum, located in the heart of Los Angeles at the La Brea Tar Pits, will incorporate the products of this TCN into their public programming, which is dedicated to bringing the connection of past and present data used in large-scale analyses to the general public. Specifically, the Page hosts events such as "Junior Scientist", where young students see demonstrations and have an up-close look at some highlights from the collection. Students learn about the connection between fossils in the museum and ask questions, make observations, and using their own customized Junior Scientist Field Notebook to make science-based discoveries. In addition, each month a course explores one of the many fields of sciences at the Page giving the TCN venues for highlighting the comprehensive view of ecological turnover in the Californian Biome.
- 3) We will collaborate with organized bioblitzes in partnership with the California Master Naturalist program (<http://ucanr.edu/sites/UCCNP/>) for UC Reserve sites. With the knowledge we gain from digitizing specimens, the bioblitzes can introduce participants to the flora and fauna of the reserve and include goal-specific activities such as looking for rare organisms, species not found in recent years, known invasive species. There is no better way to engage people than bringing them to the site and giving them the tools to explore and understand the interaction among organisms and see the impacts of human resource use.

f) Reserves-- The data that are captured and made accessible in this TCN is especially important to the UC Natural Reserve System, RECS, and ANR, allowing comprehensive access and visualization for species records on their lands and related ecoregional or associated agencies and ensure wide web accessibility to decades of research findings from the UC Reserves (Allen-Diaz and Frost 2012).

VII. Results from Prior NSF Support

Gillespie, R. (co-PIs Roderick, Resh, Powell, **Will**): Collaborative Research: *CalBug, an interactive database using arthropods to examine impacts of climate change and habitat modification* (DBI 0956389, \$975,253 to UC Berkeley, 2010-2015). This project brings together 8 entomological collections in California (see <http://calbug.berkeley.edu/>). The project has contributed to the training of 6 graduate and more than 20 undergraduate students, developed tested and refined a series of data and image capture techniques, has images >250,000 specimen labels and digitized about 470,000 specimens. Efforts have focused on developing and testing methods and workflows to increase the rate of data capture, while maximizing data quality. New collaborative opportunities were taken to develop the Notes from Nature citizen science interface. **Publication:** Hill A, Guralnick R, Smith A, Sallans A, Rosemary Gillespie, Denslow M, Gross J, Murrell Z, Tim Conyers, Oboyski P, Ball J, Thomer A, Prys-Jones R, de Torre J, Kocielek P, Fortson L. 2012 The notes from nature tool for unlocking biodiversity records from museum records through citizen science. *Zookeys*. 209:219-33.

Baldocchi, D. (co-PIs: **Kelly**, Silver) "*Understanding the coupling of greenhouse gases (methane, carbon dioxide, water vapor) and energy fluxes and scaling them across a spectrum of time and space*". (NSF-ATM 0628720, \$1,291,162, 2006-2011). The objectives of the project were to understand the temporal and spatial dynamics of greenhouse gas exchange for a number of representative ecosystems (peatland

pasture, rice and wetlands) and the biophysical and biogeochemical controls on these fluxes. Main findings included: 1) The drained peatland pasture, which represents business as usual, was a net carbon source and this management choice contributed to continued soil subsidence of the peatland; this ecosystem lost between 175 and 299 g-C m⁻²yr⁻¹. 2) 13-16% of annual CO₂ and CH₄ fluxes from the peatland pasture were released during dynamic pulses associated with flooding, drainage, and rain events. The capture of these pulse dynamics with continuous eddy covariance measurements is critical for accurate accounting of annual carbon budgets at both sites. 3) A pronounced feature of our methane flux measurements was a strong diurnal pattern with maximal values at night at both the peatland pasture field site; conventional wisdom expects either a daily maximum or a flat daily pattern. A series of case-study field campaigns were conducted to explore the cause of this unexpected diurnal pattern in methane emission; we measured flux divergences at the anchor site, the drained and grazed peatland pasture, advective fluxes on the levee upwind from the anchor site and downwind from an extensive tule wetland, and methane fluxes at a site without cows, a rice paddy. Elevated methane concentrations and fluxes, at night, were found to be due to a combination of the extension of the flux footprint under stable conditions and the presence of cows, close to our tower. 4) In comparison to the drained peatland pasture, planting flooded rice enables the landscape to be a net carbon sink, exclusive of the carbon harvested and removed from the landscape. 5) There is a water-based cost to cultivating rice in this Mediterranean climate as the rice paddy and wetland evaporated 45-95% more water than the drained grazed peatland. 6) The newly restored wetland was a small carbon source, its first year of operation. But, it has as great potential to be a large carbon sink as the tules infill the wetland. 7) The newly restored wetland is a significant source of methane, producing over 15 gC-CH₄ m⁻² y⁻¹, which is two to three times the amount of methane emitted from the rice paddy and peatland pasture, respectively.

Publications: Baldocchi, D., M. Detto, O. Sonnentag, J. Verfaillie, Y. A. Teh, W. Silver, and M. Kelly. 2012. The challenges of measuring methane fluxes and concentrations over a peatland pasture. *Agricultural and Forest Meteorology* 153(1): 177-187.

Sonnentag O, Vargas R, Detto M, Runkle BRK, Kelly M, and Baldocchi DD. 2011. Tracking the structural and functional development of a perennial pepperweed (*Lepidium latifolium* L.) infestation using a multi-year archive of webcam imagery and eddy covariance measurements. *Agricultural Forest Meteorology*: 151:916-926.

Teh, Y. A., W. L. Silver, O. Sonnentag, M. Detto, M. Kelly, and D. D. Baldocchi. 2011. Large Greenhouse Gas Emissions from a Temperate Peatland Pasture. *Ecosystems* 14: 311–325.

Sonnentag, O., M. Detto, B. Runkle, Y. Teh, W. Silver, M. Kelly, and D. D. Baldocchi. 2011. Carbon dioxide exchange of a pepperweed (*Lepidium latifolium* L.) infestation: how do flowering and mowing affect canopy photosynthesis and autotrophic respiration? *J. Geophys. Res.*, 116, G01021.

Nachman; (co-P.I. P.K. Tucker) “*The genetic basis of reproductive isolation in house mice.*” (DEB 0749004, \$240,879 to Nachman, 2008-2012) The project involved genetic studies of a hybrid zone based on tissue collections from the MVZ as well as crosses of mice in the laboratory. Patterns of introgression in nature identified genomic regions underlying reproductive isolation, and these were confirmed in the laboratory with the construction of congenic strains in which a portion of the genome of one subspecies was moved into the other subspecies through repeated backcrossing. Among the principal findings were the following: (1) the X chromosome plays a major role in reproductive isolation, (2) genes on the X chromosome interact with genes on other chromosomes to produce sterile males, (3) sterility is associated with over-expression of genes on the X chromosome during meiosis, and (4) several individual candidate genes have been identified. This work advanced our understanding of the genetic details of reproductive isolation. Since the mouse is an excellent model for human traits and many of the genes identified in this work are also likely to be important in human male fertility. This project provided training to postdocs, graduate students, and undergraduate students at the University of Arizona (Nachman’s previous institution), including one female postdoc who has since started a tenure-track

faculty position at a research university. This project also provided training to two visiting students from the Czech Republic. **Publications:** Campbell et al. 2012, 2013; Good et al. 2008a,b, 2010; Good, 2011; Janousek et al. 2012; Nachman and Payseur 2012; Phifer-Rixey et al. 2012; Teeter et al. 2008, 2010; Wang et al. 2011; Yang et al. 2011. Full citations in references.

References

- Allen-Diaz, B, Frost, B. (2012) Editorial: Long-term data at Research and Extension Centers to fuel new informatics program. pp118, doi#10.3733/ca.v066n04p118.
- Akersten, W. A., Shaw, C. A., and Jefferson, G. T. 1983. Rancho La Brea: Status and future. *Paleobiology*, 9 (3), 211-217.
- Anderson, R. S. 1982. Resource Partitioning in the Carrion Beetle (Coleoptera□: Silphidae) Fauna of Southern Ontario□: Ecological and Evolutionary Considerations. *Canadian Journal of Zoology* 60: 1314–1325.
- Brunt, J. W. and W. K. Michener. 2009. The resource discovery initiative for field stations: enhancing data management at North American biological field stations. *BioScience* 59:482-487.
- Campbell, P., J.M. Good, M.D. Dean, P.K. Tucker, and M.W. Nachman, 2012. The contribution of the Y chromosome to hybrid male sterility in house mice. *Genetics* 191: 1271-1281.
- Campbell, P., J.M. Good and M.W. Nachman, 2013. Meiotic sex chromosome inactivation is disrupted in sterile hybrid male house mice. *Genetics* 193: 819–828.
- Culot, L., Bovy, E., Zagury Vaz-de-Mello, F., Guevara, R. and M. Galetti. 2013. Selective Defaunation Affects Dung Beetle Communities in Continuous Atlantic Rainforest. *Biological Conservation* 163 (July): 79–89. doi:10.1016/j.biocon.2013.04.004.
- Good, J.M., M.A. Handel, and M.W. Nachman, 2008. Asymmetry and polymorphism of hybrid male sterility during the early stages of speciation in house mice. *Evolution* 62: 50-65.
- Good, J.M., M.D. Dean, and M.W. Nachman, 2008. A complex genetic basis to X-linked hybrid male sterility between two species of house mice. *Genetics* 179: 2213-2228.
- Good, J.M., T. Giger, M.D. Dean, and M.W. Nachman, 2010. Widespread over-expression of the X chromosome in sterile F1 hybrid mice. *PLoS Genetics*, 6(9): e1001148.
- Good, J.M., D. Vanderpool, K.L. Smith, and M.W. Nachman, 2011. Extraordinary sequence divergence at Tsga8, an X-linked gene involved in mouse spermiogenesis. *Mol. Biol. Evol.* 28: 1675-1686.
- Hanski, I., Wirta, H., Nyman, T. and P. Rahagalala. 2008. Resource Shifts in Malagasy Dung Beetles: Contrasting Processes Revealed by Dissimilar Spatial Genetic Patterns. *Ecology Letters* 11 (11) (November): 1208–15. doi:10.1111/j.1461-0248.2008.01239.x.
- Ikeda, H., K. Kubota, T. Kagaya, and T. Abe. 2006. Niche Differentiation of Burying Beetles (Coleoptera: Silphidae: Nicrophorinae) in Carcass Use in Relation to Body Size: Estimation from Stable Isotope Analysis. *Applied Entomology and Zoology*. 41 (4): 561–564.

Janousek, V., L. Wang, K. Luzynski, P. Dufkova, M. Vyskocilova, M. W. Nachman, P. Munclinger, M. Macholan, J. Pialek, and P.K. Tucker, 2012. Genome-wide architecture of reproductive isolation in a naturally occurring hybrid zone between *Mus musculus musculus* and *M. m. domesticus*. *Molecular Ecology* 21: 3032-3047.

Johnson, H. 2011. California's Population. Public Policy Institute of California
http://www.ppic.org/main/publication_show.asp?i=259 Sacramento, CA.

Martín-vega, D., Baz, A. and D. Marti. 2012. Spatiotemporal Distribution of Necrophagous Beetles (Coleoptera: Dermestidae, Silphidae) Assemblages in Natural Habitats of Central Spain. *Annals of the Entomological Society of America*. 105 (1): 44–53.

Merrick, M. J., and R. J. Smith. 2004. Temperature Regulation in Burying Beetles (*Nicrophorus* Spp.: Coleoptera: Silphidae): Effects of Body Size, Morphology and Environmental Temperature. *Journal of Experimental Biology* 207 (5) (February 15): 723–733. doi:10.1242/jeb.00807.

Miller, S. E. 1983. Late Quaternary Insects of Rancho La Brea and McKittrick, California. *Quaternary Research* 20: 90–104.

Michener, W. K., K. L. Bildstein, A. McKee, R. Parmenter, W. H. Hargrove, D. McClearn, and M. Stromberg. 2009. Biological field stations: Research legacies and sites for serendipity. *BioScience* 59:300-310.

Nachman, M.W., and B.A. Payseur, 2012. Recombination rate variation and speciation: theoretical predictions and empirical results from rabbits and mice. *Philosophical Transactions of the Royal Society B*, 367: 409-421.

O’Keefe, F. R., Fet, E. V. & Harris, J. M. 2009. Compilation, calibration, and synthesis of faunal and floral radiocarbon dates, Rancho La Brea, California. *Natural History Museum of Los Angeles County Contributions in Science*, 518 (Dec. 2009), 4.

Phifer-Rixey, M., F. Bonhomme, P. Boursot, G.A. Churchill, J. Piálek, P.K. Tucker, and M.W. Nachman, 2012. Adaptive evolution and effective population size in wild house mice. *Mol. Biol. Evol* 29: 2949-2955.

Savage, D. E. 1951. Late Cenozoic vertebrates of the San Francisco Bay region. *University of California Publications in Geological Science*, 28 (10), 215-314.

Shaw, C. A. and J. P. Quinn. 1986. Rancho La Brea: a look at coastal southern California’s past. *California Geology* 39(6):123-133.

Stock, C. 2001. *Rancho La Brea: A Record of Pleistocene life in California*. (7th ed., 2nd printing.). Revised by J. M. Harris. Los Angeles County Museum, Science Series No. 37. Los Angeles: Natural History Museum of Los Angeles County.

Teeter, K.C., L.M. Thibodeau, Z. Gompert, C.A. Buerkle, M.W. Nachman, and P.K. Tucker, 2010. The variable genomic architecture of isolation between hybridizing species of house mice. *Evolution* 64: 472-485.

Wang, L., K. Luzynski, J. Pool, V. Janoušek, P. Dufková, M. Vyskocilová, K.C. Teeter, M.W. Nachman, P. Munclinger, M. Macholán, J. Piálek, and P.K. Tucker, 2011. Measures of linkage disequilibrium among neighboring SNPs indicate asymmetries across the house mouse hybrid zone. *Mol. Ecol.* 20: 2985-3000.

Yang, H., J.R Wang, J.P. Didion, R.J. Buus, T.A. Bell, C.E. Welsh, F. Bonhomme, H.T. Yu, M.W. Nachman, J. Pialek, P.K. Tucker, P. Boursot, L. McMillan, G.A. Churchill and F. Pardo-Manuel de Villena, 2011. Subspecific origin and haplotype diversity in the laboratory mouse. *Nature Genetics* 43: 648-655.

BIOGRAPHICAL SKETCH – Aisling Bridgid Farrell

George C. Page Museum • Natural History Museum of Los Angeles County

(a) Professional Preparation

University College Cork, Ireland	Earth Science	BSc.	2000
Imperial College London, UK	Taxonomy and Biodiversity	MSc.	2003

(b) Appointments

2011 - Present	Collections Manager, George C. Page Museum
2008 - 2010	Curatorial Assistant, George C. Page Museum
2006 - 2008	Curatorial Assistant, Natural History Museum of Los Angeles County
2006 - 2006	Paleontologist, ArchaeoPaleo Resource Management Inc. LA
2005 - 2006	Gallery Interpreter, George C. Page Museum

(c) Five Relevant Products

1. Gold David, Robinson, J., Farrell Aisling B., Harris John M., Thalmann Olaf and Jacobs David. Attempted DNA Extraction from a Rancho La Brea Columbian Mammoth (*Mammuthus columbi*). *Molecular Ecology Recourses* in press 2013
2. Hartstone-Rose A., Long R.C., Farrell A.B. and Shaw C.A. 2012. The clavicles of *Smilodon fatalis* and *Panthera atrox* (Mammalia: Felidae) from Rancho La Brea, Los Angeles, California. *Journal of Morphology*, 273: 981–991.
3. Farrell, A. and C. Shaw (2009). *A preliminary description of an unusually complete specimen of Mammuthus columbi from Rancho La Brea, Los Angeles, California*. 69th Annual Meeting of the Society of Vertebrate Paleontology, Bristol, England. Abstracts Vol 29, Supplement to Number 3 September 2009

(d) Up to five relevant synergistic activities

1. Collections Manager for over 3.5 million Pleistocene fossils. Train and supervise students and volunteers to sort microfossils, catalog specimens, and curate the backlog of certain taxa within the collections. Oversee daily excavations of Project 23 where hundreds of fossils are recovered each week. Oversee all visiting researchers both students and professionals who come to work in the collections. Track collections use statistics, process outgoing and incoming loans in accordance with the Registrar's Office, install temporary exhibits and maintain all budgetary records for the department. Provide behind-the-scenes tours and participate in Museum's Public Programs. Implemented a pilot study based on the Mastodon Matrix Project with a high school student to sort samples of the microfossils from the Project 23 mammoth matrix.
2. Curatorial work for six years including organizing and leading expeditions through to assisting the design of a public viewing paleontology prep lab, curating specimens and interpreting results of scientific research to public audiences from Museum donors to first grade children.
3. Recruited, trained and supervised three undergraduate students with NSF OEDG grant to broaden the participation of groups underrepresented in science. Directed their collections based research and oversaw their participation in two field expeditions. Dinosaur Institute Natural History Museum 2006-2007
4. Developed website content for the Page Museum's Research and Collections pages. Designed interface of EMu database for Rancho La Brea collections for an online database to be accessible through the website. Also migrated three hundred thousand records, uploaded images from personally managed digital asset database and streamlined data entry of new specimens. Page Museum 2008-present
5. Interpreted the museum exhibits and public viewing excavation through hands-on activities and tours to both large school groups and the general public. Developed and implemented new educational programming including children's summer camp. Assisted in docent and intern recruitment, coordination and training. Page Museum 2005-2006

(e) Collaborators and other Affiliations

Collaborators and Co-Editors (last 48 mos): Boyde Bryttin (U. South Carolina School of Medicine);Cherney Michael (U. Michigan);Cox Shelley (George C. Page Museum);Croxen Fred (Arizona Western College);Donadeo Brett (U. South Carolina School of Medicine);El Adli Joseph (U. Michigan);Fahrni Simon (UC Irvine);Fisher Daniel (U. Michigan);Fuller Ben (UC Irvine);Gerhart Laci (U. Kansas);Gold David (UCLA);Harris John (George C. Page Museum);Hartstone-Rose Adam (U. South Carolina School of Medicine);Howard Carrie(George C. Page Museum);Hulbert Richard (Florida Museum of Natural History);Jacobs David(UCLA);Long Ryan (George C. Page Museum);McCune Tim (Yahoo! Inc Santa Monica);Robinson Jacqueline (UC Los Angeles);Scott Eric (San Bernardino County Museum);Shaw Christopher (George C. Page Museum);Southon John (UC);Takeuchi Gary(George C. Page Museum);Thalman Olaf (U. Turku Finland);Thomer Andrea (U. Illinois Urbana-Champaign);Ward Joy (U. Kansas).

Graduate Advisors:

Dr. Anthony Gill, Life Sciences Department, Vertebrates Division, Natural History Museum, Cromwell Road, London, SW7 5BD

Dr. Alfried Vogler Professor of Molecular Systematics, Imperial College London and Department of Entomology, Natural History Museum, Natural History Museum, Cromwell Road, London, SW7 5BD

BIOGRAPHICAL SKETCH – Peggy L. Fiedler

Natural Reserve System • University of California, Office of the President

(a) Professional Preparation

Radcliffe College, Harvard Univ.	Anthropology (Ethnobotany) cum laude (Departmental honors magna cum laude)	B.A.	1976
Univ. of California, Berkeley	Wildland Resource Science (Plant Ecology)	M.S.	1980
Univ. of California, Berkeley	Wildland Resource Science (Plant Evolutionary Ecology)	Ph.D.	1985

(b) Appointments

2010-Present	Director, Natural Reserve System, University of California, Office of the President, Office of Research & Graduate Studies
2011-Present	Research Associate, Jepson Herbarium, University of California, Berkeley
2009-2012	Research Associate, Royal Botanic Gardens, Kew, UK
1997-2000	Professor, Department of Biology, San Francisco State University
1993-1997	Associate Professor, Department of Biology, San Francisco State University
1989-1993	Assistant Professor/Foundation Professor for Conservation Biology, Department of Biology, San Francisco State University
1988	California State Lottery Fund Visiting Professorship Department of Biology, San Francisco State University
1985-1989	Lecturer/Distinguished Visiting Lecturer Dept. of Biology, San Francisco State University
1985-1985	Visiting Lecturer, Dept. of Landscape Architecture, University of California, Berkeley

(c) (i) Five Relevant Products

1. Fiedler, P.L., S.G. Rumsey, and K.M. Wong, editors. 2013. The Environmental Legacy of the UC Natural Reserve System. Univ. of California Press, Berkeley. xvi + 267 pp.
2. Fiedler, P.L. 2012. Calochortus. Treatment of the genus for the Jepson Manual: Higher Plants of California. B.G. Baldwin, et al., editors. Univ. of California Press, Berkeley.
3. Fiedler, P.L. 2002. Calochortus. Treatment of the genus for the Jepson Desert Manual. B.G. Baldwin, et al., editors. Univ. of California Press, Berkeley, CA.
4. Fiedler, P.L. and R.K Zebell. 2002. Calochortus. Treatment of the genus for the Flora of North America, Pp. 119-141 in Vol. 26. Published by Oxford Univ. Press for the Missouri Botanical Garden, J. Zaruchi, convening editor. New York, NY.
5. Fiedler, P.L. and B.D. Ness. 1993. Calochortus. Treatment of the genus for the Jepson Manual: Higher Plants of California. J. Hickman, editor. Univ. of California Press, Berkeley.

(c) (ii) Five additional significant products

1. Hardwick, K.A., P.L. Fiedler, L.C. Lee, and 32 others. 2011. The role of botanic gardens in the science and practice of ecological restoration. *Conservation Biology* 25:265-275.
2. Fiedler, P.L. and P.M. Kareiva, editors. 1998. *Conservation Biology: Conservation for the Coming Decade*. 2nd edition. Chapman & Hall, New York. xx + 533 pp.
3. Fiedler, P.L., P.S. White, and R.A. Leidy. 1997. The paradigm shift in ecology and its relevance to conservation biology. Pp. 145-160, In S.T.A. Pickett and R.S. Ostfeld, editors. *The Ecological Basis of Conservation: Heterogeneity, Ecosystems, and Biodiversity*. Chapman & Hall, New York.
4. Pickett, S.T.A., V.T. Parker, and P.L. Fiedler. 1992. The new paradigm in ecology: Implications for conservation biology above the species level. Pp. 65-88, In P.L. Fiedler and S.K. Jain, editors. *Conservation Biology: The Theory and Practice of Nature Conservation, Preservation, and Management*. Chapman and Hall, New York.
5. Fiedler, P.L. 1987. Life history and population dynamics of rare and common mariposa lilies (*Calochortus*: Liliaceae). *Journal of Ecology* 75: 977-995.

(d) Up to five relevant synergistic activities

1. Professional Societies – Service: California Botanical Society, President, 1993-1994; First Vice Present, 1987- 88; Board Member, 1995 1997; Chair, Environment and Public Policy Committee, American Society for Plant Taxonomists, 1996-1998; Member, California Native Plant Society Rare Plant Scientific Advisory Committee, 1990-1993.
2. Professional Societies -- Editorial Positions: Associate Editor for Book Reviews, Society for Conservation Biology (1999 – 2009); Ad Hoc Assigning Editor, Society for Conservation Biology (1997 - present) Associate Editor, Biological Conservation (1992 - 1995); Editorial Board Member, Biological Conservation (1995 - 1998); Ad hoc manuscript reviewer for > 10 journals (1982 – present).
3. Honors and Awards: Fellow, Linnean Society of London (Inducted 2012); Fulbright Senior Scholars Program Research/Teaching Fellowship. Kings Park and Botanic Garden, 8/1998 – 12/1998); Larry Heckard Fellowship (Sabbatical leave fellowship 1995-96); Jepson Herbarium, Univ. of California, Berkeley. Nominee, Pew Fellow in Conservation and the Environment (1995); Fellow, California Academy of Science (Inducted 1992); Sigma Xi (Inducted 1992); Xi Sigma Pi (National Forestry Honor Society; UC Berkeley, Inducted 1979)
4. External Professional Service: Co-Lead Mediterranean-Type Ecosystem Thematic Group, IUCN Commission on Ecosystem Management (2011-present); Member, Independent Science Advisors, Bay-Delta Conservation Plan (October 2008); Independent reviewer, Canon National Parks Science Scholars Program (July 1998); Member, SF Bay Habitat Goals Specialist Group (Plants), SF Estuary Institute (1996 - 1998); Member, IUCN/SSC (International Union for the Conservation of Nature/Species Survival Commission) Reintroduction Specialist Group (1995 - 2000); Research Associate, Univ. Herbaria, Univ. of California, Berkeley (1995 – 2000).
5. Course development (SF State Univ.): Developed core courses for new master's degree program in conservation biology, including conservation biology courses for general education (Endangered Planet); majors undergraduate (Introduction to Conservation Biology; graduate (Advanced Conservation Biology), and a variety of graduate seminars including Population Modeling in Conservation Biology, Ethnobotany, Women in Conservation Science, The Ecology & Physiology of Psychoactive Plants & Animals (team-taught).

(e) Collaborators and other Affiliations

Collaborators and Co-Editors (last 48 mos): Esa K. Crumb, Wetland & Water Sciences, San Rafael, CA; Brenda J. Grewell, UC Davis; Kate Hardwick, RBG Kew; Stephen D. Hopper, Univ. of Western Australia; A. Kate Knox (private consultant); Lyndon C. Lee, L.C. Lee & Associates, Inc.; Amber Manfree, UC Davis; Peter B. Moyle, UC Davis; Peter B. Moyle, UC Davis; Amber Manfree, UC Davis; Erin Espeland, USDA-ARS Northern Plains Agric Lab; Peter Baye; Bruce Pavlik, RBG Kew; Susan Rumsey, UC NRS; Paul Smith, RBG Kew; Rhian Smith, Royal Botanic Gardens, Kew; and 30 others from RBG Kew; Kathleen Wong UC NRS; Colin Yates, Department of Wildlife & Parks, Perth

Ph.D. Advisees (all) and Postgraduate Scholars (last 5 years):

Graduate students: Total Number: 20 total: masters students (10), masters' committee members (4), and PhD committee members (6 [2 current at UCB] [4 previous international]),
Last Five Years: Gracie Benson Martin (UC Berkeley); Kelly Easterday (UC Berkeley); Jessica Peak (SF State Univ.).

Postgraduate Scholars (last 5 years): None

BIOGRAPHICAL SKETCH – Rosemary G. Gillespie

Department of Environmental Sciences, Policy and Management • University of California, Berkeley

(a) Professional Preparation

Edinburgh University	Zoology, Biology	BSc. Hons.	1980
University of Tennessee	Zoology	Ph.D.	1986
University of Hawaii	Spider systematics and conservation biology	Postdoc	1987-92
Smithsonian Institution	Spider systematics	Postdoc	1992-93

(b) Appointments

2002-Present	Schlinger Chair in Systematics and Professor, Dept. Environmental Science, Policy & Management, University of California, Berkeley
1999-2002	Associate Professor, Dept. Environmental Science, Policy & Management, University of California, Berkeley
1999-2013	Director, Essig Museum of Entomology, University of California, Berkeley
2004-2012	Chair, Berkeley Natural History Museums (Museum of Vertebrate Zoology, UC Museum of Paleontology, UC & Jepson Herbaria, Essig Museum of Entomology, UC Botanical Garden, Hearst Museum of Anthropology)
2000-Present	Fellow of the California Academy of Sciences
1993-Present	Research Associate, Bishop Museum, Honolulu
1998-1999	Chair, Ecology, Evolution & Conservation Biology Graduate Program, Univ. Hawaii. (Vice Chair, 1994-1998)
1997-2000	Associate Professor of Zoology and Associate Researcher, Center for Conservation Research & Training, PBRC, Univ. Hawaii
1992-1997	Assistant Professor of Zoology and Associate Researcher, Center for Conservation Research & Training, PBRC, Univ. Hawaii

(c) (i) Five Relevant Products

1. Wood, H.M., Griswold, C.E., Gillespie, R.G., 2012. Phylogenetic placement of pelican spiders (Archeidae, Araneae), with insight into evolution of the “neck” and predatory behaviours of the superfamily Palpimanoidea. *Cladistics* 28: 598-626
2. Hill, A., Guralnick, R., Smith, A., Sallans, A., Gillespie, R., Denslow, M., Gross, J., Murrell, Z., Conyers, T., Oboyski, P., Ball, J., Thomer, A., Prys-Jones, R., de la Torre, J., Kociolek, P., Fortson, L. 2012. No specimen left behind: mass digitization of natural history collections. *ZooKeys* 209: Special issue: 219-233
3. Crews, S.C. and R.G. Gillespie 2010. Molecular Systematics of *Selenops* Spiders (Araneae: Selenopidae) from North and Central America: Implications for Caribbean Biogeography. *Biological Journal of the Linnean Society*. 101, 288–322.
4. Spagna, J.C., S.C. Crews, R.G. Gillespie 2010. Patterns of habitat affinity and Austral/ Holarctic parallelism in dictynoid spiders (Araneae: Entelegynae). *Invertebrate Systematics*, 24, 238–257.
5. Gillespie R.G., and M.A. Rivera. 2007. Free-Living Spiders of the Genus *Ariamnes* (Araneae, Theridiidae) in Hawaii. *Journal of Arachnology* 35: 11-37.

(c) (ii) Five additional significant products

1. Roderick, G.K., Croucher, P.J.P., Vandergast, A. Gillespie, R.G. 2012. Species differentiation on a dynamic landscape: Shifts in metapopulation and genetic structure using the chronology of the Hawaiian archipelago. *Evolutionary Biology*, 39 (2): 192-206
2. Gillespie, R.G., Baldwin, B.G., Waters, J.M., Fraser, C., Nikula, R., Roderick, G.K. 2012. Long-distance dispersal - a framework for hypothesis testing. *Trends in Ecology & Evolution* 27(1): 52-61.
3. Croucher, P.J.P., Oxford, G.S., Lam, A., Mody, N., Gillespie, R.G. 2012. Colonization history and population genetics of the exuberantly color polymorphic Hawaiian happy-face spider *Theridion grillator* (Araneae, Theridiidae). *Evolution*, 66(9): 2815-2833

4. Garb, J.E., and R.G. Gillespie. 2009. Diversity despite dispersal: Colonization history and phylogeography of Hawaiian crab spiders inferred from multilocus genetic data. *Molecular Ecology* 18:1746–1764.
5. Gillespie, RG. 2004. Community assembly through adaptive radiation in Hawaiian spiders. *Science* 303 (5656): 356-359.

(d) Up to five relevant synergistic activities

1. *Societies*: President of the *International Biogeography Society*; Past-President of the *American Arachnological Society*
2. *NSF GK-12 program, Exploring California Biodiversity*. Development of museum- and field-based outreach program focused on Graduate Fellows and high-/middle-school students in minority-dominated urban schools in the Bay Area, see <http://gk12calbio.berkeley.edu/>
3. *Mentoring*. Worked on several programs to encourage minorities into science including NSF Undergraduate Mentoring in Environmental Biology program, UMEB, for Pacific Islanders to encourage Pacific Island undergraduates into field and laboratory research in biology. Awarded NSF's *Presidential Award for Excellence in Science, Mathematics, and Engineering Mentoring* (PAESMEM) Nov 2005.
4. *Editorial*. Associate Editor, *Molecular Ecology*; Editorial Board, *Evolutionary Applications*; *University of California Publications in Entomology*; *Pan Pacific Entomologist*
5. *Advising*: Board of Trustees for the California Academy of Sciences, responsible for advising on science and education.

(e) Collaborators and other Affiliations

Collaborators and Co-Editors (last 48 mos): Arnedo Miquel A. (U. Barcelona); Barnosky Tony (UCB); Benjamin Suresh (Inst. Fundamental St., Sri Lanka); Bidegaray-Batista Leticia (U. Barcelona); Blackledge Todd (U. Akron); Croucher Peter (UCB); Emerson Brent (University of East Anglia); González Alda (CEPAVE, La Plata, Argentina) Goodacre Sara (Nottingham U.); Griswold Charles (California Academy Sciences); Guralnick Rob (U. Colorado Boulder); Hadly Liz (Stanford U.); Hill Andrew (Vizzuality); Lam Athena (UCB); Martinez Neo (Pacific Ecoinformatics, Berkeley); Matzke Nick (UCB); McCormack Gerald (Cook Islands Natural Heritage Trust); Medeiros Matthew (USNM); Mooers Arne (Simon Fraser U.); Okamoto Tomoko (JT Biohistory Research Hall, Osaka); Oxford Geoffrey (York University, England); Pons Joan (IMEDEA, Mallorca); Tabashnik Bruce (U Arizona Tucson); Vermeij Geerat (UC Davis); Clague David (Monterey Bay Aquarium Research Inst.); Agnarsson Ingi (U Puerto Rico); Ashmole Philip (U. Edinburgh); Coddington Jonathan (Smithsonian); Croom Henrietta (U. South, Sewanee); Daane Kent (UCB); Esposito Lauren (UCB); Evenhuis Neil (Bishop Museum, Honolulu); Fisher Brian (California Academy Sciences); Fraser Ceridwen (Australian National U.); Gaimari Steven (California Dept of Food & Agriculture); Gosliner Terry (California Academy Sciences); Hormiga Gustavo (George Washington U.); Howarth Francis G. (Bishop Museum, Honolulu); Kavanaugh David (California Academy Sciences); Kimsey Lynn (UC Davis); Medeiros Art (USGS); Mindell David (NSF); Palumbi Steven R. (Hopkins Marine Lab, California); Platnick Norman (American Museum Natural History); Polhemus Dan (DLNR Hawaii); Roderick George (UCB); Shapiro Leo (U. Maryland); Sierwald Petra (Field Museum, Chicago); Thebaud Christophe (U. Paul Sabatier, Toulouse); Waters Jon (U. Otago, New Zealand); Whittaker Robert (Oxford U.); Williamson Mark (York University, England).

Graduate Advisors and Postdoctoral Sponsors: Riechert Susan E. (U. Tennessee, Knoxville)

Ph.D. Advisees (all) and Postgraduate Scholars (last 5 years)

Graduate students (20 - Major Professor): Adams Ashley (UCB) Balukjian Bradley (UCB); Casquet Juliane (University of Paul Sabatier, Toulouse); Chousou-Polydouri Natalia (UCB); Claridge Elin (Gump Research Station, Moorea); Cotoras Darko (UCB); Crews Sarah (City College, Berkeley); Garb Jessica E. (University of Massachusetts, Lowell); Heddle Mandy L. (Bowling Green State University); Hembry David (UCB); Hogg Brian (USDA); Kennedy Susan (UCB) Krushelnycky Paul (USGS, Hawaii); Lim Jun Ying (UCB); Nakamura Jan (University of Hawaii Berkeley); Rivera Malia (University of Hawaii, Honolulu); Spagna Joseph (William Paterson University of New Jersey); Rominger Andy (UCB); Vandergast Amy (SDSU); Wood Hannah (UC Davis).

Postdoctoral advisees (17): Becking Lisa (UCB); Goodman Kari (UCB); Clavel Joanne (UCB); Rapacchiolo (UCB); Brewer Michael (UCB); Esposito Lauren (UCB); Croucher Peter (UCB); Ewing Curtis (U. Hawaii, Hilo); Arias Elizabeth (UCB); Winchell Chris (UCB); Claridge Eli.

BIOGRAPHICAL SKETCH – Robert P. Guralnick

Department of Ecology and Evolutionary Biology • University of Colorado, Boulder

(a) Professional Preparation

UC Berkeley	Psychology	BA	1992
UC Berkeley	Integrative Biology	Ph.D.	1999
UC Berkeley	Museum of Paleontology	Postdoc	1999

(b) Appointments

2007-Present	Associate Professor, Dept of Ecology and Evolutionary Biology, University of Colorado.
2000-2007	Assistant Professor, Dept of Ecology and Evolutionary Biology, University of Colorado.
2000-Present	Curator of Zoology, CU Museum of Natural History, University of Colorado.

(c) (i) Five Relevant Products

1. Hill, A.W. R., Guralnick, A. M. Smith, A. Sallans, R. G. Gillespie, M. W. Denslow, J. Gross, Z. Murrell, T. Conyers, P. Oboyski, J. Ball, A. Thomer, R P Prys-Jones, J de la Torre, P Kociolek, L F Fortson. 2012. The Notes from Nature tool for unlocking biodiversity records from museum records through citizen science. *ZooKeys* 209 Special issue: 219-233.
2. Jetz, W., J. MacPherson and R. P. Guralnick. 2012. Integrating Biodiversity Distribution Knowledge: Toward A Global Map Of Life. *Trends in Ecology and Evolution* 27(3):151-159 [doi:10.1016/j.tree.2011.09.007].
3. Map of Life (<http://mappinglife.org>) website and mapping application for examining multiple different distributional products for tens of thousands of species. The beta version of Map of Life has been accessed by over 200,000 users since its launch in May 2012.
4. Constable, H., R. P. Guralnick, J. Wiczorek, C. Spencer, A. T. Peterson and the VertNet Steering Committee. 2010. VertNet: A New Model for Biodiversity Data Sharing. *PLoS Biology* 8(2): e1000309
5. Guralnick, R. P. and A. W. Hill. 2009. Biodiversity Informatics: Automated Approaches for Documenting Global Biodiversity Patterns and Processes. *Bioinformatics* 25(4):421-428.

(c) (ii) Five additional significant products

1. Guralnick, R. P., A. W. Hill and M. Lane. 2007. Towards a collaborative, global infrastructure for biodiversity assessment. *Ecology Letters* 10(8):663-672.
2. Erb, L. P., C. Ray and R. P. Guralnick. 2011. On the generality of a climate-mediated shift in the distribution of the American Pika (*Ochotona princeps*). *Ecology* (report format) 92(9): 1730–1735.
3. Flemons, P., R. Guralnick, J. Krieger, A. Ranipeta, and D. Neufeld. 2007. A Web based GIS Tool for Exploring the World's Biodiversity: The Global Biodiversity Information Facility Mapping and Analysis Portal Application (GBIF MAPA). *Ecological Informatics* 2:49-60.
4. E. Waltari, R. Hijmans, A. Peterson, Á. Nyári, S. Perkins, and R. Guralnick. 2007. Locating Pleistocene Refugia: Comparing Phylogeographic and Ecological Niche Model Predictions. *PLoS ONE* 2(7): e563.
5. Guralnick, R., J. Wiczorek, R. J. Hijmans, R. Beaman and the Biogeomancer Working Group. 2006. Biogeomancer: Automated georeferencing to map the world's biodiversity data. *PLoS Biology* 4(11):1908-1909.

(d) Up to five relevant synergistic activities

1. Chair, VertNet Steering Committee (2010-present)
2. Steering Committee member, iEvoBio satellite conference Evolution 2010-2012 meeting (Co-Chair in 2011)
3. PCAST working group on biodiversity and ecosystems.
4. JRS Foundation Board Member and current Vice President 2011-present
5. Service on multiple advisory committees and co-organizer of multiple workshops (12 since 2010) (e.g. CONABIO, iPlant GIS Advisory Committee, Barcode of Life Database Advisory Group, DataONE

metadata group, Art of Life Advisory Board, Missouri Botanic Gardens, Organizing Committee ESA Scaling Up Workshop)

(e) Collaborators and other Affiliations

Collaborators and Co-Editors (last 48 mos): Reed Beaman (Univ. of Florida), Deane Bowers (CU Boulder), Nico Cellenese (Univ. of Florida), Carla Cicero (Univ. of California, Berkeley), Joel Cracraft (American Museum of Natural History), Meg Daly (Ohio State University), John Deck (Univ. of California at Berkeley), Mark Fornwall (National Biological Information Infrastructure), Thomas Hauser (CU Boulder), Walter Jetz (Yale), David Maddison (Univ. of Oregon), Lucinda McDade (Rancho Santa Ana Botanic Gardens), Brian McGill (U. Maine), Val McKenzie (U. Colorado), Andrew Martin (CU Boulder), Cesar Nufio (CU Boulder), Cynthia Parr (Smithsonian Institute), Chris Ray (CU Boulder), Steve Schmidt (CU Boulder), Dave Vieglais (University of Kansas), Quentin Wheeler (Arizona State Univ.), John Wieczorek (University of California at Berkeley).

Graduate Advisors and Postdoctoral Sponsors: Dr. David Lindberg, University of California at Berkeley

Ph.D. Advisees (all) and Postgraduate Scholars (last 5 years): Graduate students:

EBIO Masters program: Aidan Beers

EBIO PhD Program Current: Liesl Peterson, Robert Jadin, Natalie Robinson, Brian Stuckey, Gaurav Vaidya

EBIO Graduate Program (graduated): Kathleen Weaver (University of LaVerne, tenured), Jonathan Krieger (Royal Botanic Gardens, Kew), David Daitch (Natural Resources Lead at SWCA Environmental Consultants), Heidi Schutz (Pacific Luthern University, tenure-track), Andrew Hill (Chief Scientist, Vizzuality), Peter Erb (Biological Sciences Initiative).

Postdoctoral advisees: Javier Otegui (Fall 2012-present), Stephen Mayor (Fall 2013-present), Tamara Anderson (2005-2006), Eric Waltari (2005-2007).

BIOGRAPHICAL SKETCH – John M. Harris

George C. Page Museum • Natural History Museum of Los Angeles County

(a) Professional Preparation

University of Leicester (U.K.)	Biology	B.Sc.	1964
University of Texas	Biology	M.A.	1967
University of Bristol (U.K.)	Biology	Ph.D.	1970

(b) Appointments

1995-Present	Chief Curator, George C. Page Museum.
2000-Present	Chief Curator and Head of Vertebrate Studies, Natural History Museum of Los Angeles County.
1996-Present	Adjunct Professor, Department of Geology & Geophysics, University of Utah.
2001-Present	Visiting Associate in Geology, California Institute of Technology.
1993-1996	Research Professor, Dept of Geology & Geophysics, University of Utah.
1995-2000	Chief Curator of Paleontology, Natural History Museum of Los Angeles County.
1980-1993	Chief Curator, Division of Earth Sciences, Natural History Museum of Los Angeles County.
1977-1979	Head of Division of Paleontology, The International Louis Leakey Memorial Institute for African Prehistory, Nairobi, Kenya.
1972-1977	Director of Palaeontology, National Museums of Kenya, Nairobi.
1971-1972	Senior Palaeontologist, Centre for Prehistory & Palaeontology, Nairobi.
1970	Lecturer in Geology, Ahmadu Bello University, Nigeria.

(c) (i) Five Relevant Products

1. Holden, A. R., J. M. Harris, and R. M. Timm. 2013. Paleoeological implications of insect-damaged vertebrate remains from Rancho La Brea, southern California. *PLoS ONE* 8(7): e67119. doi:10.1371/journal.pone.0067119
2. Coltrain, J. B., J. M. Harris, T. E. Cerling, J. R. Ehleringer, M. Dearing, J. Ward, and J. Allen. 2004. Trophic level relationships among Rancho La Brea fauna and their implications for the paleoecology of the late Pleistocene based on bone collagen stable carbon and nitrogen isotope chemistry. *Palaeogeography, Palaeoclimatology, Palaeoecology*, 205: 199-219.
3. Gerhart, L., J. Harris, J. Nippert, D. Sandquist, and J. Ward. 2012. Glacial trees from the La Brea Tar Pits show physiological constraints of Low CO₂. *New Phytologist* 194:63–69.
4. Harris J. M., 1992, Revision of Chester Stock's *Rancho La Brea: A record of Pleistocene Life in California*. (7th edition). Natural History Museum of Los Angeles County, *Science Series*, 113pp.
5. Christiansen, P. and J. M. Harris. 2012. Variation in Craniomandibular morphology and sexual dimorphism in pantherines and the sabercat *Smilodon fatalis*. *PLoS ONE* 7(10): e48352. doi:10.1371/journal.pone.0048352

(c) (ii) Five additional significant products

1. Leakey, M. G. and J. M. Harris (eds) 2003. *Lothagam: the Dawn of Humanity in Africa*. Columbia Univ. Press.
2. Harris J. M. (ed) 1991, Koobi Fora Research Project Volume 3: *Geology, fossil artiodactyls and paleoecology*; Clarendon Press, Oxford.
3. Leakey, M. D and J. M. Harris (eds), 1987, *Laetoli, a Pliocene site in northern Tanzania*. Clarendon Press, Oxford.
4. Harris J. M. (ed), 1983, Koobi Fora Research Project Volume 2 *The fossil ungulates: Proboscidea, Perissodactyla and Suidae* Clarendon Press, Oxford.
5. Harris, J. M. and T. D. White, 1979, Evolution of the Plio-Pleistocene African Suidae. *Trans. Amer. Phil. Soc.*, 69 (2): 1–128.

(e) Collaborators and other Affiliations

Collaborators and Co-Editors (last 48 mos):

Cerling, T.E. University of Utah; Cherney, M. University of Michigan; Christiansen, P. University of Aalborg, Denmark; Cox, S. George C. Page Museum; Delmer, C. CNRS, Museum National d'Histoire Naturelle, Paris; El Adli, J. University of Michigan; Fahrni, S. University of California, Irvine; Farrell, A. George C. Page Museum; Fet, E. V. Marshal University; Fisher, D. University of Michigan; Fuller, B. University of California, Irvine; Geraads, D. CNRS, Museum National d'Histoire Naturelle, Paris; Gerhart, L. J. University of Kansas; Gheerbrant, E. CNRS, Museum National d'Histoire Naturelle, Paris; Gold, D. A. University of California, Los Angeles; Groves, C. P. Australian National University; Holden, A. R. Natural History Museum of Los Angeles County; Howard, C. George C. Page Museum; Huszeynov, S. Azarbaijan Museum, Azarbaijan; Kingdon, J. Oxford University; Kunimatsu, Y. Kyoto University, Japan; Leakey, M. G. National Museums of Kenya; Levin, N. Johns Hopkins University; Manthi, F. K. National Museums of Kenya; Nakatsukasa, M., Kyoto University, Japan; Nakaya, H. Kagoshima University, Japan; Nippert, J. B. Kansas State University; O'Keefe, F. R. Marshall University; Passey, B. Johns Hopkins University; Robinson, J. R.. University of California, Los Angeles; Saegusa, H. Museum of Nature and Human Activities, Hyogo, Japan; Sanders, W.J. University of Michigan; Sandquist, D. R. Cal State University, Fullerton; Solounias, N. New York College of Osteopathic Medicine; Southon, J. University of California, Irvine; Takeuchi, G. George C. Page Museum; Thalman, O. University of Turku, Finland; Timm, R. M. University of Kansas; Uno, K. Johns Hopkins University; Ward, J. University of Kansas.

Graduate Advisors and Postdoctoral Sponsors: J. A. Wilson, University of Texas
R J. G. Savage, University of Bristol

BIOGRAPHICAL SKETCH – N. Maggi Kelly

Geospatial Innovation Facility and Department of Environmental Sciences, Policy and Management •
University of California, Berkeley

(a) Professional Preparation

University of California, Berkeley	Geography	B.A.	1988
University of North Carolina	Geography	M.A.	1991
University of Colorado, Boulder	Geography	Ph.D.	1996
National Research Council, NOAA-NMFS Lab, Beaufort, NC	Ecology	Postdoc	1996-98

(b) Appointments

- 2010 – Present Professor in Residence and Specialist in Coop ext.. Ecosystem Sciences Division of the Dept of Environmental Sciences, Policy and Management. UC Berkeley
- 2005 - Present Faculty Director. Geospatial Innovation Facility (GIF), College of Natural Resources, UC Berkeley
- 2003-2010 Associate Specialist in Coop ext. and Adjunct Associate Professor. Ecosystem Sciences Division of the Department of Environmental Sciences, Policy and Management. UC Berkeley
- 1999-2003 Assistant Specialist in Coop ext. and Adjunct Assistant Professor. Ecosystem Sciences Division of the Department of Environmental Sciences, Policy and Management. UC Berkeley

(c) (i) Five Relevant Products

1. Koy, K., S. V. Wart, B. Galey, M. O'Connor, and M. Kelly. 2011. Cal-Adapt: Bringing global climate change data to local application. *Photogrammetric Engineering and Remote Sensing* 77(6): 546-550
2. Kelly, M., K. Ueda and B. Allen-Diaz. 2008. Considerations for ecological reconstruction of historic vegetation: Analysis of the spatial uncertainties in the California Vegetation Type Map dataset. *Plant Ecology* 194 (1): 37-49
3. Pederson, B., F. Kearns and M. Kelly. 2007. Methods for facilitating web-based participatory research informatics. *Ecological Informatics* 2(1): 33-42
4. Kelly, M., B. Allen-Diaz, and N. Kobzina. 2005. Digitization of a historic dataset: the Wieslander California vegetation type mapping project. *Madroño* 52(3):191-201
5. Kearns, F. R., M. Kelly, and K. A. Tuxen. 2003. Everything happens somewhere: using webGIS as a tool for sustainable natural resource management. *Frontiers in Ecology and the Environment* 1(10): 541-548

(c) (ii) Five additional significant products

1. Jakubowski, M. J., W. Li, Q. Guo, and M. Kelly. **2013**. Delineating individual trees from lidar data: a comparison of vector- and raster-based segmentation approaches. *Remote Sensing*, 5: 4163-4186; doi:10.3390/rs5094163
2. Kelly, M., S. Ferranto, K. Ueda, S. Lei and L. Huntsinger. **2012**. Expanding the table: the web as a tool for participatory adaptive management in California forests. *Journal of Environmental Management* 109:1-11
3. Kelly, M., S. Ferranto, K. Ueda, S. Lei and L. Huntsinger. **2012**. Expanding the table: the web as a tool for participatory adaptive management in California forests. *Journal of Environmental Management* 109:1-11
4. Zhao, F., Q. Guo, and M. Kelly. **2012**. Allometric equation choice impacts lidar-based forest biomass estimates: A case study from the Sierra National Forest, CA. *Agriculture and Forest Meteorology* 165: 64-72
5. Baldocchi, D., M. Detto, O. Sonnentag, Verfaillie, Y. Teh, W. Silver, and M. Kelly. **2012**. The challenges of measuring methane fluxes and concentrations over a peatland pasture. *Agricultural and Forest Meteorology* 153(1): 177-187

(d) Up to five relevant synergistic activities

1. Faculty Director of the Geospatial Innovation Facility (GIF) provides leadership and training across a broad array of integrated mapping technologies - Remote Sensing, Geographic Information Systems (GIS), Global Positioning Systems (GPS), web mapping, and spatial modeling.
2. Director of the University of California Agriculture and Natural Resources (ANR) Statewide Program Informatics and Geographic Information Systems (IGIS). This new program will provide a home for ANR's rich and diverse data, information and resources for academics and the public who rely on geospatial and informatics data, analysis and display.
3. Our Space: A neighborhood database project. Funded by the NIH, this project examines neighborhood effects on weight change and diabetes risk factors in 9 counties in California.
4. SNAMP: the Sierra Nevada Adaptive Management Project. Funded by the USDA Forest Service, a multi-disciplinary group is learning how to apply adaptive management in the Sierra Nevada Forest Plan Amendment.

(e) Collaborators and other Affiliations

Collaborators and Co-Editors (last 48 mos): Adler, Nancy E (Kaiser); Allen-Diaz, Barbara (UCB); Badenoch, Nathan (National Agricultural and Forestry Research Institute Lao PDR); Baldocchi, Dennis (UCB); Blanchard, Sam (UCB); Brennan, Matthew (Private Consultant); Brown, Greg (U. Queensland, Australia); Callaway, John C. (U. SF); Collins, Brandon (USDA Forest Service); Connors, John (Arizona State Univ.); Crooks, Stephen (Private Consultant); DeLasaux, Michael (UC Coop ext.); Detto, Matteo (UCB); Drill, Sabrina (UC Coop ext.); Ferranto, Shasta (UCB); Galey, Brian (UCB); Gallego, Ana H. (Universidad Politécnica de Madrid, Spain); Garcia-Feced, Celia (Joint Research Centre of Ispra, Italy); Getz, Christy; Gong, Peng (UCB); Gross, Stephen (LBNL); Herzog, M. (USGS); Huntsinger, Lynn (UCB); Jones-Smith, Jessie (UCSF); Jongsomjit, Dennis (PRBO Conservation Science); Karter, Andrew J. (Kaiser); Kersten, Ellen (UCB); Koy, Kevin (UCB); Kushi, Lawrence H (Kaiser Department of Research); Laraia, Barbara A (UCB); Leung, Cindy H. (Harvard School of Public Health); Linderman, Marc (U. Iowa); Liu, Y (University of California, Merced); McPherson, Brice M. (UCB); Merenlender, Adina (UC Coop ext.); Miller, Jay D. (USDA Forest Service); Moffet, Howard H (Kaiser); Mori, Sylvia (USDA Forest Service); Moritz, Max (UC Coop ext.); Morrow, William (LBNL); Nakamura, Gary (UC Coop ext.); Nickleach, Dana (UCSF); Nur, Nadav (PRBO Conservation Science, USA); O'Connor, Mark (UCB); Parker, V. Thomas (Sf State Univ.); Parton, William (George Mason Univ.); Runkle, Ben RK (U. Hamburg, Germany); Saornil, Javier V. (Universidad Politécnica de Madrid, Spain); Schile, Lisa M. (UCB); Schillinger, Dean (UCSF); Silver, Whendee (UCB); Sonnentag, Oliver (Harvard Univ.); Standiford, Richard B. (UC Coop ext.); Stephens, Scott L. (UCB); Stewart, William (UC Coop ext.); Stralberg, Diana (U. Alberta); Teh, Yit (St. Andrews Univ.); Temple, Douglas (U. Minnesota); Ueda, Ken-ichi (Private Consultant); Valacovich, Yana (UC Coop ext.); van Wagendonk, Jan W. (USGS); VanWey, Leah K. (U. Waterloo, Canada); Vargas, Rodrigo (UCB); Vasey, Michael (Sf State Univ.); Visel, Axel (LBNL); Wart, Sarah V. (UCB); Warton, Margaret (, Kaiser); Whital, Deb (USDA-Forest Service); Windam-Meyers, L. (USGS); Wood, David. L. (UCB); Wood, Julian K. (PRBO); Yen, Irene H (UCSF); Zhao, Feng (U. Maryland)

Graduate Advisors and Postdoctoral Sponsors:

Ph.D. Advisees (all) and Postgraduate Scholars (last 5 years):

Graduate students (14): Byrd, Kristin (USGS); DeChant, Tim (University of Chicago); Easterday, Kelly (UCB); Ferranto, Shasta (USDI); Guo, Qinghua (University of California, Merced); Jakubowski, Marek (UCB); Kramer, Heather (UCB); Lei, Shufei (UCB); Lewis, Sarah (UCB); Liu, Desheng (Ohio State University); Palomino, Jenny (UCB); Schile, Lisa (Smithsonian); Tuxen, Karin (K., Google, Inc.); Zeledon, Esther (US Department of State)

Postdoctoral advisees (5): Cao, Lina; McIntyre, Patrick; O'Connell, Jessica; Sonnentag, Oliver; Zhao, Feng.

BIOGEOGRAPHICAL SKETCH: Michelle S. Koo
Museum of Vertebrate Zoology • University of California, Berkeley

(a) Professional Preparation:

Barnard College, Columbia University	Biology and Anthropology.	BA	1990
University of California, Berkeley	Integrative Biology.	MS	1994

(b) Appointments:

2006 – Present	Biodiversity Informatics & GIS Associate Specialist, Museum of Vertebrate Zoology, University of California, Berkeley, CA.
1998 – 2006	Biogeographic Systems Manager, California Academy of Sciences, San Francisco, CA
2000	GIS Consultant, American Museum of Natural History, NY, NY
1996 – 1998	Curatorial Assistant II, California Academy of Sciences, San Francisco, CA
1995	Research Assistant, Center for the Reproduction of Endangered Wildlife, Cincinnati Zoo and Botanical Garden, Cincinnati, OH
1992 - 1994	Museum Scientist

(c) (i) Five Relevant Products

1. Cicero, C. and **M.S. Koo**. 2012. The role of niche divergence and phenotypic adaptation in promoting lineage diversification of the Sage Sparrow (*Artemisospiza belli*, Aves: Emberizidae). *Biological Journal of the Linnean Society* 107(2):332-354.
2. Tingley, M., **M.S. Koo**, C. Moritz, A.C. Rush, S. Beissinger. 2012. The push and pull of climate change causes heterogeneous shifts in avian elevational ranges. *Global Change Biology* 18(11):3279-3290.
3. Leaché, A.D., **M. S. Koo**, C.L. Spencer, T.J. Papenfuss, R.N. Fisher and J.A. McGuire. 2009. Quantifying ecological, morphological, and genetic variation to delimit species in the coast horned lizard species complex (*Phrynosoma*). *Proceedings of the National Academy of Sciences* 28 July 2009. 106(30): 12418-12423.
4. **AmphibiaWeb** (<http://amphibiaweb.org/>)— Online resource on the biology, taxonomy and conservation of amphibians globally since 2000, Associate Director and Sr. Consultant since 2006.
5. **VertNet** (<http://vertnet.org/>)—NSF-funded next-generation distributed database portal for natural history collections, Sr. Personnel.

(c) (ii) Five additional significant products

1. Smith, A.B., M.J. Santos, **M.S. Koo**, K.M.C. Rowe, K.C. Rowe, J.L. Patton, J.D. Perrine, S.R. Beissinger, C. Moritz. 2013. Evaluation of species distribution models by resampling of sites surveyed a century ago by Joseph Grinnell. *Ecography*. Online Early doi: 10.1111/j.1600-0587.2013.00107.x
2. Davis, E. B., **M.S. Koo**, C. Conroy, J.L. Patton, C. Moritz. 2008. The California Hotspots Project: Identifying regions of rapid diversification of mammals. *Molecular Ecology*. 17(1):120-138. doi:10.1111/j.1365-294X.2007.03469.x
3. McGuire, J.A., C.W. Linkem, **M.S. Koo**, D.W. Hutchison, A.K. Lappin, D.I. Orange, J. Lems-Espinal, B.R. Riddle, J.R. Jaeger. 2007. Mitochondrial introgression and incomplete lineage sorting through space and time: phylogenetics of crotaphytid lizards. *Evolution* 61 (12): 2879–2897.
4. Fellers, G.M., K.L. Pope, J.E. Stead, **M.S. Koo**, H.H. Welsh, Jr. 2007. Turning population trend monitoring into active conservation: Can we save the Cascades frog (*Rana cascadae*) in the Lassen region of California? *Herpetological Conservation and Biology* 3(1):28-39.
5. Pawar, S., **M.S. Koo**, C. Kelly, M.F. Ahmed, S. Choudhury, S. Sarkar. 2007. Conservation assessment and prioritization of areas in Northeast India: Priorities for amphibians and reptiles. *Biological Conservation*. 136: 346 - 361.

(d) Up to five relevant synergistic activities

1. Oversees biodiversity informatics and GIS technologies at the Museum of Vertebrate Zoology (MVZ) providing training, infrastructure support and analyses in GIS, spatial and distributional modeling and other research. Curates with other staff curators the MVZ collection database (Arctos) ensuring the geospatial integrity, data quality, and fostering new developments. Serves on the multi-institutional

- Arctos Advisory Committee. Co-manages MVZ Archives and co-PI on Mellon CLIR grant (\$481,000) to catalog and put online the archival assets. Supervises archivist, and undergraduate, intern and support staff in IT, GIS and curatorial tasks.
2. Research integrates biocollections, fieldwork and analytic research methods, e.g., Grinnell Resurvey Project, a project to resurvey 80 year old sites in California to document changes in species distribution and through modeling analyze the impact of climate change; the Evolutionary Hotspots Project, which models areas conducive to the processes of speciation by identifying regions of high endemic diversification.
 3. Collaborates on biodiversity informatics projects, including the NSF-funded distributed database web portals for herpetological and ornithological collections (HerpNet and OrNIS) and VertNet, which allow access to primary natural history data collections. Sr. Personnel on current NSF-funded VertNet. Currently Co-PI on Keck Foundation-funded project (\$1.5M) to create an integrated biodiversity visualization and data discovery portal, the Berkeley Ecoinformatics Engine. Serves as Associate Director for AmphibiaWeb, an online resource dedicated to global amphibian declines and species information, and works to promote access and visualization of biodiversity data for both the lay public and researchers alike. Contributed in NESCent workshop on the strategic planning document "Establishing a National Digital Biological Collections Resource" (April 2010) aiming to establish a national effort to digitize and make accessible biodiversity data in national collections.
 4. Established biannual workshops in Species Distribution Modeling in the Geospatial Innovation Facility, UC Berkeley, for students, staff and public. Co-instructor and developer for VertNet Biodiversity Informatics workshops, including creating tutorial material and best practice guidelines in informatics, GIS and modeling (material available via websites <http://vertnet.org>, <http://herpnet.org/>). Acts as consultant and co-instructor for VertNet/ GBIF Georeferencing workshops. Coordinated and taught NSF-funded AmphibiaTree workshop in modeling (2009).
 5. Mentors undergraduates in Biology Scholars Program, which serves students from economic, gender, ethnic groups historically underrepresented in biology. Promotes public awareness of biodiversity science (e.g. invited talks: East Bay Science Café, 2012; Bay Area BioForum 2012, Science at the Presidio Symposium, 2007). Produces imagery and content for the popular media (e.g. *Smithsonian* magazine, *Quest* TV) and for scientific literature. Creates data and project visualizations (e.g. branding, infographics) for professional conferences and websites. Served as reviewer for *Ecography*, *Global Ecology and Biogeography*, *Animal Conservation* among others.

(e) Collaborators & Other Affiliations:

Collaborators and Co-Editors (last 48 mos): John Asher (American Museum of Natural History), Steve Beissinger (UC Berkeley), Rauri Bowie (UC Berkeley), Carla Cicero (UC Berkeley), Edward Davis (University of Oregon), Rosemary Gillespie (UC Berkeley), Robert Guralnick (University of Colorado), Charles Marshall (UC Berkeley), Jenny McGuire (University of Washington), Jimmy A. McGuire (UC Berkeley), Craig Moritz (Australia National University), Karen Rowe, Kevin Rowe (Museum Victoria, Australia), Adam Smith (Missouri Botanical Garden), Carol Spencer (UC Berkeley), Morgan Tingley (Princeton University), Vance Vredenburg (San Francisco State University), Rudolf von May (UC Berkeley), David Wake (UC Berkeley).

Graduate Advisors and Postdoctoral Sponsors: Marvalee H. Wake (UC Berkeley).

Ph.D. Advisees (all) and Postgraduate Scholars (last 5 years): I do not advise graduate students or sponsor postdoctoral scholars.

BIOGRAPHICAL SKETCH – Kevin Koy

Geospatial Innovation Facility • Department of Environmental Sciences, Policy and Management •
University of California, Berkeley

(a) Professional Preparation

University of Pennsylvania	Environmental Studies and Anthropology	BA	1998
George Mason University	Biology	MS	2003

(b) Appointments

- 2011 – Present Executive Director. Geospatial Innovation Facility (GIF), College of Natural Resources, University of California, Berkeley. <http://gif.berkeley.edu>
- 2008 – 2010 Manager. Geospatial Innovation Facility (GIF), College of Natural Resources, University of California, Berkeley. <http://gif.berkeley.edu>
- 2003 – 2008 GIS / Remote Sensing Specialist. American Museum of Natural History, Center for Biodiversity and Conservation
- 1999 – 2003 Remote Sensing & GIS Analyst. Smithsonian Institution, Conservation and Research Center.

(c) (i) Five Relevant Products

1. Sathaye, J., L. Dale, P. Larsen, G. Fitts, K. Koy, S. Lewis, and A. Pereira de Lucena. 2013. Estimating impacts of warming temperatures on California's electricity system. *Global Environmental Change*. 23(2): 499-511.
2. Kelly M., S. Blanchard, E. Kersten, and K. Koy. 2011. Terrestrial Remotely Sensed Imagery in Support of Public Health: New Avenues of Research Using Object-Based Image Analysis. *Remote Sensing* 3:2321-2345.
3. Koy, K., S. V. Wart, B. Galey, M. O'Connor, and M. Kelly. 2011. Cal-Adapt: Bringing global climate change data to local application. *Photogrammetric Engineering and Remote Sensing* 77(6): 546-550.
4. Koy, K., W. McShea, P. Leimgruber, B. Haack, and M. Aung. 2005. Percent canopy cover - using Landsat imagery to delineate habitat for Myanmar's endangered Eld's deer (*Cervus eldi*). *Animal Conservation*. 8(3): 289-296.
5. McShea, W., K. Koy, T. Clements, A. Johnson, M. Aung. 2005. Finding a needle in the haystack: Regional analysis of suitable Eld's deer (*Cervus eldi*) habitat in Southeast Asia. *Journal of Biological Conservation*. 125(2005): 101-111.

(c) (ii) Five additional significant products

1. Demaría M., W. McShea, K. Koy, and N. Maceira. 2003. Pampas deer conservation with respect to habitat loss and protected area considerations in San Luis, Argentina. *Journal of Biological Conservation*. 115(2003): 121-130.
2. McShea W., J. Pagels, J. Orrock, E. Harper, and K. Koy. 2003. Mesic deciduous forest as patches of small mammal richness within an Appalachian mountain forest. *Journal of Mammalogy*. 84(2): 188-204.

(d) Up to five relevant synergistic activities

1. Co-PI and development lead on HoloS, Berkeley Ecoinformatics Engine (<http://ecoengine.berkeley.edu>) funded by the W. M. Keck Foundation.
2. Lead the development of Cal-Adapt (<http://cal-adapt.org>) a web based climate change data visualization and analysis tool.
3. Developed and teach 12 different geospatial workshops at UC Berkeley (<http://gif.berkeley.edu/support/workshops.html>)

4. Developed a web based tool for analyzing climate change data in Ethiopia (<http://gif.berkeley.edu/ethiopia/>)
5. Developed and taught geospatial methods to global health practitioners working in Africa and India (<http://www.globalhealthsciences.ucsf.edu/education/framework/>)

(e) Collaborators and other Affiliations

Collaborators and Co-Editors

Ben Sleeter, U.S. Geological Survey
Brian Galey, UC Berkeley
Carol Greenwood, California Energy Commission
Charles Marshall, UC Berkeley
Chris Stewart, UC San Francisco
David Ackerly, UC Berkeley
Falk Schuetzenmeister, UC Berkeley
Guido Franco, California Energy Commission
Kurt Malchow, California Natural Resources Agency
Larry Dale, Lawrence Berkeley National Lab
Lorraine Hwang, California Energy Commission
Maggi Kelly, UC Berkeley
Mark O'Connor, UC Berkeley
Michelle Koo, UC Berkeley
Rosemary Gillespie, UC Berkeley
Sarah Hinman, UC Berkeley
Sarah Pittiglio, California Energy Commission
Scott Butterfield, The Nature Conservancy
Shruti Mukhtyar, UC Berkeley
Zhiliang Zhu, U.S. Geological Survey

Graduate Advisor:

Barry Haack, George Mason University

Ph.D. Advisees (all) and Postgraduate Scholars (last 5 years): None

BIOGRAPHICAL SKETCH – Samuel A. McLeod
Natural History Museum of Los Angeles County

(a) Professional Preparation

University of California, Berkeley	Anthropology	A.B.	1974
University of California, Berkeley	Paleontology	Ph.D.	1981

(b) Appointments

1985-present	Collections Manager, Department of Vertebrate Paleontology, Natural History Museum of Los Angeles County.
1985	Adjunct Assistant Professor, Department of Earth and Space Sciences, University of California, Los Angeles.
1981-1985	Collections Manager, Section of Vertebrate Paleontology, Natural History Museum of Los Angeles County Foundation, Los Angeles.

(c) (i) Five Relevant Products

1. Pyenson, Nicholas D., Randall B. Irmis, Jere H. Lipps, Lawrence G. Barnes, Edward D. Mitchell, and Samuel A. McLeod. 2009. The origin of a widespread marine bonebed deposited during the Middle Miocene Climatic Optimum. *Geology*, 37(6):519-522.
2. Prothero, Donald R., Matthew R. Lister, Lawrence G. Barnes, Xiaoming Wang, Edward D. Mitchell, Samuel A. McLeod, David P. Whistler, Richard H. Tedford, and Clayton E. Ray. 2008. Land mammals from the Middle Miocene Sharktooth Hill Bonebed, Kern County, California. p.299-314 in Spencer G. Lucas, Gary S. Morgan, Justin A. Spielman, and Donald R. Prothero, eds. *Neogene Mammals*, Bulletin of the New Mexico Museum of Natural History & Science, 44:i-iii, 1-442.
3. McLeod, Samuel A. 2006. A history of the Caltech Collections from the Yepómera area, Chihuahua, Mexico. In: *Advances in late Tertiary vertebrate paleontology in Mexico and the Great American Biotic Interchange*. Oscar Carranza-Castañeda and Everett H. Lindsay (eds.). Universidad Nacional Autónoma de México, Instituto de Geología and Centro de Geociencias, Publicación Especial, 4:1-18.
4. McLeod, Samuel A. 1991. Computerization Fields for Vertebrate Paleontology. pp. 33-56, *in*: Guidelines and Standards for Fossil Vertebrate Databases. Results of the Society of Vertebrate Paleontology Workshop on Computerization. Stanley D. Blum (editor), Special Publication of the Society of Vertebrate Paleontology. i-vi + 129 pp.
5. McLeod, Samuel A. and Melissa A. Winans. 1991. Logistics and Planning for Computerization. pp. 9-32, *in*: Guidelines and Standards for Fossil Vertebrate Databases. Results of the Society of Vertebrate Paleontology Workshop on Computerization. Stanley D. Blum (editor), Special Publication of the Society of Vertebrate Paleontology. i-vi + 129 pp.

(c) (ii) Five additional significant products

1. Mayr, Gerald, Goedert, James L., McLeod, Samuel A. 2013. Partial Skeleton of a Bony-Toothed Bird from the Late Oligocene/Early Miocene of Oregon (USA) and the Systematics of Neogene Pelagornithidae. *Journal of Paleontology*, 87(5):922-929.
<http://www.psjournals.org/doi/abs/10.1666/13-025>
2. Lucas, Spencer G., Samuel A. McLeod, Lawrence G. Barnes, Guillermo E. Alvarado, Ramiro García, and Edgar Espinosa. 2009. A baleen whale from the Pliocene of Nicaragua. [Ballena de barbas del Plioceno de Nicaragua.] *Revista Geológica de América Central*, 41:17-24.
3. Czaplewski, Nicholas J., Gary S. Morgan, and Samuel A. McLeod. 2008. Chapter 12 - Chiroptera, pp. 174-197. In: Christine M. Janis, Gregg F. Gunnell, and Mark D. Uhen (eds.), *Evolution of Tertiary Mammals of North America, Volume 2, Small Mammals, Xenarthrans, and Marine Mammals*. Cambridge University Press, Cambridge, 802 pp.
4. McLeod, Samuel A., and Lawrence G. Barnes. 2008. A new genus and species of Eocene protocetid archaeocete whale (Mammalia, Cetacea) from the Atlantic Coastal Plain, pp. 73-98 In: Xiaoming Wang and Lawrence G. Barnes (eds.), *Geology and Vertebrate Paleontology of Western and Southern North America. Contributions in Honor of David P. Whistler*. Science Series, Natural History Museum of Los Angeles County, 41:i-viii, 1-388.

5. McLeod, Samuel A., Frank C. Whitmore, Jr. and Lawrence G. Barnes. 1993. Evolutionary Relationships and Classification. pp. 45-70 *in*: The Bowhead Whale. John J. Burns, J. Jerome Montague and Cleveland J. Cowles (editors), Special Publication Number 2. The Society for Marine Mammalogy. xxxvi + 787 pp.

(d) Up to five relevant synergistic activities

1. Member Society of Vertebrate Paleontology Information Technology Committee, 1993-Present
2. Manage Vertebrate Paleontology discussion list, VRTPALEO at USC
3. Supervise at-risk high school students in the Summer Youth Job Corps at the Natural History Museum of Los Angeles County

(e) Collaborators and other Affiliations

Collaborators and Co-Editors (last 48 mos):

Mayr, Gerald, Forschungsinstitut Senckenberg
Goedert, James, University of Washington
Pyenson, Nicholas, Smithsonian Institution
Irmis, Randall, University of Utah
Lipps, Jere, California State University, Fullerton
Mitchell, Edward, Natural History Museum of Los Angeles County
Barnes, Lawrence, Natural History Museum of Los Angeles County
Lucas, Spencer, New Mexico Museum of Natural History & Science
Alvarado, Guillermo, Universidad de Costa Rica
García, Ramiro, Museo Nacional de Nicaragua
Espinosa, Edgar, Museo Nacional de Nicaragua

Graduate Advisors and Postdoctoral Sponsors:

Gregory, Joseph, University of California, Berkeley (deceased)
Clemens, William, University of California, Berkeley (emeritus)
Berry, William, University of California, Berkeley (deceased)
Patton, James, University of California, Berkeley (emeritus)
Wake, David, University of California, Berkeley (emeritus)

BIOGRAPHICAL SKETCH – Michael W. Nachman

Museum of Vertebrate Zoology and Department of Integrative Biology • University of California, Berkeley

(a) Professional Preparation

University of California, Berkeley	Zoology	B.A.	1983
University of Michigan	Biology	M.S.	1987
University of Michigan	Biology	Ph.D.	1990
Oxford University	Zoology Department	Postdoc	1990-91
Cornell University	Genetics and Development	Postdoc	1991-94

(b) Appointments

2013-present	Director, Museum of Vertebrate Zoology and Professor, Integrative Biology University of California, Berkeley
2003-2013	Professor, Ecology and Evolutionary Biology, University of Arizona
2000-2003	Associate Professor, Ecology and Evolutionary Biology, University of Arizona
1996-1999	Assistant Professor, Ecology and Evolutionary Biology, University of Arizona
1994-1995	Research Associate, Section of Genetics and Development, Cornell University

(c) (i) Five Relevant Products

1. Nachman, M.W., Hoekstra, H.E., and S.L. D'Agostino. 2003. The genetic basis of adaptive melanism in pocket mice. *Proceedings of the National Academy of Sciences USA* 100: 5268-5273.
2. Payseur, B.A., J.G. Krenz, and M.W. Nachman. 2004. Differential patterns of introgression across the X chromosome in a hybrid zone between two species of house mice. *Evolution* 58: 2064-2078.
3. Geraldes, A., P. Basset, B. Gibson, K. L. Smith, B. Harr, H-T. Yu, N. Bulatova, Y. Ziv, and M. W. Nachman. 2008. Inferring the history of speciation in house mice from autosomal, X-linked, Y-linked and mitochondrial genes. *Molecular Ecology* 17: 5349-5363.
4. Carneiro, M., J.A. Blanco-Aguilar, R. Villafuerte, N. Ferrand, and M.W. Nachman. 2010. Speciation in the European rabbit (*Oryctolagus cuniculus*): islands of differentiation on the X-chromosome and autosomes. *Evolution* 64: 3443-3460.
5. Geraldes, A., P. Basset, K.L. Smith, and M.W. Nachman. 2011. Higher differentiation among subspecies of the house mouse (*Mus musculus*) in genomic regions with low recombination. *Molecular Ecology* 20: 4722-4736.

(c) (ii) Five additional significant products

1. Nachman, M.W., and S.L. Crowell. 2000. Estimate of the mutation rate per nucleotide in humans. *Genetics* 156: 297-304.
2. Laurie, C.C., D.A. Nickerson, B.S. Weir, R.J. Livingston, M.D. Dean, K. Smith, E.E. Schadt, and M.W. Nachman. 2007. Linkage disequilibrium in a natural population of the house mouse, *Mus musculus domesticus*. *PLoS Genetics* 3: 1487-1495.
3. Good, J.M., T. Giger, M.D. Dean, and M.W. Nachman. 2010. Widespread over-expression of the X chromosome in sterile F1 hybrid mice. *PLoS Genetics* 6(9): e1001148.
4. Song, Y., S. Endepols, N. Klemann, D. Richter, F.R. Matuschka, C.H. Shih, M.W. Nachman and M. H. Kohn. 2011. Adaptive introgression of anticoagulant rodent poison resistance by hybridization between Old World mice. *Current Biology* 21: 1-6.
5. Phifer-Rixey, M., F. Bonhomme, P. Boursot, G.A. Churchill, J. Piálek, P.K. Tucker, and M.W. Nachman. 2012. Adaptive evolution and effective population size in wild house mice. *Molecular Biology and Evolution* 29: 2949-2955.

(d) Up to five relevant synergistic activities

1. Fellow, American Association for the Advancement of Science, elected 2005
2. Director, University of Arizona NSF-IGERT Program in Comparative Genomics, 2002 -2013
3. Associate Editor, *Molecular Biology and Evolution*, 2003 – present

4. Associate Editor, *Genetics*, 2008 – present
5. Section Editor for Evolution, *PLoS Genetics*, 2008 – 2012

(e) Collaborators and other Affiliations

Collaborators and Co-Editors (last 48 mos): F. Bonhomme, University of Montpellier; P. Boursot, University of Montpellier; C.A. Buerkle, University of Wyoming; G.A. Churchill, The Jackson Laboratory; N. Ferrand, University of Porto, Portugal; M. H. Kohn, Rice University; C. Laurie, University of Washington; M.J. MacCoss, University of Washington; M. Macholan, Czech Republic; P. Munclinger, Czech Republic; D. Nickerson, University of Washington; F. Pardo-Manuel de Villena, University of North Carolina; J. Pialek, Czech Republic; E.E. Schadt, University of Washington; W.J. Swanson, University of Washington; P.K. Tucker, University of Michigan; B. Weir, University of Washington;

Graduate Advisors and Postdoctoral Sponsors: Charles F. Aquadro, Cornell University; Wesley M. Brown, University of Michigan; Philip Myers, University of Michigan; Jeremy B. Searle, University of York

Ph.D. Advisees (all) and Postgraduate Scholars (last 5 years):

Graduate students (11): Cynthia Riginos, Mathew Saunders, Bret Payseur, Jeff Good, Tovah Salcedo, Gabriela Wlasiuk, Miguel Carneiro; Noelle Bittner, Taichi Suzuki, Ting-Ting Lin, Katya Mack

Postdoctoral advisees (12): Mathew Dean, Armando Geraldes, Mari Sans-Fuentes, Patrick Basset, Radka Storchova, Megan Phifer-Rixey, Polly Campbell, Felipe Martins, Michael Sheehan.

BIOGRAPHICAL SKETCH – Gordon M. Nishida
Essig Museum of Entomology • University of California, Berkeley

(a) Professional Preparation

San Mateo Junior College	Biology	A.A.	1966
University of California, Berkeley	Biology	B.A.	1968
San Jose State University	Biological Sciences with emphasis in Entomology	M.A.	1975

(b) Appointments

2001-Present	Museum Scientist, University of California, Berkeley.
1993-2001	Collections Manager, Department of Natural Sciences, Bishop Museum.
1973-1993	Collections Manager, Department of Entomology, Bishop Museum.

(c) (i) Five Relevant Products

1. Nishida, G.M. 2003. Museums and Display Collections. Pp.768-774 **In** Resh, V.H. & R.T. Cardé, eds. *Encyclopedia of Insects*. Academic Press. 1266 pp.
2. Nishida, G.M. (ed.). 2002. Hawaiian Terrestrial Arthropod Checklist. Fourth Edition. *Bishop Museum Technical Report 22*: iv+313 pp.
3. Nishida, G.M. & J.W. Beardsley. 2002. A review of the insects and related arthropods of Midway Atoll. *Bishop Museum Occasional Papers* No. 68: 25-69.
4. Allison, A., S.E. Miller & G.M. Nishida. 1995. Hawaii Biological Survey: a model for the Pacific Region. pp. 349–355 **In** J.E. Maragos, et al. (eds.), *Marine and coastal biodiversity in the tropical island Pacific region. Volume I. Species systematics and information management priorities*. East-West Center, Honolulu. xxii + 424 pp.
5. Arnett, R.H., Jr., G.A. Samuelson & G.M. Nishida. 1993. *The Insect and Spider Collections of the World*. Sandhill Crane Press, Inc., Gainesville, Florida. 310 pp.

(c) (ii) Five additional significant products

1. Nishida, G.M. & J.M. Tenorio. 1992. *What Bit Me? Identifying Hawai'i's stinging and biting insects and their kin*. University of Hawaii Press, Honolulu. 80 pp.
2. Nishida, G.M. (ed.). 1992. Hawaiian Terrestrial Arthropod Checklist. *Bishop Museum Technical Publication* [1]: viii+262 pp.

(d) Up to five relevant synergistic activities

1. (present) Coordinator for data input for CalBug project , also coordinator for data input for Tri-Trophic project at University of California, Berkeley.
2. (2009) Compiled checklists and relevant literature citations for French Polynesia .
3. (1990-2002) Instigated, developed, and completed a checklist and bibliography for Hawaiian arthropod species. Began in 1990, provided three revisions .

(e) Collaborators and other Affiliations

Collaborators and Co-Editors (last 48 mos): None

BIOGRAPHICAL SKETCH – Kipling Will

Essig Museum of Entomology and Department of Environmental Sciences, Policy and Management •
University of California, Berkeley

(a) Professional Preparation

The Ohio State University	Biology	B.Sc.	1994
Cornell University	Entomology	Ph.D.	2000
University of Arizona	Systematics	Postdoc	2000-01

(b) Appointments

- 2013-Present Director, Essig Museum of Entomology, University of California, Berkeley.
2001-Present Associate Professor / Insect Systematist, Department of Environmental Science, Policy and Management - Division of Organisms & Environment. University of California, Berkeley.

(c) (i) Five Relevant Products

1. Will, K. 2011. Taxonomic review of the Pterostichini and Loxandriini fauna of New Caledonia (Coleoptera: Carabidae). *ZooKeys*, 147: 337–397.
2. Guthrie, N.A. Weir, T and Will, K. 2010. Localized and regional patterns in ground-dwelling beetle assemblages in a semi-tropical arid zone environment. *Records of the Western Australian Museum Supplement*. 78:169-184.
3. Ruiz, C., Jordal, B.H., Emerson, B.C., Will, K.W., and Serrano, J. 2010. Molecular phylogeny and Holarctic diversification of the subtribe Calathina (Coleoptera: Carabidae: Sphodrini). *Molecular Phylogenetics and Evolution*. 55(2):358-371.
4. Will, K.W., Gill, A.S and Attygalle, A.B. 2010. Quantification and evidence for mechanically metered release of pygidial secretions in formic acid producing carabid beetles (Coleoptera: Carabidae). 17pp. *Journal of Insect Science* 10:12.
5. Arndt, E., Beutel, R.G. and Will, K.W. 2005. 7.8. Carabidae Latreille, 1802. in *Handbook of Zoology, Vol. IV Arthropoda: Insecta* (series ed. By N.P. Kristensen and R.G. Beutel). Part 38. Coleoptera, Vol. 1: Morphology and Systematics (Archostemata, Adephaga, Myxophaga, Polyphaga (partim) (vol. ed. by R.G. Beutel and R.A.B. Leschen). Walter De Gruyter, Berlin, New York.

(c) (ii) Five additional significant products

1. Will, K.W. and Kavanaugh, D. H. 2012. A new species of *Lesticus* Dejean, 1828 (Coleoptera, Carabidae) from the Finisterre Range, Papua New Guinea and a key to the genera of pterostichine-like Harpalinae of New Guinea. *ZooKeys*. 246, 27-37.
2. Will, K.W. and Gill, A.S. 2008. Phylogeny and classification of *Hypherpes* auctorum (Coleoptera: Carabidae: Pterostichini: Pterostichus). *Annals of Carnegie Museum*. 77(1)93-127.
3. Will, K.W, Mishler, B.D. and Wheeler, Q.D. 2005. The perils of DNA barcoding and the need for integrative taxonomy. *Systematic Biology*. 54(5):844-851.
4. Attygalle, A.B, Wu, X. and Will, K.W. 2007. Biosynthesis of tiglic, ethacrylic, and 2-methylbutyric acids in a carabid beetle, *Pterostichus (Hypherpes) californicus*. *Journal of Chemical Ecology*. 33:963-970.
5. Liebherr, J. K. and Will, K. W. 1998. Inferring phylogenetic relationships within Carabidae (Insecta, Coleoptera) from characters of the female reproductive tract. In: Ball, G.E., Casale, A., Taglianti, A., eds. *Phylogeny and Classification of Caraboidea* (Coleoptera: Adephaga), dal Bolletino del Museo Regionale di Scienze Naturali - Torino, ATTI. Pp. 107-170.

(d) Up to five relevant synergistic activities

1. Instructor for summer, 2012 Shortcourse on the “Natural History and Taxonomy of the Carabidae”, sponsored in part by the IOBC-NRS, and affiliated with the Midwest Institute for Biological Control. Held in Brookings Co., SD, at the Oak Lake Field Station of South Dakota State University.
2. President of Pacific Coast Entomological Society 2011-2012.

3. Organized the Essig Museum's annual "Darwin Day" open house for university and local Community.
4. Co-organizer of Biogeography session International Congress of Entomology, 2012.

(e) Collaborators and other Affiliations

Collaborators and Co-Editors (last 48 mos): David Kavanaugh (California Academy of Sciences), Rosemary Gillespie (UC Berkeley), Charles Griswold (California Academy of Sciences), Heraty John (UC Riverside), Matthew Medieros (UC Berkeley), Jerry Powell (UC Berkeley), George Roderick (UC Berkeley), Christiane Weirauch (UC Riverside), Maggi Kelly (UC, Berkeley), Lisa Fischer (UC, ANR and Research and Extension Centers), Shane Feirer UC, Hopland REC), Frieder Schurr (UC, Center for Forestry), Jeff Brown (UC, Berkeley Central Sierra Field Research Stations), David Baxter (University and Jepson Herbaria, Berkeley), Brent Mishler (UC, Berkeley).

Graduate Advisors: Liebherr James (Cornell University)

Postdoctoral Sponsors: David Maddison (Oregon State University)

Ph.D. Advisees (all) and Postgraduate Scholars (last 5 years):

Graduate students (6): Meghan Culpepper(UC Berkeley), Traci Gryzmala (UC Berkeley), Stephen Lew (Unaffiliated), Ainsley Seago (CSIRO, Canberra), Wang Tianyu (Beijing, China), Matthew VanDam (UC Berkeley).

Postdoctoral advisees: None.

SUMMARY PROPOSAL BUDGET

YEAR 1

ORGANIZATION University of California-Berkeley				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Kipling W Will				AWARD NO.	Proposed	Granted	
A. SENIOR PERSONNEL: PI/PI, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer	Funds granted by NSF (if different)
		CAL	ACAD	SUMR			
1.	Kipling W Will - PI	0.00	0.00	0.25	2,659		
2.	N. Maggi Kelly - Co-PI	0.00	0.00	0.25	2,580		
3.	Michelle S Koo - Co-PI	1.00	0.00	0.00	5,583		
4.							
5.							
6.	(0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	0.00	0.00	0.00	0		
7.	(3) TOTAL SENIOR PERSONNEL (1 - 6)	1.00	0.00	0.50	10,822		
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1.	(0) POST DOCTORAL SCHOLARS	0.00	0.00	0.00	0		
2.	(7) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	19.80	0.00	0.00	139,384		
3.	(3) GRADUATE STUDENTS				65,973		
4.	(10) UNDERGRADUATE STUDENTS				54,000		
5.	(0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)				0		
6.	(0) OTHER				0		
TOTAL SALARIES AND WAGES (A + B)					270,179		
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)					115,879		
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)					386,058		
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)					9,000		
2. FOREIGN					0		
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				8,000		
2.	PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION				0		
3.	CONSULTANT SERVICES				0		
4.	COMPUTER SERVICES				12,000		
5.	SUBAWARDS				205,694		
6.	OTHER				0		
TOTAL OTHER DIRECT COSTS					225,694		
H. TOTAL DIRECT COSTS (A THROUGH G)					620,752		
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) MTDC (Rate: 40.0000, Base: 412912)							
TOTAL INDIRECT COSTS (F&A)					165,165		
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					785,917		
K. RESIDUAL FUNDS					0		
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)					785,917		
M. COST SHARING PROPOSED LEVEL \$ 0 AGREED LEVEL IF DIFFERENT \$							
PI/PI NAME Kipling W Will				FOR NSF USE ONLY			
ORG. REP. NAME* Christine Luppino				INDIRECT COST RATE VERIFICATION			
		Date Checked	Date Of Rate Sheet	Initials - ORG			

SUMMARY PROPOSAL BUDGET

YEAR **2**

ORGANIZATION University of California-Berkeley				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Kipling W Will				AWARD NO.	Proposed	Granted	
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		Funds Requested By proposer	Funds granted by NSF (if different)
				CAL	ACAD	SUMR	
1.	Kipling W Will - PI			0.00	0.00	0.25	2,712
2.	N. Maggi Kelly - Co-PI			0.00	0.00	0.25	2,632
3.	Michelle S Koo - Co-PI			1.00	0.00	0.00	5,695
4.							
5.							
6.	(0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)			0.00	0.00	0.00	0
7.	(3) TOTAL SENIOR PERSONNEL (1 - 6)			1.00	0.00	0.50	11,039
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1.	(0) POST DOCTORAL SCHOLARS			0.00	0.00	0.00	0
2.	(7) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)			19.80	0.00	0.00	143,905
3.	(5) GRADUATE STUDENTS						96,011
4.	(12) UNDERGRADUATE STUDENTS						61,680
5.	(0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)						0
6.	(1) OTHER						5,000
TOTAL SALARIES AND WAGES (A + B)							317,635
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							146,652
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							464,287
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
TOTAL EQUIPMENT							0
E. TRAVEL							9,000
1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)							9,000
2. FOREIGN							0
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						0
3.	CONSULTANT SERVICES						0
4.	COMPUTER SERVICES						12,000
5.	SUBAWARDS						169,471
6.	OTHER						0
TOTAL OTHER DIRECT COSTS							182,471
H. TOTAL DIRECT COSTS (A THROUGH G)							655,758
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)							
MTDC (Rate: 40.0000, Base: 409807)							
TOTAL INDIRECT COSTS (F&A)							163,923
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)							819,681
K. RESIDUAL FUNDS							0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							819,681
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PD NAME Kipling W Will				FOR NSF USE ONLY			
ORG. REP. NAME* Christine Luppino				INDIRECT COST RATE VERIFICATION			
		Date Checked	Date Of Rate Sheet	Initials - ORG			

SUMMARY PROPOSAL BUDGET

YEAR 3

ORGANIZATION University of California-Berkeley				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Kipling W Will				AWARD NO.	Proposed	Granted	
A. SENIOR PERSONNEL: PI/PI, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer	Funds granted by NSF (if different)
				CAL	ACAD	SUMR	
1.	Kipling W Will - PI			0.00	0.00	0.25	2,766
2.	N. Maggi Kelly - Co-PI			0.00	0.00	0.25	2,684
3.	Michelle S Koo - Co-PI			1.00	0.00	0.00	5,809
4.							
5.							
6.	(0) OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)			0.00	0.00	0.00	0
7.	(3) TOTAL SENIOR PERSONNEL (1 - 6)			1.00	0.00	0.50	11,259
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1.	(0) POST DOCTORAL SCHOLARS			0.00	0.00	0.00	0
2.	(7) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)			18.00	0.00	0.00	123,907
3.	(3) GRADUATE STUDENTS						65,973
4.	(10) UNDERGRADUATE STUDENTS						54,000
5.	(0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)						0
6.	(1) OTHER						5,000
TOTAL SALARIES AND WAGES (A + B)							260,139
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							127,434
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							387,573
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)							5,000
2. FOREIGN							0
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						3,000
3.	CONSULTANT SERVICES						0
4.	COMPUTER SERVICES						12,000
5.	SUBAWARDS						172,809
6.	OTHER						0
TOTAL OTHER DIRECT COSTS							188,809
H. TOTAL DIRECT COSTS (A THROUGH G)							581,382
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) MTDC (Rate: 40.0000, Base: 345477)							
TOTAL INDIRECT COSTS (F&A)							138,191
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)							719,573
K. RESIDUAL FUNDS							0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							719,573
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PI NAME Kipling W Will				FOR NSF USE ONLY			
ORG. REP. NAME* Christine Luppino				INDIRECT COST RATE VERIFICATION			
		Date Checked		Date Of Rate Sheet		Initials - ORG	

SUMMARY PROPOSAL BUDGET Cumulative

ORGANIZATION University of California-Berkeley				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Kipling W Will				AWARD NO.	Proposed	Granted	
A. SENIOR PERSONNEL: PI/PI, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer	Funds granted by NSF (if different)
		CAL	ACAD	SUMR			
1.	Kipling W Will - PI	0.00	0.00	0.75	8,137		
2.	N. Maggi Kelly - Co-PI	0.00	0.00	0.75	7,896		
3.	Michelle S Koo - Co-PI	3.00	0.00	0.00	17,087		
4.							
5.							
6.	() OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)	0.00	0.00	0.00	0		
7.	(3) TOTAL SENIOR PERSONNEL (1 - 6)	3.00	0.00	1.50	33,120		
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)							
1.	(0) POST DOCTORAL SCHOLARS	0.00	0.00	0.00	0		
2.	(21) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	57.60	0.00	0.00	407,196		
3.	(11) GRADUATE STUDENTS				227,957		
4.	(32) UNDERGRADUATE STUDENTS				169,680		
5.	(0) SECRETARIAL - CLERICAL (IF CHARGED DIRECTLY)				0		
6.	(2) OTHER				10,000		
TOTAL SALARIES AND WAGES (A + B)					847,953		
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)					389,965		
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)					1,237,918		
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)					23,000		
2. FOREIGN					0		
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				10,000		
2.	PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION				3,000		
3.	CONSULTANT SERVICES				0		
4.	COMPUTER SERVICES				36,000		
5.	SUBAWARDS				547,974		
6.	OTHER				0		
TOTAL OTHER DIRECT COSTS					596,974		
H. TOTAL DIRECT COSTS (A THROUGH G)					1,857,892		
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)							
TOTAL INDIRECT COSTS (F&A)					467,279		
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)					2,325,171		
K. RESIDUAL FUNDS					0		
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)					2,325,171		
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PI NAME Kipling W Will				FOR NSF USE ONLY			
ORG. REP. NAME* Christine Luppino				INDIRECT COST RATE VERIFICATION			
		Date Checked	Date Of Rate Sheet	Initials - ORG			

C *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

UC Berkeley: Budget Justification

A. Senior Personnel

- a. Kipling Will - 1 week per year of summer salary for time dedicated to oversight of the project as a whole, particularly the digitization of entomological specimens and directing the digitization and image capture manager, outreach position and Project Coordinator. As lead PI, he has fiduciary responsibility for the proposed project.
- b. Maggi Kelly - 1 week per year summer salary for time dedicated to assisting on general project oversight and development of Holos, Berkeley Ecoinformatics Engine, and managing the interaction with GIF.
- c. Michelle Koo - 1 month per year summer salary for time dedicated to implementing the recruitment, training, and oversight of the georeferencing and data quality vetting of digitized data. With the Project Coordinator, Koo will help plan and conduct the training workshops in concordance with iDigBio/GBIF/VertNet best practices, acting as liaison with relevant working groups from those organizations. She will coordinate with the Holos team in development of applications and final visualization of integrated datasets.
- d. Project Coordinator (TBN) - 50%, for years 1-3. Under the leadership of the project PIs, the coordinator will oversee the general administrative functions, staffing, and training needs of the project. The coordinator will be responsible for coordinating workflow within and among digitization components at UCB and the UC reserves as well as ensure that digitization efforts are conducted according to appropriate digitization standards. S/he will coordinate advisory and technical meetings and training events at UCB and will coordinate the hiring of staff and students. S/he will also manage the graduate and undergraduate students. The coordinator will manage the budget and oversee the day-to-day running of the project and report writing according to NSF requirements.
- e. Gordon Nishida - 15%, for years 1-3. Nishida will act as the Essig Museum digitization and image capture manager. He will oversee the day to day image capture and pre-NfN pipeline activities. He will assist in training students in digitization and will head up the Essig Museum's georeferencing and error checking of data. He will work directly with the outreach specialist and the NfN application programmers.

Senior Personnel	Year 1	Year 2	Year 3
PI Will	2,695	2,712	2,766
Co-PI Kelly	2,580	2,632	2,684
Co-PI Koo	5,583	5,695	5,809
Project Coordinator (TBN)	23,788	24,264	24,749
Digit. Manager Nishida	10,293	19,653	11,026

B. Other Personnel

- a. Outreach Specialist (TBN) - 15% for years 1-3. To maintain a consistent, high level of interaction with citizen scientist volunteers on the Notes from Nature (NfN) website, the project must engage them on the talk and discussion boards, write blogs to educate them and answer questions related to the process of transcription and why these data matter. To bring in a stream of new users, we must engage the community at NfN and beyond frequently and develop and promote events, through social media and other outlets. This position will be responsible for maintaining this interaction and actively coordinate between the project's science teams and the NfN community. Without this outreach effort, the "crowd" of NfN user will decline and the efficiency in doing this kind of transcription will be lost.

- b. Application Programmers (3 TBN) - 1 @ 50% for years 1-3; 2 @ 25% for years 1-2 & 15% for year 3. Programming for this effort will be needed to manage image uploads to NfN and process returned transcriptions. Programming is needed for error checking of both newly digitized data and cleanup and migration of legacy data. Programmers will coordinate the data side at UCB with interface development at U Colorado. Programmers will ensure migration of newly captured data to Holos so that all data will be accessible in both the existing API and website for researchers and the public.
- c. GIF Director (Kevin Koy) - 10% for years 1-3. Salary support for oversight of GIF Apps programmers time and GSR. He will supervise the programming efforts to ensure the applications are optimized to meet the goals of project.
- d. Graduate students - 9 semesters of GRS, 1 summer GSR will be employed throughout to manage and train undergraduates, to assist in the digitization of specimens and georeferencing. Each of the BNHMs will have GSRs assigned to assist in digitization, data entry and georeferencing tasks as appropriate. Graduate students will head up the groups traveling to UC reserves to digitize and transport specimens. One GSR (step 6) in year 2 will work with GIF App programmers to provide GIS database support for the Holos Berkeley Ecoinformatics Engine.
- e. Undergraduate students will be employed to capture images of labels for the CalBug pipeline to NfN, to participate in the UC Reserve collection digitization teams, and assist in georeferencing records. 10 to 12 Students will be divided over each of the BNHMs each semester and will work directly for supervising personnel on digitization and georeferencing.
- f. Interns - 1 in each of years 2-3. We will recruit advanced undergraduates or recent post-baccalaureates to an internship focused on biodiversity informatics, specifically to work on data quality and efficiency applications that may allow for streamlined workflow, better reporting, and thus higher quality fit-for-use data. Products from the internship will be highlighted and accessible through Holos as well as other project related venues and coordinated with tool dissemination at iDigBio. The interns will work directly with co-PIs and the Holos engineers.

Other Personnel	Year 1	Year 2	Year 3
Outreach Coordinator	5,416	5,606	5,802
Application Programmers	51,914	53,731	55,612
Koy, GIF Director	9,587	9,923	10,270
Graduate Students	65,973	96,011	65,973
Undergraduate Students	54,000	61,680	54,000
Interns	-	5,000	5,000

C. Fringe Benefits

- a. Benefits for the PI and co-PIs have been calculated at 18.10% of payroll. For the Project Coordinator and Michelle Koo, benefits have been calculated for an academic position: Y1 at 36.8%, Y2 at 39.5%, and Y3 at 42.1%. For the programmers, Gordon Nishida, and the GIF Manager, benefits are calculated for staff positions at: Y1 at 44.6%, Y2 at 47.6%, and Y3 at 50.5%. The outreach position benefits are calculated at: Y1 at 18.1%, Y2 at 19.1% and Y3 at 20%. Interns, undergraduate and graduate student research assistant benefits are at 0%. In addition, funds are budgeted for the graduate students' fee remission (in-state fees), which is included in the fringe benefit line item. Graduate students who are supported at 45% or more time are eligible for the full fee remission

(including non-resident tuition), which includes coverage of the SHIP fee plus campus fees. It is UC Berkeley's practice to similarly compensate students in non-sponsored as well as sponsored activities.

D. Travel

- a. Domestic - Each year, coordination and training meetings will be held at UCB. Participants from LACM and Page Museums and from CU will attend. These will be 2 day events with specific training related to digitization georeferencing and analysis for student participants. Training will also be combined for all primary personnel with meetings to discuss progress, coordinate efforts and troubleshoot issues. This also covers travel by digitization teams from UCB to each of the UC reserves that have collections.

Travel	Year 1	Year 2	Year 3
Coordination & Training Meetings	4,000	4,000	2,000
Field Stations	5,000	5,000	5,000

F. Other costs

- b. Materials and supplies- Funds are requested to cover curatorial supplies such as archival supplies to print specimen tags and other incidentals associated with processing specimens at volume. An additional digitization station is required for the Essig Museum of Entomology (i.e., computer, camera, light and lens totalling \$3,000). Additional computers are required for the georeferencing stations in the UCMP and MVZ (\$4,000). Shipping is required for some specimens that may be shipped by mail from UC reserves (\$1,000 per year).
- c. Publication cost - We expect to publish on the protocols developed and efficiencies achieved during the project in Year 3.
- d. Computer services - These are ongoing costs for the following computer-related services: 1) Amazon Web Services is a cloud-based virtual machine where the Holos Ecoengine geodatabase and web portal are deployed (estimated at \$6,000.00 per year); 2) UC Berkeley's IS&T will supply system administration, colocation and backup fees for the server which houses the main database and image storage as well as installation of the project website content management system (such as Wordpress or Drupal) and assist with storage needs through the life of the project (\$6,000 per year).
- e. Subawards - LACM and Page Museums will digitize paleontological specimens, and will submit their own budget. The University of Colorado, Boulder, will develop additional interfacing and features of the Notes from Nature web site, and will submit their own budget.

Indirect Costs—Indirect costs calculated at the UCB rate for Other Sponsored activity of FY 2015-2017 (40.0%).

Other Costs	Year 1	Year 2	Year 3
Materials and Supplies: Digitization stations (cameras, lights, lenses, computers) Shipping.	8,000	1,000	1,000
Publication costs	-	-	3,000
Computer Services: Amazon Web Services	6,000	6,000	6,000
Computer Services: IST	6,000	6,000	6,000

Cost per specimen: \$2.46 [Total project cost/total number specimens = \$2,325,171 / 944,528].

SUMMARY PROPOSAL BUDGET

YEAR 1

ORGANIZATION Los Angeles County of Natural History Museum				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR John W Harris				AWARD NO.	Proposed	Granted	
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		Funds Requested By proposer	Funds granted by NSF (if different)
		CAL	ACAD	SUMR			
1.		0.00	0.00	0.00			
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. (2) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)		24.00	0.00	0.00		84,000	
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)						84,000	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)						20,160	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)						104,160	
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
Flatbed scanner -1, 18"x24", LACM				\$	10,000		
Flatbed scanner -1, 18"x24", PAGE					10,000		
TOTAL EQUIPMENT						20,000	
E. TRAVEL 1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)						2,500	
2. FOREIGN						0	
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						9,000	
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION						0	
3. CONSULTANT SERVICES						0	
4. COMPUTER SERVICES						0	
5. SUBAWARDS						0	
6. OTHER						0	
TOTAL OTHER DIRECT COSTS						9,000	
H. TOTAL DIRECT COSTS (A THROUGH G)						135,660	
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)							
MTDC (Rate: 38.8500, Base: 115660)							
TOTAL INDIRECT COSTS (F&A)						44,934	
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)						180,594	
K. RESIDUAL FUNDS						0	
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)						180,594	
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PD NAME John W Harris				FOR NSF USE ONLY			
ORG. REP. NAME* Christine Luppino				INDIRECT COST RATE VERIFICATION			
		Date Checked	Date Of Rate Sheet	Initials - ORG			

SUMMARY PROPOSAL BUDGET

YEAR 2

ORGANIZATION Los Angeles County of Natural History Museum				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR John W Harris				AWARD NO.	Proposed	Granted	
				A. SENIOR PERSONNEL: PI/PI, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)			
				CAL	ACAD	SUMR	
1.				0.00	0.00	0.00	
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. (2) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				24.00	0.00	0.00	85,680
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)							85,680
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							20,563
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							106,243
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)							2,500
2. FOREIGN							0
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							4,000
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							0
3. CONSULTANT SERVICES							0
4. COMPUTER SERVICES							0
5. SUBAWARDS							0
6. OTHER							0
TOTAL OTHER DIRECT COSTS							4,000
H. TOTAL DIRECT COSTS (A THROUGH G)							112,743
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) MTDC (Rate: 38.8500, Base: 112743)							
TOTAL INDIRECT COSTS (F&A)							43,801
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)							156,544
K. RESIDUAL FUNDS							0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							156,544
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PI NAME John W Harris				FOR NSF USE ONLY			
ORG. REP. NAME* Christine Luppino				INDIRECT COST RATE VERIFICATION			
		Date Checked	Date Of Rate Sheet	Initials - ORG			

SUMMARY PROPOSAL BUDGET

YEAR 3

ORGANIZATION Los Angeles County of Natural History Museum				FOR NSF USE ONLY		
				PROPOSAL NO.	DURATION (months)	
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR John W Harris				Proposed	Granted	
				AWARD NO.		
A. SENIOR PERSONNEL: PI/PI, 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.	0.00	0.00	0.00			
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. (2) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)	24.00	0.00	0.00	87,394		
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)				87,394		
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)				20,975		
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)				108,369		
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)				2,500		
2. FOREIGN				0		
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				4,000		
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION				0		
3. CONSULTANT SERVICES				0		
4. COMPUTER SERVICES				0		
5. SUBAWARDS				0		
6. OTHER				0		
TOTAL OTHER DIRECT COSTS				4,000		
H. TOTAL DIRECT COSTS (A THROUGH G)				114,869		
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)						
MTDC (Rate: 38.8500, Base: 114869)						
TOTAL INDIRECT COSTS (F&A)				44,627		
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)				159,496		
K. RESIDUAL FUNDS				0		
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)				159,496		
M. COST SHARING PROPOSED LEVEL \$		0	AGREED LEVEL IF DIFFERENT \$			
PI/PI NAME John W Harris				FOR NSF USE ONLY		
ORG. REP. NAME* Christine Luppino				INDIRECT COST RATE VERIFICATION		
		Date Checked	Date Of Rate Sheet	Initials - ORG		

SUMMARY PROPOSAL BUDGET Cumulative

ORGANIZATION Los Angeles County of Natural History Museum				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR John W Harris				AWARD NO.	Proposed	Granted	
				A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)			
				CAL	ACAD	SUMR	
1.				0.00	0.00	0.00	
2.							
3.							
4.							
5.							
6.	() OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)			0.00	0.00	0.00	0
7.	(0) 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.	(6) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)			72.00	0.00	0.00	257,074
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)							257,074
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							61,698
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							318,772
D. EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM EXCEEDING \$5,000.)							
				\$		20,000	
TOTAL EQUIPMENT							20,000
E. TRAVEL							
	1. DOMESTIC (INCL. CANADA, MEXICO AND U.S. POSSESSIONS)						7,500
	2. FOREIGN						0
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						17,000
2.	PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION						0
3.	CONSULTANT SERVICES						0
4.	COMPUTER SERVICES						0
5.	SUBAWARDS						0
6.	OTHER						0
TOTAL OTHER DIRECT COSTS							17,000
H. TOTAL DIRECT COSTS (A THROUGH G)							363,272
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)							
TOTAL INDIRECT COSTS (F&A)							133,362
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)							496,634
K. RESIDUAL FUNDS							0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							496,634
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PD NAME John W Harris				FOR NSF USE ONLY			
ORG. REP. NAME* Christine Luppino				INDIRECT COST RATE VERIFICATION			
		Date Checked		Date Of Rate Sheet		Initials - ORG	

Budget Justification

SALARIES & FRINGE BENEFITS

Funds are requested for 2 Assistant Collections Managers, one for Vertebrate Paleontology and one for the Rancho La Brea Department at the Page Museum. These positions must be held by persons familiar with both paleontological and osteological data, and with museum databases. They will need to scan catalog pages, manually enter data, check accuracy, normalize these data, rename files, upload and download data as required and backup files. They will participate in a variety of Public Programs at the Museum, as well as train volunteers to assist in their efforts. They will also participate in the Notes from Nature talk and discussion boards in order answer questions posed by citizen scientist volunteers about the specimens being digitized and paleontology in general. Since the facilities are separated by a 45 minute drive and hold large collections of different species from different localities, this work cannot be accomplished by the same person.

EQUIPMENT

Two 18" x 24" flatbed scanners are requested to scan catalog pages, one for LACM and one for the Page Museum. These will be used to start the digitization process and allow scanned documents to be uploaded to the internet so that the public can enter the records as part of a crowd sourcing citizen science initiative.

TRAVEL

\$7,500 is requested to help in travel to related costs for conferences and digitization workshops such as and SPNHC and iDigBio over a 3 year period.

OTHER

Two computer stations are requested to hold the specimen record data with external backup drives, one for LACM and one for the Page Museum. These computers will also be used to upload records online, receive citizen science returned data files and to the Museum's database EMu. Software Adobe products are requested to organize files, tag metadata, etc. one for LACM and one for Page Museum and minor equipment to cover office and computer supplies.

The Natural History Museum of Los Angeles County has negotiated an indirect cost rate of 38.85% with NSF

SUMMARY PROPOSAL BUDGET

YEAR 1

ORGANIZATION University of Colorado at Boulder				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Robert W Guralnick				AWARD NO.	Proposed	Granted	
A. SENIOR PERSONNEL: PI/PI, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer	Funds granted by NSF (if different)
		CAL	ACAD	SUMR			
1.		0.00	0.00	0.00			
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.)		2.00	0.00	0.00		12,450	
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)						12,450	
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)						4,009	
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)						16,459	
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)						0	
2. FOREIGN						0	
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						0	
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION						0	
3. CONSULTANT SERVICES						0	
4. COMPUTER SERVICES						0	
5. SUBAWARDS						0	
6. OTHER						0	
TOTAL OTHER DIRECT COSTS						0	
H. TOTAL DIRECT COSTS (A THROUGH G)						16,459	
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) MTDC (Rate: 52.5000, Base: 16459)							
TOTAL INDIRECT COSTS (F&A)						8,641	
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)						25,100	
K. RESIDUAL FUNDS						0	
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)						25,100	
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PI NAME Robert W Guralnick				FOR NSF USE ONLY			
ORG. REP. NAME* Christine Luppino				INDIRECT COST RATE VERIFICATION			
		Date Checked	Date Of Rate Sheet	Initials - ORG			

SUMMARY PROPOSAL BUDGET

YEAR 2

ORGANIZATION University of Colorado at Boulder				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Robert W Guralnick				AWARD NO.	Proposed	Granted	
				A. SENIOR PERSONNEL: PI/PI, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)			
				CAL	ACAD	SUMR	
1.				0.00	0.00	0.00	
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.)				1.00	0.00	0.00	6,412
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)							6,412
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							2,065
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							8,477
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)							0
2. FOREIGN							0
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							0
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							0
3. CONSULTANT SERVICES							0
4. COMPUTER SERVICES							0
5. SUBAWARDS							0
6. OTHER							0
TOTAL OTHER DIRECT COSTS							0
H. TOTAL DIRECT COSTS (A THROUGH G)							8,477
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) MTDC (Rate: 52.5000, Base: 8477)							
TOTAL INDIRECT COSTS (F&A)							4,450
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)							12,927
K. RESIDUAL FUNDS							0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							12,927
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PI NAME Robert W Guralnick				FOR NSF USE ONLY			
ORG. REP. NAME* Christine Luppino				INDIRECT COST RATE VERIFICATION			
		Date Checked		Date Of Rate Sheet		Initials - ORG	

SUMMARY PROPOSAL BUDGET

YEAR 3

ORGANIZATION University of Colorado at Boulder				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Robert W Guralnick				AWARD NO.	Proposed	Granted	
A. SENIOR PERSONNEL: PI/PI, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer	Funds granted by NSF (if different)
				CAL	ACAD	SUMR	
1.				0.00	0.00	0.00	
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.)				1.00	0.00	0.00	6,604
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)							6,604
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							2,126
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							8,730
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)							0
2. FOREIGN							0
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							0
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							0
3. CONSULTANT SERVICES							0
4. COMPUTER SERVICES							0
5. SUBAWARDS							0
6. OTHER							0
TOTAL OTHER DIRECT COSTS							0
H. TOTAL DIRECT COSTS (A THROUGH G)							8,730
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE) MTDC (Rate: 52.5000, Base: 8730)							
TOTAL INDIRECT COSTS (F&A)							4,583
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)							13,313
K. RESIDUAL FUNDS							0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							13,313
M. COST SHARING PROPOSED LEVEL \$ 0				AGREED LEVEL IF DIFFERENT \$			
PI/PI NAME Robert W Guralnick				FOR NSF USE ONLY			
ORG. REP. NAME* Christine Luppino				INDIRECT COST RATE VERIFICATION			
		Date Checked	Date Of Rate Sheet	Initials - ORG			

SUMMARY PROPOSAL BUDGET Cumulative

ORGANIZATION University of Colorado at Boulder				FOR NSF USE ONLY			
				PROPOSAL NO.	DURATION (months)		
PRINCIPAL INVESTIGATOR / PROJECT DIRECTOR Robert W Guralnick				AWARD NO.			
A. SENIOR PERSONNEL: PI/PI, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in brackets)				NSF Funded Person-months		Funds Requested By proposer	Funds granted by NSF (if different)
				CAL	ACAD	SUMR	
1.				0.00	0.00	0.00	
2.							
3.							
4.							
5.							
6. () OTHERS (LIST INDIVIDUALLY ON BUDGET JUSTIFICATION PAGE)				0.00	0.00	0.00	0
7. (0) 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. (3) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)				4.00	0.00	0.00	25,466
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)							25,466
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)							8,200
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)							33,666
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)							0
2. FOREIGN							0
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							0
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION							0
3. CONSULTANT SERVICES							0
4. COMPUTER SERVICES							0
5. SUBAWARDS							0
6. OTHER							0
TOTAL OTHER DIRECT COSTS							0
H. TOTAL DIRECT COSTS (A THROUGH G)							33,666
I. INDIRECT COSTS (F&A)(SPECIFY RATE AND BASE)							
TOTAL INDIRECT COSTS (F&A)							17,674
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)							51,340
K. RESIDUAL FUNDS							0
L. AMOUNT OF THIS REQUEST (J) OR (J MINUS K)							51,340
M. COST SHARING PROPOSED LEVEL \$				0	AGREED LEVEL IF DIFFERENT \$		
PI/PI NAME Robert W Guralnick				FOR NSF USE ONLY			
ORG. REP. NAME* Christine Luppino				INDIRECT COST RATE VERIFICATION			
		Date Checked		Date Of Rate Sheet		Initials - ORG	

C *ELECTRONIC SIGNATURES REQUIRED FOR REVISED BUDGET

Budget Justification
University of Colorado, Boulder

A&B. Personnel (salaries include a 3% inflationary increase each year)

A1. Programmer: We request funds to hire a web programmer who has experience with front-end web design, and is proficient in current tools (HTML5, CSS3, JScript). The programmer salary is set to be competitive given market prices for such a position. The commitment to the project will be 2 months in Year 1 of the grant and 1 month thereafter. The programmer will be expected to take part in routine meetings with other informatics staff and will also have some responsibilities for overall code management for the Notes from Nature project, which is expected to be a minimal extra commitment covered through this funding and other sources.

Current and Pending Support

(See GPG Section II.D.8 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: Aisling Farrell	Other agencies (including NSF) to which this proposal has been/will be submitted.		
Support: <input type="checkbox"/> Current <input checked="" type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support Project/Proposal Title: <i>Digitization TCN: Digitization and Integration of Ecoinformatics Data from the Californian Biome Reserve</i>			
Source of Support: NSF Total Award Amount: \$496,634 Total Award Period Covered 07/01/14 – 06/30/17 Location of Project: UC Berkeley, UC Natural Reserve System, LACM Person-Months Per Year Committed to the Project. Cal: 0.05 Acad: Sumr:			
Support: <input type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *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: <input type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *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: <input type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *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: <input type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *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:			

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

Current and Pending Support

(See GPG Section II.D.8 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: Peggy Fiedler	Other agencies (including NSF) to which this proposal has been/will be submitted.		
Support: <input checked="" type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support Project/Proposal Title: University of California Natural Reserve System – Cyberinfrastructure Renovation Source of Support: NSF OIA-09629 16 Total Award Amount: \$710,115 Total Award Period Covered 10/01/10- 09/31/13 Location of Project: UC NRS reserves across California Person-Months Per Year Committed to the Project. Cal: 0.05 Acad: Sumr:			
Support: <input checked="" type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support Project/Proposal Title: Planning Workshops for the Development and Implementation of the University of California Natural Reserve System Strategic Plan Source of Support: NSF DBI-1249294 Total Award Amount: \$24,999 Total Award Period Covered: 12/01/2012 – 11/30/2014 Location of Project: UC NRS reserves across California Person-Months Per Year Committed to the Project. Cal: 0.05 Acad: Sumr:			
Support: <input type="checkbox"/> Current <input checked="" type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support Project/Proposal Title: <i>Digitization TCN</i> : Digitization and Integration of Ecoinformatics Data from the Californian Biome Source of Support: NSF Total Award Amount: \$2,325,171 Total Award Period Covered: 07/01/14 – 06/30/17 Location of Project: UC Berkeley, UC Natural Reserve System Person-Months Per Year Committed to the Project. Cal: 0.2 Acad: Sumr:			
Support: <input type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *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: <input type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *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:			

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

Current and Pending Support

(See GPG Section II.D.8 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: Rosemary G. Gillespie	Other agencies (including NSF) to which this proposal has been/will be submitted.		
Support: <input type="checkbox"/> Current <input checked="" type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support			
Project/Proposal Title: Molecular Basis for Shifts in Cryptic Coloration in an Adaptive Radiation of Hawaiian Spiders			
Source of Support: NSF			
Total Award Amount: : \$ 590,554		Total Award Period Covered: 07/01/14 – 07/01/17	
Location of Project: UC Berkeley			
Person-Months Per Year Committed to the Project.		Cal:	Acad: Sumr: 0.25
Support: <input checked="" type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support			
Project/Proposal Title: Dimensions: Collaborative Research: A community level approach to understanding speciation in Hawaiian lineages			
Source of Support: NSF			
Total Award Amount: : \$ 1,061,370		Total Award Period Covered: 03/01/13 – 03/01/18	
Location of Project: UC Berkeley			
Person-Months Per Year Committed to the Project.		Cal:	Acad: Sumr: 1.00
Support: <input checked="" type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support			
Project/Proposal Title: Collaborative Research: Calbug, an interactive database using arthropods to examine impacts of climate change and habitat modification			
Source of Support: NSF			
Total Award Amount: \$ 975,253 + \$7,000 REU		Total Award Period Covered: 09/01/10 – 09/01/15	
Location of Project: UC Berkeley			
Person-Months Per Year Committed to the Project.		Cal:	Acad: Sumr: 0.25
Support: <input checked="" type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support			
Project/Proposal Title: Coupling Biodiversity Dynamics and Human Impacts in the Islands of Polynesia			
Source of Support: IIS, UC Berkeley			
Total Award Amount: \$ 53,400		Total Award Period Covered: 04/01/10 – 12/01/13	
Location of Project: UC Berkeley			
Person-Months Per Year Committed to the Project.		Cal: 0.25	Acad: Sumr:
Support: <input checked="" type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support			
Project/Proposal Title: Genomics of repeatedly evolving color diversity in the polymorphic Hawaiian happy face spider			
Source of Support: NSF			
Total Award Amount: \$ 697,463 + \$7,000 REU		Total Award Period Covered: 07/15/09 – 07/15/14	
Location of Project: UC Berkeley			
Person-Months Per Year Committed to the Project.		Cal:	Acad: Sumr: 1.0
Support: <input checked="" type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support			
Project/Proposal Title: Track 2, GK-12 Exploring California Biodiversity			
Source of Support: NSF			
Total Award Amount: \$ 1,999,942		Total Award Period Covered: 01/01/06 – 12/31/13	
Location of Project: UC Berkeley			
Person-Months Per Year Committed to the Project.		Cal: 0.5	Acad: Sumr:



Current and Pending Support

(See GPG Section II.D.8 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: Rosemary Gillespie	Other agencies (including NSF) to which this proposal has been/will be submitted.		
*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.			
Support: <input checked="" type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support			
Project/Proposal Title: Informatics Engine for Understanding Biotic Response to Global Change			
Source of Support: Keck Foundation			
Total Award Amount: \$1,500,000		Total Award Period Covered: 2012-2015	
Location of Project: UC Berkeley			
Person-Months Per Year Committed to the Project.		Cal: 0.1	Acad:
Sumr:			
Support: <input checked="" type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support			
Project/Proposal Title: Berkeley Initiative for Global Change Biology			
Source of Support: Moore Foundation			
Total Award Amount: \$1,044,334		Total Award Period Covered: 2011-2014	
Location of Project: UC Berkeley			
Person-Months Per Year Committed to the Project.		Cal: 0.1	Acad:
Sumr:			
Support: <input type="checkbox"/> Current <input checked="" type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support			
Project/Proposal Title: <i>Digitization TCN: Digitization and Integration of Ecoinformatics Data from the Californian Biome</i>			
Source of Support: NSF			
Total Award Amount: \$2,325,171		Total Award Period Covered: 07/01/14 – 06/30/17	
Location of Project: UC Berkeley, UC Natural Reserve System			
Person-Months Per Year Committed to the Project.		Cal: 0.1	Acad:
Sumr:			
Support: <input type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *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:			



Current and Pending Support

Principle Investigator: **Robert Guralnick**

PI except where listed as a Co-PI or Senior Personnel

Senior Personnel, pending

Project Title: *Digitization TCN*: Digitization and Integration of Ecoinformatics Data from the Californian Biome

Amount of Award: \$51,340

Source of Support: NSF ADBC

Period covered: 07/01/14 – 06/30/17

Person Months Committed to Project: 0 months summer

Collaborative PI, pending

Project Title: Collaborative Research: ABI Sustaining: Advancing the VertNet Data Network

Amount of Award: \$232,000

Source of Support: NSF DBI Advances in Biological Informatics

Period covered: May 1, 2014 to April 30, 2017

Person Months Committed to Project: .15 months summer

Collaborative PI, pending

Project title: Historic and contemporary eco-evolutionary responses to climate change: Implications for trait-based predictive modeling

Amount of award: \$229,000

Source of Support: NSF DEB Population and Community Ecology Program

Period covered: May 1, 2014 to April 30, 2017

Person Months Committed to Project: .3 months summer

Collaborative PI, pending

Project title: ABI Development: Advancing Map of Life's Impact and Capacity for Sharing, Integrating, and Using Global Spatial Biodiversity Knowledge

Amount of award: \$909,541

Source of Support: NSF ABI

Period covered: August 1, 2013 to July 31, 2016

Person Months Committed to Project: .6 month summer

Co-PI, pending

Project title: Cooperation between the EU and the US in Ecology (E-COOPEUS)

Amount of award: \$286,167 to CU Boulder

Source of Support: NSF SAVI

Period covered: Oct 1, 2013 to Sept. 30, 2016

Person months committed to project: 0 months

Co-PI.

Project title: Year 6 continued development of the data component for the national marine theme of NBII (OBIS-USA)

Amount of award: \$144,000

Source of Support: NBII/USGS

Period covered: 12/01/13-11/30/14

Person month committed to project: 0 months summer 2012

Current and Pending Support Continued

Principle Investigator: **Robert Guralnick**

PI except where listed as a Co-PI or Senior Personnel

Co-PI

Project title: Linking Map of Life and Google Earth Engine to map global biodiversity and predict biological impacts and risks from climate change

Amount of award: \$30,000 to CU Boulder

Source of Support: Google University Researcher Grant

Period covered: 8/1/2012-7/31/2013

Person months committed to project: 0 months

Collaborative PI

Project title: Dimensions: Collaborative Research: Assembly and evolution of the Amazonian biota and its environment: an integrated approach

Amount of award: \$211,066 to CU Boulder

Source of Support: NSF Dimensions of Biodiversity

Period covered: 9/1/12-8/31/17

Person months committed to project: .15 months summer 2011-2016

Co-PI

Project title: MRI: Acquisition of a Scalable Petascale Storage Infrastructure for Data-Collections and Data-Intensive Discovery

Amount of award: \$699,945

Source of support: NSF MRI

Period covered: 10/1/2011-9/30/2014

Person months committed to the project: 0 months

PI

Project title: Collaborative Research: ABI Development:: VertNet, a New Model for Biodiversity Networks

Amount of Award: \$338,569

Source of support: NSF DBI Advances in Biological Informatics

Period covered: 4/1/11-3/31/14

Person months committed to the project: .3 months summer 2011-2014.

Colorado PI

Project title: Integrating global species distributions, remote sensing information and climate station data to assess recent biodiversity response to climate change.

Amount of Award: , \$1.67mil total budget, ~188K to CU Boulder

Source of support: NASA Climate and Biological Response: Research and Applications program

Period covered: 3/1/11-2/28/15

Person months committed to the project: 0 months summer 2011-2015

Current and Pending Support Continued

Principle Investigator: **Robert Guralnick**

PI except where listed as a Co-PI or Senior Personnel

Colorado PI

Project title: Collaborative Research: BiSciCol toolkit: Towards a tagging and tracking infrastructure for biodiversity science collections.

Amount of award: \$210,000 to CU Boulder

Source of Support: NSF IBRC

Period covered: 9/1/10-8/30/13

Person months committed to project: .3 months summer 2010-2012

Colorado PI

Project title: Collaborative Research: Map of Life: An infrastructure for integrating global species distribution knowledge

Amount of Award: \$459,000 to CU

Source of Support: NSF ABI

Period Covered: 6/1/10-5/31/14

Person months committed to project: .6 months summer 2010-2012

Current and Pending Support

(See GPG Section II.D.8 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 Harris	Other agencies (including NSF) to which this proposal has been/will be submitted.		
Support: <input type="checkbox"/> Current <input checked="" type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support			
Project/Proposal Title: <i>Digitization TCN: Digitization and Integration of Ecoinformatics Data from the Californian Biome Reserve</i>			
Source of Support: NSF			
Total Award Amount: \$496,634		Total Award Period Covered 07/01/14 – 06/30/17	
Location of Project: UC Berkeley, UC Natural Reserve System, LACM			
Person-Months Per Year Committed to the Project. Cal: 0.05 Acad: Sumr:			
Support: <input type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *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: <input type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *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: <input type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *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:			

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

Current and Pending Support

(See GPG Section II.D.8 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: Nina Maggi Kelly	Other agencies (including NSF) to which this proposal has been/will be submitted.
--------------------------------	---

Support:	<input checked="" type="checkbox"/> Current	<input type="checkbox"/> Pending	<input type="checkbox"/> Submission Planned in Near Future	<input type="checkbox"/> *Transfer of Support
Project/Proposal Title: Advanced Geospatial Data Delivery and Visualization Tools for Communication about Climate Change and Ecosystem Adaptation				
Source of Support: USDI Geological Survey (G12AC20086)				
Total Award Amount: \$428,664 Total Award Period Covered 4/15/12 – 4/14/16				
Location of Project: UC Berkeley				
Person-Months Per Year Committed to the Project. Cal: 0.5 Acad: Sumr:				

Support:	<input checked="" type="checkbox"/> Current	<input type="checkbox"/> Pending	<input type="checkbox"/> Submission Planned in Near Future	<input type="checkbox"/> *Transfer of Support
Project/Proposal Title: SNAMP - 1. Public Participation Facilitation and Research				
Source of Support: USDA Forest Service (10-CS-11052007-121)				
Total Award Amount: \$3,440,057 Total Award Period Covered: 9/16/10 – 9/15/15				
Location of Project: UC Berkeley				
Person-Months Per Year Committed to the Project. Cal: 1 Acad: Sumr:				

Support:	<input checked="" type="checkbox"/> Current	<input type="checkbox"/> Pending	<input type="checkbox"/> Submission Planned in Near Future	<input type="checkbox"/> *Transfer of Support
Project/Proposal Title: Neighborhood Effects on Weight Change and Diabetes Risk Factors				
Source of Support: UC San Francisco (5710sc)				
Total Award Amount: \$430,264 Total Award Period Covered: 8/25/09 – 7/31/14				
Location of Project: San Francisco				
Person-Months Per Year Committed to the Project. Cal: 1 Acad: Sumr:				

Support:	<input checked="" type="checkbox"/> Current	<input type="checkbox"/> Pending	<input type="checkbox"/> Submission Planned in Near Future	<input type="checkbox"/> *Transfer of Support
Project/Proposal Title: Maintenance of Web-Based Mapping Tools for Sudden Oak Death Management				
Source of Support: USDA Miscellaneous (20121943)				
Total Award Amount: \$23,631 Total Award Period Covered: 7/1/12 – 12/31/13				
Location of Project: UC Berkeley				
Person-Months Per Year Committed to the Project. Cal: 0.2 Acad: Sumr:				

Support:	<input checked="" type="checkbox"/> Current	<input type="checkbox"/> Pending	<input type="checkbox"/> Submission Planned in Near Future	<input type="checkbox"/> *Transfer of Support
Project/Proposal Title: Advanced Remote Sensing to Quantify Temperate Peatland Capacity for Below Ground Carbon Capture				
Source of Support: USDI Geological Survey (G11AC20013)				
Total Award Amount: \$325,862 Total Award Period Covered: 1/12/11 – 1/31/14				
Location of Project: UC Berkeley				
Person-Months Per Year Committed to the Project. Cal: 0.5 Acad: Sumr:				

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

Current and Pending Support

(See GPG Section II.D.8 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: Nina Maggi Kelly	Other agencies (including NSF) to which this proposal has been/will be submitted.		
Support: <input checked="" type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support Project/Proposal Title: LiDAR survey of Tahoe National Forest Source of Support: USDA Forest Service (13-PA-11051700-028) Total Award Amount: \$750,000 Total Award Period Covered 8/14/13 – 8/13/18 Location of Project: UC Berkeley Person-Months Per Year Committed to the Project. Cal: 0.5 Acad: Sumr:			
Support: <input checked="" type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support Project/Proposal Title: SEES FELLOWS: SUSTAINABILITY AND SAFETY IN THE PACIFIC WEST'S NATIONAL PARKS Source of Support: NSF (CHE-1314091) Total Award Amount: \$474,805 Total Award Period Covered: 9/1/13 – 8/31/16 Location of Project: UC Berkeley Person-Months Per Year Committed to the Project. Cal: 0.5 Acad: Sumr:			
Support: <input checked="" type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support Project/Proposal Title: Informatics Engine for Understanding Biotic Response to Global Change Source of Support: William M. Keck Foundation (32510) Total Award Amount: \$1,500,000 Total Award Period Covered: 1/1/12 – 21/31/13 Location of Project: UC Berkeley Person-Months Per Year Committed to the Project. Cal: 1 Acad: Sumr:			
Support: <input type="checkbox"/> Current <input checked="" type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support Project/Proposal Title: Updating and Enhancing the Cal-Adapt Website Source of Support: CEC California Energy Commission (20132701) Total Award Amount: \$515,000 Total Award Period Covered: 8/1/13 – 3/31/2015 Location of Project: UC Berkeley Person-Months Per Year Committed to the Project. Cal: 0.5 Acad: Sumr:			
Support: <input type="checkbox"/> Current <input checked="" type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support Project/Proposal Title: Improved Integration of Remote Sensing Data in Adaptive Forest Management and Planning Source of Support: Society for Conservation Biology (20130691) Total Award Amount: \$168,630 Total Award Period Covered: 7/1/13 – 6/30/15 Location of Project: UC Berkeley Person-Months Per Year Committed to the Project. Cal: 0.5 Acad: Sumr:			
*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.			



Current and Pending Support

(See GPG Section II.D.8 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: Nina Maggi Kelly	Other agencies (including NSF) to which this proposal has been/will be submitted.		
Support: <input type="checkbox"/> Current <input checked="" type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support			
Project/Proposal Title: Collaborative Research: Responses of Desert Endotherms to Rapid 20th Century Climate Change			
Source of Support: NSF			
Total Award Amount: \$719,980		Total Award Period Covered 2/1/14 – 1/31/18	
Location of Project: UC Berkeley			
Person-Months Per Year Committed to the Project.		Cal: 0.2	Acad:
Sumr:			
Support: <input type="checkbox"/> Current <input checked="" type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support			
Project/Proposal Title: Fire and Water in Sierra Nevada Forests: A Possible Win-Win			
Source of Support: ANR Competitive Grants			
Total Award Amount: \$250,000		Total Award Period Covered: 4/1/14 – 3/31/16	
Location of Project: Sierra Nevada Forests & UC Berkeley			
Person-Months Per Year Committed to the Project.		Cal: 0.5	Acad:
Sumr:			
Support: <input type="checkbox"/> Current <input checked="" type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support			
Project/Proposal Title: Quantifying ecological effects of land use and climate change using historical collections			
Source of Support: ANR Competitive Grants			
Total Award Amount: \$250,000		Total Award Period Covered: 4/1/14 – 3/31/16	
Location of Project: UC Berkeley			
Person-Months Per Year Committed to the Project.		Cal: 0.5	Acad:
Sumr:			
Support: <input type="checkbox"/> Current <input checked="" type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support			
Project/Proposal Title: Assessing the Vulnerability of Coastal Habitat to Climate Change in Six UC Natural Reserves			
Source of Support: California State Coastal Conservancy (20140547)			
Total Award Amount: \$195,838		Total Award Period Covered: 2/1/14 – 1/31/17	
Location of Project: UC Natural Reserves, UC Berkeley			
Person-Months Per Year Committed to the Project.		Cal: 1	Acad:
Sumr:			
Support: <input type="checkbox"/> Current <input checked="" type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support			
Project/Proposal Title: <i>Digitization TCN</i> : Digitization and Integration of Ecoinformatics Data from the Californian Biome			
Source of Support: NSF			
Total Award Amount: \$2,325,171		Total Award Period Covered: 07/01/14 – 06/30/17	
Location of Project: UC Berkeley, UC Natural Reserve System			
Person-Months Per Year Committed to the Project.		Cal: 0.25	Acad:
Sumr: 0.25			
*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.			



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: Michelle Koo	Other agencies (including NSF) to which this proposal has been/will be submitted.
Support: <input checked="" type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support Project/Proposal Title: ABI Development: Collaborative Research: VertNet, a New Model for Biodiversity Networks Source of Support: NSF (Senior Personnel) Total Award Amount: \$ 1,871,968 Total Award Period Covered: 05/01/11 - 04/30/14 Location of Project: UC Berkeley Person-Months Per Year Committed to the Project. Cal:0.10 Acad: 0.00 Sumr: 0.00	
Support: <input checked="" type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support Project/Proposal Title: Cataloging Hidden Archives of the Museum of Vertebrate Zoology: Increasing Integration and Accessibility for Interdisciplinary Research Source of Support: Andrew W. Mellon Foundation Total Award Amount: \$ 481,800 Total Award Period Covered: 01/01/12 - 06/30/15 Location of Project: UC Berkeley Person-Months Per Year Committed to the Project. Cal:0.10 Acad: 0.00 Sumr: 0.00	
Support: <input checked="" type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support Project/Proposal Title: Informatics Engine for Understanding Biotic Response to Global Change Source of Support: William M. Keck Foundation Total Award Amount: \$ 1,500,000 Total Award Period Covered: 01/01/12 - 12/31/13 Location of Project: UC Berkeley Person-Months Per Year Committed to the Project. Cal:0.10 Acad: 0.00 Sumr: 0.00	
Support: <input type="checkbox"/> Current <input checked="" type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support Project/Proposal Title: Collaborative Research: Responses of Desert Endotherms to Rapid 20th Century Climate Change Source of Support: NSF (Senior Personnel) Total Award Amount: \$ 719,980 Total Award Period Covered: 02/01/14 - 01/31/18 Location of Project: UC Berkeley Person-Months Per Year Committed to the Project. Cal:0.25 Acad: 0.00 Sumr: 0.00	
Support: <input type="checkbox"/> Current <input checked="" type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support Project/Proposal Title: Collaborative Research: An Integrative Study of the Avian Suture Zone in the Western United States using Genetic, Behavioral and GIS Methods Source of Support: NSF Total Award Amount: \$ 557,968 Total Award Period Covered: 04/01/14 - 03/31/17 Location of Project: UC Berkeley Person-Months Per Year Committed to the Project. Cal:0.25 Acad: 0.00 Summ: 0.00	
*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.	

Current and Pending Support

(See GPG Section II.D.8 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: Michelle Koo Continued 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: *Digitization TCN*: Digitization and Integration of Ecoinformatics Data from the Californian Biome Reserve

Source of Support: NSF
Total Award Amount: \$2,516,893 Total Award Period Covered 07/01/14 – 06/30/17
Location of Project: UC Berkeley, UC Natural Reserve System, LACM
Person-Months Per Year Committed to the Project. Cal: 1 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: 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: 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: 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: Sumr:

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

Current and Pending Support

(See GPG Section II.D.8 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: Kevin Koy	Other agencies (including NSF) to which this proposal has been/will be submitted.		
Support: <input checked="" type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support			
Project/Proposal Title: Advanced Geospatial Data Delivery and Visualization Tools for Communication about Climate CI and Ecosystem Adaption			
Source of Support: USDI Geological Survey (G12AC20086)			
Total Award Amount: \$428,664		Total Award Period Covered 4/15/12 – 4/14/16	
Location of Project: UC Berkeley			
Person-Months Per Year Committed to the Project.		Cal: 4	Acad:
Sumr:			
Support: <input checked="" type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support			
Project/Proposal Title: Informatics Engine for Understanding Biotic Response to Global Change			
Source of Support: William M. Keck Foundation (32510)			
Total Award Amount: \$1,500,000		Total Award Amount: \$1,500,000	
Location of Project: UC Berkeley			
Person-Months Per Year Committed to the Project.		Cal: 3	Acad:
Sumr:			
Support: <input checked="" type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support			
Project/Proposal Title: Updating and Enhancing the Cal-Adapt Website			
Source of Support: CEC California Energy Commission (20132701)			
Total Award Amount: \$515,000		Total Award Amount: \$515,000	
Location of Project: UC Berkeley			
Person-Months Per Year Committed to the Project.		Cal: 4	Acad:
Sumr:			
Support: <input type="checkbox"/> Current <input checked="" type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support			
Project/Proposal Title: <i>Digitization TCN: Digitization and Integration of Ecoinformatics Data from the Californian Biome</i>			
Source of Support: NSF			
Total Award Amount: \$2,325,171		Total Award Period Covered: 07/01/14 – 06/30/17	
Location of Project: UC Berkeley, UC Natural Reserve System			
Person-Months Per Year Committed to the Project.		Cal: 1	Acad:
Sumr:			
*If this project has previously been funded by another agency, please list and furnish information for immediately preceding funding period.			



Current and Pending Support

(See GPG Section II.D.8 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: Samuel McLeod 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: *Digitization TCN: Digitization and Integration of Ecoinformatics Data from the Californian Biome Reserve*

Source of Support: NSF

Total Award Amount: \$496,634

Total Award Period Covered 07/01/14 – 06/30/17

Location of Project: UC Berkeley, UC Natural Reserve System, LACM

Person-Months Per Year Committed to the Project.

Cal: 0.05

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:

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:

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:

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:

Sumr:

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

Current and Pending Support

(See GPG Section II.D.8 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: Michael Nachman	Other agencies (including NSF) to which this proposal has been/will be submitted.
-------------------------------	---

Support: <input checked="" type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support Project/Proposal Title: Natural selection and DNA sequence variation in <i>Mus</i> Source of Support: NIH/NIGMS Total Award Amount: \$1,800,000 Total Award Period Covered: 2/01/2012 - 1/31/2016 Location of Project: U.C. Berkeley Person-Months Per Year Committed to the Project. Cal: Acad: Sumr: 1

Support: <input type="checkbox"/> Current <input checked="" type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support Project/Proposal Title: Evolutionary inference in hybrid zones using information from admixture tracts Source of Support: NIH/NIGMS Total Award Amount: \$2,668,829 Total Award Period Covered: 4/1/2014 – 3/31/2018 Location of Project: U.C. Davis, U.C. San Francisco, U.C. Berkeley, University of Michigan Person-Months Per Year Committed to the Project. Cal: Acad: Sumr: 1
--

Support: <input type="checkbox"/> Current <input checked="" type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support Project/Proposal Title: <i>Digitization TCN</i> : Digitization and Integration of Ecoinformatics Data from the Californian Biome Source of Support: NSF Total Award Amount: \$2,325,171 Total Award Period Covered: 07/01/14 – 06/30/17 Location of Project: UC Berkeley, UC Natural Reserve System Person-Months Per Year Committed to the Project. Cal: 0.2 Acad: Sumr:
--

Support: <input type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *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: <input type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *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:
--

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

Current and Pending Support

(See GPG Section II.D.8 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: Gordon Nishida	Other agencies (including NSF) to which this proposal has been/will be submitted.		
Support: <input type="checkbox"/> Current <input checked="" type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *Transfer of Support Project/Proposal Title: <i>Digitization TCN: Digitization and Integration of Ecoinformatics Data from the Californian Biome Reserve</i>			
Source of Support: NSF Total Award Amount: \$2,325,171 Total Award Period Covered 07/01/14 – 06/30/17 Location of Project: UC Berkeley, UC Natural Reserve System, LACM Person-Months Per Year Committed to the Project. Cal: 0.05 Acad: Sumr:			
Support: <input type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *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: <input type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *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: <input type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *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: <input type="checkbox"/> Current <input type="checkbox"/> Pending <input type="checkbox"/> Submission Planned in Near Future <input type="checkbox"/> *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:			

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

Current and Pending Support

(See GPG Section II.D.8 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: Kipling Will	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: Collaborative Research: Calbug, an Interactive Database
 Using Arthropods to Examine Impacts of Climate Change and
 Habitat Modification

Source of Support: NSF Award # 0956389
 Total Award Amount: \$1,230,565 Total Award Period Covered: 08/01/10 – 07/31/15

Location of Project: UC Berkeley

Person-Months Per Year Committed to the Project. Cal: 0.00 Acad: 0.00 Sumr: 1.00

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

Project/Proposal Title: Digitization TCN: Plants, Predators, and Parasitoids: A
 Model System for the Study of Tri-Trophic Associations

Source of Support: NSF
 Total Award Amount: \$77,361 Total Award Period Covered: 11/01/11 – 10/31/15

Location of Project: UC Berkeley

Person-Months Per Year Committed to the Project. Cal: 0.00 Acad: 0.00 Sumr: 0.40

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

Project/Proposal Title: DISSERTATION RESEARCH: Systematics and Diversification
 of the Aderidae (Coleoptera: Tenebrionoidea): Elucidating the
 Evolution of Sexual Dimorphism

Source of Support: NSF - DDIG
 Total Award Amount: \$17,492 Total Award Period Covered: 06/01/2013 – 12/31/2014

Location of Project: UC Berkeley

Person-Months Per Year Committed to the Project. Cal: 0.00 Acad: 0.00 Sumr: 0.00

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

Project/Proposal Title:
 Digitization TCN: Digitization and Integration of Ecoinformatics Data from the Californian Biome

Source of Support NSF
 Total Award Amount: \$2,325,171 Total Award Period Covered: 07/01/14 – 06/30/17

Location of Project UC Berkeley, UC Natural Reserve System

Person-Months Per Year Committed to the Project. Cal: 0.00 Acad: 0.00 Sumr: 0.25

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: 0.00 Acad: 0.00 Sumr: 0.00

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

I. Facilities, Equipment and other Resources

UC Berkeley Institutional Support: The Museums, Centers, PIs and senior personnel will make available their equipment and laboratories for the ADBC project. Collectively this provides many resources needed to support the proposed project, including computational resources, archival printing capabilities, imaging systems and space for personnel to work with specimens. The UC Berkeley campus provides general supplies, mail delivery, telephones, electricity, and security.

Berkeley Natural History Museums (BNHM) are comprised of six natural history museums all housed on the University of California, Berkeley, campus: the Essig Museum of Entomology, the Museum of Vertebrate Zoology, the UC & Jepson Herbaria, the UC Museum of Paleontology, the Phoebe Hearst Museum of Anthropology, and the UC Botanical Gardens. The first four listed museums are involved in this proposal. Each museum has its own space and resources and shares in additional space and resources. A digitizing center has been set-up in the southeast corner of the UC & Jepson Herbaria, with two imaging pipelines and six dedicated computers currently being used for the current NSF-funded digitizing projects that are underway.

Offices and meeting rooms – Each museum has Principal Investigators and Senior Personnel, all of whom have appointments or designated office space. Space is available for other project personnel including the project coordinator, outreach coordinator, and Essig's digitization manager (Gordon Nishida). Meetings and workshops may be held in common space between the sister museums, specifically the MVZ Library or Bioinformatics facility, the UCMP's conference room, or the UC Jepson Herbaria conference room. All rooms have wireless internet, projectors and adequate space for conferences of 20-40 people.

Computers and Networking – Between the four participating BNHM units, we have several rooms that house multiple desktop computers and servers for specimen curation, data capture, archival digitization, intranet functions, data storage and analysis, and ongoing informatics projects. These rooms are equipped with high speed internet connections and wireless networking, and have proven adequate for development and georeferencing activities related to MaNIS, HerpNet, ORNIS, and VertNet. Further, MVZ has hosted several training workshops in the past decade including georeferencing and species distribution modeling workshops for NSF (AmphibiaTree, VertNet), GBIF (HerpNet), and pre- professional conferences (e.g., SPNCH).

Other Facilities – Administrative functions of the BNHM (purchasing, human resources, contracts and grants, accounting) are supported by the staff of Research Enterprise Services, UC Berkeley. These staff members have offices within the MVZ or in campus buildings, where they are accessible by phone or email.

Biodiversity Sciences Technology group (BSCIT), <http://bscit.berkeley.edu/>, is part of the BNHM at UC Berkeley, and develops web-based, database-driven software systems for biological and natural history museum collections, biodiversity science projects, and other research projects. Our projects include genetics, Geographical Information Systems (GIS), digital images and digital documents, and collection management software and databases. BSCIT was formed in 2005 after years of successful collaborations among the Berkeley Natural History Museums, Berkeley Digital Library Project, Department of Integrative Biology, and the Information Systems and Technology on the UC Berkeley campus. BSCIT is currently supported by the Berkeley Natural History Museums, the Department of Integrative Biology, and Information Systems and Technology. BSCIT sites are hosted on an 8 CPU Linux System, running Redhat AS 5, 32 Gb RAM, and expandable SAN storage disk modules. Software development uses MySQL and Postgres databases, and Perl, PHP, Java, Flash, and Javascript for development of user interfaces. Additional hardware and software support of BSCIT systems are

available through collaboration with the central campus computing support group (Informatics Services and Technology).

Three main BNHM database systems are relevant to this proposal:

1) The Essig Museum database system, hosted in a secure campus computing facility, the BSCIT database uses open-source software LAMP (Linux OS, Apache web server, MySQL database, Perl/PHP). This provides a cross-platform, web-based system. The BSCIT system includes: (i) flexible web-based querying and browsing; (ii) real-time record creation and correction; (iii) automatic verification and data enhancement during upload process; (iv) data exports mapped to the DarwinCore (DwC) metadata standards via the Integrated Publishing Toolkit (IPT); (v) dynamic mapping on interactive Google Maps base layers; and (vii) integration of specimen images via CalPhotos, <http://calphotos.berkeley.edu/>.

2) Data in the Museum of Vertebrate Zoology (MVZ) are managed through Arctos, a collaborative and comprehensive collection management information system currently serving 21 institutions and 70 collections (<http://arctos.database.museum/>) of diverse types (e.g., vertebrates, plants, fossils, insects) and of diverse datasets, including specimen records, observations, tissues/blood, parasites, stomach contents, field notes and other documents, and media such as images, audio recordings, and video. It also provides solutions to managing and integrating collections data with object tracking (e.g., barcodes), transactions, geospatial information, people and organizations, and usage (publications, projects, citations, GenBank). Arctos integrates a GeoLocate widget, a semi-automated georeferencing tool. Arctos incorporates a set of controlled vocabularies and authorities for managing data content such as taxonomy, geography, names, parts, attributes (e.g., sex, age), identifier types, media metadata, and data licensing resulting in high data quality compared to systems where data entry is more free-form. Arctos aligns its fields to DwC standards in collaboration with Senior Personnel on the VertNet project (<http://vertnet.org>); thus, Arctos shares all data with VertNet, the Global Biodiversity Information Facility (GBIF), and other data network portals, including iDigBio via the Integrated Publishing Toolkit (IPT). Arctos has capacities for linking to other digital data repositories such as GenBank, MorphBank, DigiMorph, and Dryad. Arctos is entirely cross-platform and web-based, currently run on an enterprise Oracle virtual private database hosted at the Texas Advanced Computing Center (TACC), an NSF-funded supercomputing center based at University of Texas, Austin.

3) Data in the University and Jepson Herbaria (UCJeps) are managed through CollectionSpace. As an early adopter of the Mellon-funded CollectionSpace, UCJeps has been active in its development, working with the central campus Information Services and Technology to customize the system to meet UCJeps requirements. CollectionSpace is designed to facilitate customization, extension, data access and sharing. UCJeps currently shares data with GBIF, the Mycology Collections Portal, Consortium of California Herbaria (<http://ucjeps.berkeley.edu/consortium/>), Consortium of North American Bryological Herbaria (<http://symbiota.org/bryophytes>), Consortium of North American Lichen Herbaria (<http://lichenportal.org/portal>), Herbaria@Home (<http://herbariaunited.org/atHome>), and looks forward to sharing with the U.S. Virtual Herbarium.

Software and IT Services for BNHM

Resource	Description	Who is Using It
BerkeleyMapper	Embeddable specimen mapping plugin that displays points on the Google Maps base maps with options for customized map layers. Link back to specimen database, display uncertainty estimate radii, zoom in on points, label points, etc.	<i>Online databases:</i> Arctos (MVZ), BSCIT (EME), California Consortium of Herbaria (UCJeps) <i>Online websites:</i> AmphibiaWeb, MioMap, NeoMap, Paleoportal,

CalPhotos	User-contributed, online database for photos of plants, animals, habitats, specimens. Includes themed collections of photos, georeferencing data, community-contributed taxonomic identifications, web services for distribution.	AmphibiaWeb, BioCode, BioKeys, Essig, Encyclopedia of Life (EOL), MioMap, MVZ, PaleoPortal, UCJeps, UCMP, Wunderpix
DocuBase	Management system for digital documents.	Essig, Hastings, Dept. Integrative Biology, MVZ, PaleoBios, UCJeps, UCMP, faculty labs
Databases	UNIX-based relational databases MySQL and Postgres	Angelo, BioCode, BioKeys, Essig, GK12, Miomap, Paleoportal, UCJeps, UCMP
Website Hosting	Websites for BNHM museums and research projects	AmphibiaWeb, Angelo, Biocode, BioKeys, BNHM, BotGarden, CalPhotos, Essig, GK12, Herpnet, Invasive Species, Miomap, MVZ, Paleoportal, Polynesian Arthropods, UCJeps, UCMP
Disk Storage	Storage for large resolution image files, documents, archival files, etc.	Essig, MVZ, UCJeps, UCMP

Equipment in the BNHM

Resource	Location	Description	How it's Used
HP Digital Sender	BSCIT	Networked document scanner	Scan paper documents - OCR, databasing, online access via DocuBase
Microoptics Digital XLT imaging system	EMEC	High depth of field camera system	CalBugs Project: high quality specimen imaging for publication and web pages
Epson Perfection V33 Scanner	EMEC	flatbed scanner	CalBugs Project: scan microscope slides for collection data capture
Olympus Powershot G9 camera (x4)	EMEC	High resolution digital cameras w. imaging stages & lighting	CalBugs Project: imaging specimen and labels for data capture
Epson 2400 Photo Scanner	UCMP	flatbed photo scanner	Scan photos, slides, negatives up to 2400 dpi
HP Scanjet 8250 Flatbed Scanner	MVZ	flatbed scanner with automatic feeder	Scan documents and photos, up to 4800 dpi
Opticbook 3600 Book Scanner	MVZ	flatbed scanner	Scan archival field note books, up to 1200 dpi

The Geospatial Innovation Facility (GIF- <http://gif.berkeley.edu>) was established in 2005 at the UC Berkeley's College of Natural Resources with dedicated staff, computer lab and conference room. The mission of the GIF is to help people better understand the complex challenges facing our changing world through the analysis and visualization of spatial data. GIF develops engaging applications that leverage and build upon state-of-the-art geospatial and web technologies, and provide opportunities for new researchers to learn how they can use these technologies to answer critical questions. The GIF actively develops Cal-Adapt (<http://cal-adapt.org>) in partnership with the California Energy Commission (CEC), the LandCarbon Atlas (<http://landcarbon.org>) in partnership with the US Geological Survey (USGS), and Holos: Berkeley Ecoinformatics Engine (<http://ecoengine.berkeley.edu>) in collaboration with the Berkeley Natural History Museums (BNHM). Each of these projects offer a unique and sophisticated approach to working with a large and diverse array of environmental and ecological data. The GIF offers advising through a combination of workshops and one-on-one training. Curriculum has been developed for sixteen unique workshops, and at least ten are offered in a given academic semester. These workshops cover a range of geospatial topics including: Geographic Information Systems (GIS), Remote Sensing, Object Based Image Analysis (OBIA), WebGIS, Species Distribution Modeling, and Global Positioning Systems (GPS). Geospatial software currently installed on all GIF workstations includes: ESRI ArcGIS, Erdas Imagine, ENVI, Ecognition Developer, and various other geospatial tools. These programs are available through 15 high-end Windows workstations that are available for all of our users at no charge. The GIF also maintains the College of Natural Resources Teaching Lab offering 30 computers with geospatial software. The GIF's expertise and experience is further enhanced by the close relationships and interactions it holds with additional units throughout the Berkeley campus. Strong campus collaborations have developed with the Berkeley Natural History Museums (BNHM), the Berkeley Initiative in Global Change Biology (BIGCB), and the D-Lab. Through a variety of events and outreach activities, the GIF enables all of UC Berkeley's geospatial community to forge connections and build success.

GIF Services	Description
Student Advising	Consulting services to students of all levels for simple to complex projects
Equipment Rentals	Short and long term rentals are available for a variety of GPS equipment
Hourly Consulting	Hourly consulting for any user on more complex project support
WebGIS	Development, maintenance, and hosting for webGIS sites
Workspace and Teaching Lab	Work space and teaching lab are available for geospatial research
Printing	GIF offers a variety of printing options, including large format posters

UC Berkeley Field Stations and Natural Reserve System (UC NRS): The UC NRS has 38 reserves throughout California; its University-wide NRS office is located in the UC Office of the President (UCOP), Office of the Vice President for Research, and includes a small staff of seven under the direction of the faculty-level UC NRS Director. UC NRS-UCOP provides inter-campus coordination. The reserves vary in size, remoteness, degree of human impact, and ability to support use. Fourteen of the 38 sites currently are, or are funded to become, full facility reserves with the infrastructure, equipment, and professional staff necessary to support long-term research projects and multi-week field courses at sites remote from

campus services. In addition, several UC NRS reserves are gateways to much larger areas adjacent to the land managed by UC where research also takes place. For example, the 9,000-acre Sweeney Granite Mountains Reserve supports 75% of the research in the adjacent federally managed 1.6 million-acre Mojave National Preserve.



Each of the UC NRS sites is managed by one of the nine general campuses. Each reserve has an UC NRS Reserve Faculty Manager, and a faculty campus committee to oversee reserve activities, development, and funding. Eighteen of the 38 NRS reserves support a resident or part-time resident director. Twenty-four of the 38 reserves have facilities (including housing) suitable for the temporary establishment of a digitization station; 23 of the 38 reserves support internet access.

On average, 300-400 research faculty members use the reserves each year, along with about 700 research scientists, 600 research assistants, 700 graduate students, and 400-500 undergraduates conduct research. Approximately 3,000 volunteers work at the reserves each year, and about 7,000

members of the public visit the UC NRS reserves, generating (respectively) about 35,000 and 15,000 user-days (most of the public only visit one day). Users come from across the world, but are primarily from California and other regions of North America.

Rancho La Brea

The proposed work by the Natural History Museum of Los Angeles County (NHMLAC) staff will be conducted at the George C. Page Museum of La Brea Discoveries (Page) in Hancock Park, Los Angeles, CA, which houses the collections of Rancho La Brea (RLB). The Page Museum is an on-site facility dedicated to the history and prehistory of Rancho La Brea. Because of these collections, Rancho La Brea is the most completely known late Pleistocene terrestrial ecosystem. The Page Museum's paleontologists are actively excavating fossils on public view 7 days a week. They also interact daily with the public during Hancock Park tours and are often available to discuss their work with visitors on an informal basis. The Museum's education staff develops public programming in conjunction with the Research and Collections staff.

Specimens range in size from microscopic crustaceans to 12ft-tall mammoths. Small specimens are stored in capsules, in glass vials, in archival cardboard trays, in wooden or metal shelves inside standard metal cabinets. Oversize specimens are stored on RiveTier shelving units. Type specimens are stored in locked metal cabinets. There are over 12,000 open 2ft² plastic shelves with specimen organized taxonomically for Hancock Collection and numerically for ongoing excavation collections. There are over 170 standard metal Lane cabinets and over 9,000 sq foot of open shelving. Catalog information is either written on the specimen on the capsule it is kept in. All curated specimens have a catalog number which also includes taxonomic name, locality, and relevant bibliographic information. Old labels are kept with the specimen for historical purposes. The museum contains office space for staff, areas for specimen research, microscopes, computers, free Wi-Fi, a research library with 160 3ft wide shelves with ~650 books and 7,000 reprints and 2,000 journals and an archive with ~25,000 cataloged images and documents as well as 1,100 historic items.

Roles of persons not requesting salary:

Aisling Farrell, Collections Manager at the George C. Page Museum, will direct the digitization and image capture of catalog records and will supervise the Assistant Collections Manager at the George C. Page Museum in these tasks. She will assist in the training of students and volunteers in error checking of data. She will coordinate outreach programs with the Museum's Public Programs department.

Peggy Fiedler, Director of the UC Natural Reserve System (NRS), will assist in general project oversight especially coordinating the UC Reserves and their specimen digitization.

Rosemary Gillespie, Essig Museum of Entomology Curator and Professor, Environmental Science Policy and Management, currently co-leads the NSF CalBug project. She is a steering committee member of NfN and will assist in general project coordination especially activities within the Essig Museum.

Robert Guralnick, University of Colorado - Notes from Nature PI, will manage and oversee the programmer developing the NfN interface for Page and NHMLAC data ledgers and developing the new features of the existing Calbug interface. He also will collaborate with the project team in the Notes for Nature design phase and follow up adjustment and troubleshooting phases.

John Harris, Director of Vertebrate Studies at the Natural History Museum of Los Angeles County and Chief Curator of the George C. Page Museum, will have oversight of the digitization and image capture of catalog records of the Rancho La Brea specimens housed at the Page Museum and of the McKittrick and Maricopa specimens housed at the Natural History Museum of Los Angeles County and of associated public programs. As a steering committee member, he will assist in general project oversight and coordination between NHMLAC and Page Museum and UCB units.

Michael Nachman, Director of the Museum of Vertebrate Zoology and Professor of Integrative Biology, will provide overall project coordination and planning. He will assist in active recruitment of undergraduates for various roles and training opportunities that the project will provide.

Samuel McLeod, Collections Manager of Vertebrate Paleontology at the Natural History Museum of Los Angeles County (NHMLAC) will direct the digitization and image capture of catalog records and will supervise the newly employed Assistant Collections Manager at the NHMLAC in these tasks. He will assist in the training of students and volunteers in error checking of data. He will coordinate outreach programs with the Museum's Public Programs department.

J. Data Management Plan

1. Describe the data that will be collected, and the data and metadata formats and standards used.

The primary products will be the digital images and digitized records of organismal specimen collections, primarily entomological but also vertebrate, invertebrate and plant fossils as well as botanical, herpetological, ornithological, and mammal specimens. The effective transmission of data from field station to museum collection facility, from analog to digital database, and dissemination will be handled through a data management pipeline involving online tools and portals to upload, share and collaborate between participants. In all opportunities, this TCN will adhere to community standards; we have a strong record of engaging the community to help develop and delineate common-sense best practices and standards, such as participation in Biodiversity Information Standards -Taxonomic Databases Working Group (<http://www.tdwg.org/>), GBIF - Georeferencing Best Practices, and iDigBio's Georeferencing Working Group. Thus all specimen data will conform to the Darwin Core (DwC) metadata standard.

For any ecological datasets, specifically ancillary datasets encountered at the UC Reserves, we will register and archive ecological data as simple text files with EML (Ecological Markup Language), as established by the Knowledge Network for Biocomplexity (KNB, <http://knb.ecoinformatics.org>) through KNB or DataONE (<http://www.dataone.org>). All metadata will minimally contain information on citation, access, data holder contact information, methods of discovery, and data structure.

2. Describe what physical and/or cyber resources and facilities (including third party resources) will be used to store and preserve the data after the grant ends.

Specimen digitization at the Essig Museum of Entomology (EME) will be entered into a customized open-source, web-based database built and supported by the Berkeley Science Technology group (BSCIT) (<http://essigdb.berkeley.edu/advanced.html>). Data in the Museum of Vertebrate Zoology (MVZ) are managed through Arctos, a collaborative and comprehensive collection management information system currently serving 21 institutions and 70 collections (<http://arctos.database.museum/>) of diverse types (e.g., vertebrates, plants, fossils, insects) and of diverse datasets, including specimen records, observations, tissues/blood, parasites, stomach contents, field notes and other documents, and media such as images, audio recordings, and video. Data in the University and Jepson Herbaria (UCJeps) are managed through CollectionSpace, a collections management system. As an early adopter of the Mellon-funded CollectionSpace, UCJeps has been active in its development, working with the central campus Information Services and Technology to customize the system to meet UCJeps requirements. See Facilities for further details on UC Berkeley database systems.

The Natural History Museum of Los Angeles County (NHMLAC) and the George C. Page Museum manage most of their collections with KE Software's EMu Database Management System. The data for these institutions, as well as the William S. Hart Ranch and Museum, are stored on one server housed at NHMLAC. EMu is a robust system tailored to handle many collection types, digital assets, events, transactions, accessions, geospatial data, taxonomic information, reporting, and various record-keeping tasks. NHMLAC has customized EMu to manage anthropology, conservation efforts, paleontology, entomology, historical artifacts and documents, herpetology, ornithology, nature gardens, and live animal care. Additional collections continue to be added each year. The anthropology, paleontology, and George C. Page Museum collections are online at collections.nhm.org. Currently, NHMLAC provides some data to GBIF, VertNet, and its associated biodiversity portals through a series of customized programs designed by VertNet technicians. This allows various data from diverse database systems to be configured to VertNet and GBIF standards. Data from EMu can be made readily available, but is not being processed by VertNet's conversion system or delivered in any other manner at this time.

3. Describe what media and dissemination methods will be used to make the data and metadata available to others after the grant ends.

All specimen data and imaging generated by this project and entered into their respective collection management systems or databases will be available through multiple access portals: the respective collections' database system if online (BSCIT, Arctos, EMu, and eventually CollectionSpace) as well as on Holos Berkeley Ecoinformatics Engine (<http://ecoengine.berkeley.edu>), which will make accessible and integrate all available data from participating museums and field stations in this TCN. Holos will allow integrated views of specimen data, field station weather data and images alongside habitat and environmental base layers such as vegetation types, elevation, climate models for the present, future and past to the Last Glacial Maximum, and much more. Holos also makes data available for researchers and developers through its API or web services; for example, researchers using R Statistics program may search and have returned specimen datasets directly through Holos for immediate analyses in the R Statistics environment allowing for robust, repeatable, and reproducible methods.

In addition, since all data products in the respective collection databases will be exported as DwC compliant archives via the Integrated Publishing Toolkit (IPT), these data are made available to GBIF, VertNet and the Biodiversity Information Serving Our Nation (BISON). Other data portals, including iDigBio, have access to these resources. VertNet also has an RSS feed that alerts subscribers to publication of a new or updated resource. These resources contain globally unique values for DwC terms including occurrenceID that can be used to distinguish records from different publishers when data are harvested by iDigBio or other portals. In addition, with several NSF ADBC projects currently active at UCJeps, UCJeps are active participants with iDigBio, the ADBC hub.

4. Describe the policies for data sharing and public access (including provisions for protection of privacy, confidentiality, security, intellectual property rights and other rights as appropriate).

Policies for data sharing and public access including re-distribution and use policies remain at the respective institution's discretion. In general, data and media are the property of the originating institution, with all rights reserved; the species records are intended for use in education and research; data may not be repackaged, redistributed, or sold in any form without prior written consent from the collection(s) holding the data; and users wishing to include any of the collection data or media in publications, reports, websites, or other means of dissemination must acknowledge the provenance of the original data, cite the institutional catalog number(s), and notify the appropriate curator. Data harvested via IPT carry the license and terms of use with specimen records in these distributed platforms. Data, once entered and approved by curators, are accessible to anyone with an internet connection.

5. Describe roles and responsibilities of all parties with respect to the data management (including contingency plans for the departure of key personnel from the project) after the grant ends.

All digitized data from this proposal will be curated in perpetuity in the respective museum collections, which all have permanent staff collection managers and curators independent from this proposal. The security of all databases is paramount to the partner collections. For example, EME's data and media are securely stored in the BSCIT database with daily backups managed by IST at the UC Berkeley, and is independent of the employment of project-specific personnel. Likewise, data and media from the MVZ and other Arctos collections are archived securely with daily backups at the Texas Advanced Computing Center (University of Texas, Austin), an NSF XSEDE facility. This proposal's main online integrative portal, Holos, is securely stored on a cloud-based enterprise platform, Amazon Web Services, with local redundancy, and is actively maintained by the Geospatial Innovation Facility, College of Natural Resources, the premier geospatial resource and expertise at UC Berkeley.

K. List of participants

University of California, Berkeley

1. Rosemary Gillespie (Department of Environmental Sciences, Policy, and Management)
2. Maggi Kelly (Geospatial Innovation Facility, Department of Environmental Sciences, Policy, and Management)
3. Michelle Koo (Museum of Vertebrate Zoology)
4. Kevin Koy (Geospatial Innovation Facility)
5. Michael Nachman (Museum of Vertebrate Zoology, Department of Integrative Biology)
6. Gordon Nishida (Essig Museum of Entomology)
7. Kipling Will (Essig Museum of Entomology, Department of Environmental Sciences, Policy, and Management)

Natural History Museum of Los Angeles County

1. Aishling Farrell (George C. Page Museum)
2. Samuel McLeod (Department of Vertebrate Paleontology)
3. John Harris (Vertebrate Studies & George C. Page Museum)

University of California, Office of the President

1. Peggy Fiedler (Natural Reserve System)

University of Colorado, Boulder

1. Robert Guralnick (Department of Ecology and Evolutionary Biology)

L. Postdoc mentoring plan

Not applicable.

M. Integrated Summary Budget (for collaborative proposal only)

Not applicable