



Grant Number: 1U24MH123696-01
FAIN: U24MH123696

Principal Investigator(s):
DONALD F. CONRAD (contact), PHD

Project Title: Coordinating center for collaborative marmoset research

secondary individuals

Grants & Contracts Admin - S
3181 SW Sam Jackson Park Rd
L106OPAM
Portland, OR 972393098

Award e-mailed to: orserv@ohsu.edu

Period Of Performance:

Budget Period: 09/01/2020 – 06/30/2021

Project Period: 09/01/2020 – 06/30/2025

Dear Business Official:

The National Institutes of Health hereby awards a grant in the amount of \$682,263 (see "Award Calculation" in Section I and "Terms and Conditions" in Section III) to OREGON HEALTH & SCIENCE UNIVERSITY in support of the above referenced project. This award is pursuant to the authority of 42 USC 241 31 USC 6305 42 CFR 52 and is subject to the requirements of this statute and regulation and of other referenced, incorporated or attached terms and conditions.

Acceptance of this award including the "Terms and Conditions" is acknowledged by the grantee when funds are drawn down or otherwise obtained from the grant payment system.

Each publication, press release, or other document about research supported by an NIH award must include an acknowledgment of NIH award support and a disclaimer such as "Research reported in this publication was supported by the National Institute Of Mental Health of the National Institutes of Health under Award Number U24MH123696. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health." Prior to issuing a press release concerning the outcome of this research, please notify the NIH awarding IC in advance to allow for coordination.

Award recipients must promote objectivity in research by establishing standards that provide a reasonable expectation that the design, conduct and reporting of research funded under NIH awards will be free from bias resulting from an Investigator's Financial Conflict of Interest (FCOI), in accordance with the 2011 revised regulation at 42 CFR Part 50 Subpart F. The Institution shall submit all FCOI reports to the NIH through the eRA Commons FCOI Module. The regulation does not apply to Phase I Small Business Innovative Research (SBIR) and Small Business Technology Transfer (STTR) awards. Consult the NIH website <http://grants.nih.gov/grants/policy/coi/> for a link to the regulation and additional important information.

If you have any questions about this award, please contact the individual(s) referenced in Section IV.

Sincerely yours,

Rita Sisco
Grants Management Officer
NATIONAL INSTITUTE OF MENTAL HEALTH

Additional information follows

SECTION I – AWARD DATA – 1U24MH123696-01**Award Calculation (U.S. Dollars)**

Salaries and Wages	\$135,185
Fringe Benefits	\$30,451
Personnel Costs (Subtotal)	\$165,636
Consultant Services	\$6,000
Materials & Supplies	\$3,000
Travel	\$2,000
Other	\$20,000
Subawards/Consortium/Contractual Costs	\$300,650

Federal Direct Costs	\$497,286
Federal F&A Costs	\$184,977
Approved Budget	\$682,263
Total Amount of Federal Funds Obligated (Federal Share)	\$682,263
TOTAL FEDERAL AWARD AMOUNT	\$682,263

AMOUNT OF THIS ACTION (FEDERAL SHARE) **\$682,263**

SUMMARY TOTALS FOR ALL YEARS		
YR	THIS AWARD	CUMULATIVE TOTALS
1	\$682,263	\$682,263
2	\$619,997	\$619,997
3	\$619,997	\$619,997
4	\$619,997	\$619,997
5	\$619,997	\$619,997

Recommended future year total cost support, subject to the availability of funds and satisfactory progress of the project

Fiscal Information:

CFDA Name: Mental Health Research Grants
CFDA Number: 93.242
EIN: 1931176109A1
Document Number: UMH123696A
PMS Account Type: P (Subaccount)
Fiscal Year: 2020

IC	CAN	2020	2021	2022	2023	2024
MH	8027799	\$332,263	\$419,997	\$419,997	\$419,997	\$519,997
AA	8470456	\$200,000	\$100,000	\$100,000	\$100,000	\$100,000
DE	8472270	\$150,000	\$100,000	\$100,000	\$100,000	

Recommended future year total cost support, subject to the availability of funds and satisfactory progress of the project

NIH Administrative Data:

PCC: 1H-TDF / **OC:** 41026 / **Released:** username 08/19/2020
Award Processed: 08/27/2020 12:06:29 AM

SECTION II – PAYMENT/HOTLINE INFORMATION – 1U24MH123696-01

For payment and HHS Office of Inspector General Hotline information, see the NIH Home Page at <http://grants.nih.gov/grants/policy/awardconditions.htm>

SECTION III – TERMS AND CONDITIONS – 1U24MH123696-01

This award is based on the application submitted to, and as approved by, NIH on the above-titled project and is subject to the terms and conditions incorporated either directly or by reference in the following:

- a. The grant program legislation and program regulation cited in this Notice of Award.
- b. Conditions on activities and expenditure of funds in other statutory requirements, such as those included in appropriations acts.
- c. 45 CFR Part 75.
- d. National Policy Requirements and all other requirements described in the NIH Grants Policy Statement, including addenda in effect as of the beginning date of the budget period.
- e. Federal Award Performance Goals: As required by the periodic report in the RPPR or in the final progress report when applicable.
- f. This award notice, INCLUDING THE TERMS AND CONDITIONS CITED BELOW.

(See NIH Home Page at <http://grants.nih.gov/grants/policy/awardconditions.htm> for certain references cited above.)

Research and Development (R&D): All awards issued by the National Institutes of Health (NIH) meet the definition of "Research and Development" at 45 CFR Part§ 75.2. As such, auditees should identify NIH awards as part of the R&D cluster on the Schedule of Expenditures of Federal Awards (SEFA). The auditor should test NIH awards for compliance as instructed in Part V, Clusters of Programs. NIH recognizes that some awards may have another classification for purposes of indirect costs. The auditor is not required to report the disconnect (i.e., the award is classified as R&D for Federal Audit Requirement purposes but non-research for indirect cost rate purposes), unless the auditee is charging indirect costs at a rate other than the rate(s) specified in the award document(s).

This institution is a signatory to the Federal Demonstration Partnership (FDP) Phase VI Agreement which requires active institutional participation in new or ongoing FDP demonstrations and pilots.

Carry over of an unobligated balance into the next budget period requires Grants Management Officer prior approval.

This award is subject to the requirements of 2 CFR Part 25 for institutions to receive a Dun & Bradstreet Universal Numbering System (DUNS) number and maintain an active registration in the System for Award Management (SAM). Should a consortium/subaward be issued under this award, a DUNS requirement must be included. See <http://grants.nih.gov/grants/policy/awardconditions.htm> for the full NIH award term implementing this requirement and other additional information.

This award has been assigned the Federal Award Identification Number (FAIN) U24MH123696. Recipients must document the assigned FAIN on each consortium/subaward issued under this award.

Based on the project period start date of this project, this award is likely subject to the Transparency Act subaward and executive compensation reporting requirement of 2 CFR Part 170. There are conditions that may exclude this award; see <http://grants.nih.gov/grants/policy/awardconditions.htm> for additional award applicability information.

In accordance with P.L. 110-161, compliance with the NIH Public Access Policy is now mandatory. For more information, see NOT-OD-08-033 and the Public Access website: <http://publicaccess.nih.gov/>.

This award is funded by the following list of institutes. Any papers published under the auspices of this award must cite the funding support of all institutes.

National Institute Of Mental Health (NIMH) National Institute On Alcohol Abuse And Alcoholism (NIAAA) National Institute Of Dental & Craniofacial Research (NIDCR)
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In accordance with the regulatory requirements provided at 45 CFR 75.113 and Appendix XII to 45 CFR Part 75, recipients that have currently active Federal grants, cooperative agreements, and procurement contracts with cumulative total value greater than \$10,000,000 must report and maintain information in the System for Award Management (SAM) about civil, criminal, and administrative proceedings in connection with the award or performance of a Federal award that reached final disposition within the most recent five-year period. The recipient must also make semiannual disclosures regarding such proceedings. Proceedings information will be made publicly available in the designated integrity and performance system (currently the Federal Awardee Performance and Integrity Information System (FAPIIS)). Full reporting requirements and procedures are found in Appendix XII to 45 CFR Part 75. This term does not apply to NIH fellowships.

Treatment of Program Income:

Additional Costs

SECTION IV – MH Special Terms and Conditions – 1U24MH123696-01

Clinical Trial Indicator: No

This award does not support any NIH-defined Clinical Trials. See the NIH Grants Policy Statement Section 1.2 for NIH definition of Clinical Trial.

INFORMATION:

This grant is awarded with the understanding that project delays and challenges may occur due to COVID-19. It is NIMH's intention to ensure the ultimate success of each project: to that end, we will work with recipients on a case-by-case basis to identify flexibilities and find solutions. You are encouraged to refer to the NIH Guide (<https://grants.nih.gov/grants/guide/notice-files/NOT-OD-20-086.html>, and updates referenced therein) and to the regularly updated Frequently Asked Questions (<https://grants.nih.gov/faqs/#/covid-19.htm>) for guidance on delays in research progress, delays in financial and RPPR reporting, costs, and other relevant issues, and contact your grants specialist and/or program officer with questions.

AWARD NOTICE - COOPERATIVE AGREEMENT TERMS & CONDITIONS:

This award has been made in response to the application submitted under the Funding Opportunity Announcement **RFA-MH-20-150** and is issued as a cooperative agreement, a financial assistance mechanism in which substantial NIH scientific and/or programmatic involvement is anticipated in the performance of the activity. This award is subject to the Cooperative Agreement Terms and Conditions of Award as set forth in Section VI. Copy of these Terms and Conditions may be accessed at the following internet address: <https://grants.nih.gov/grants/guide/rfa-files/RFA-MH-20-150.html>.

NIH PROJECT SCIENTIST:

The Project Scientist for this award is Dr. Rebecca F. Rosen, rebecca.rosen@nih.gov from the National Institute of Mental Health (NIMH).

BUDGET/PROJECT PERIOD ADJUSTMENT:

This grant has been selected under the NIMH plan to redistribute grant workloads more evenly throughout the year. Consequently, the initial budget period reflects a **6/30/2021** end date. Subsequent budget periods will begin on **July 1** and will be for a 12-month duration. Although this grant will have a slightly shorter budget period this year, it is awarded the full 12-month level of funds for the budget period. If needed, additional time may be requested at the end of the project period for a first no-cost extension through eRA Commons.

CONSORTIUM / CONTRACTUAL COSTS:

This award includes funds for consortium activity with the **University of Wisconsin and Texas Biomedical Research Institute**. Each consortium is to be established and administered in accordance with the NIH Grants Policy Statement (<http://grants.nih.gov/grants/policy/nihgps/index.htm>). No foreign performance site may be added to this project without the written prior approval of the National Institute of Mental Health.

DATA SHARING PLAN:

This award is subject to the data sharing guidance outlined in **NOT-MH-19-010** which can be found at <https://grants.nih.gov/grants/guide/notice-files/NOT-MH-19-010.html>, and to the genomic

data sharing guidance outlined in **NOT-OD-14-124** which can be found at <https://grants.nih.gov/grants/guide/notice-files/NOT-OD-14-124.html>. The recipient agrees to adhere to the resource and data sharing plan negotiated with NIMH Program staff. Dissemination of study data will be in accord with the Recipient's accepted data sharing plan as stated in **page 149** of the application.

Please note that a statement of progress on the Sharing Plan must be included in the Research Performance Progress Report (RPPR) under section C.5 "Other Products and Resource Sharing." Failure to adhere to the sharing plan as mutually agreed upon by the Recipient and the NIH/IC may result in Enforcement Actions as described in the NIH Grants Policy Statement.

STAFF CONTACTS

The Grants Management Specialist is responsible for the negotiation, award and administration of this project and for interpretation of Grants Administration policies and provisions. The Program Official is responsible for the scientific, programmatic and technical aspects of this project. These individuals work together in overall project administration. Prior approval requests (signed by an Authorized Organizational Representative) should be submitted in writing to the Grants Management Specialist. Requests may be made via e-mail.

Grants Management Specialist: Robert J Munk
Email: rmunk@mail.nih.gov **Phone:** 301-443-3034 **Fax:** 301-480-1956

Program Official: Abigail A Soyombo-shoola
Email: abigail.soyombo@nih.gov **Phone:** 301-827-7329

SPREADSHEET SUMMARY

GRANT NUMBER: 1U24MH123696-01

INSTITUTION: OREGON HEALTH & SCIENCE UNIVERSITY

Budget	Year 1	Year 2	Year 3	Year 4	Year 5
Salaries and Wages	\$135,185	\$135,185	\$135,185	\$135,185	\$135,185
Fringe Benefits	\$30,451	\$30,451	\$30,451	\$30,451	\$30,451
Personnel Costs (Subtotal)	\$165,636	\$165,636	\$165,636	\$165,636	\$165,636
Consultant Services	\$6,000	\$6,000	\$6,000	\$6,000	\$6,000
Materials & Supplies	\$3,000	\$3,000	\$3,000	\$3,000	\$3,000
Travel	\$2,000	\$2,000	\$2,000	\$2,000	\$2,000
Other	\$20,000	\$5,000	\$5,000	\$5,000	\$5,000
Subawards/Consortium/Contractual Costs	\$300,650	\$302,134	\$302,134	\$302,134	\$302,134
TOTAL FEDERAL DC	\$497,286	\$483,770	\$483,770	\$483,770	\$483,770
TOTAL FEDERAL F&A	\$184,977	\$136,227	\$136,227	\$136,227	\$136,227
TOTAL COST	\$682,263	\$619,997	\$619,997	\$619,997	\$619,997

Facilities and Administrative Costs	Year 1	Year 2	Year 3	Year 4	Year 5
F&A Cost Rate 1	75%	75%	75%	75%	75%
F&A Cost Base 1	\$246,636	\$181,636	\$181,636	\$181,636	\$181,636
F&A Costs 1	\$184,977	\$136,227	\$136,227	\$136,227	\$136,227

[illegible]

APPLICATION FOR FEDERAL ASSISTANCE

SF 424 (R&R)

3. DATE RECEIVED BY STATE		State Application Identifier
1. TYPE OF SUBMISSION*		4.a. Federal Identifier
<input type="radio"/> Pre-application <input checked="" type="radio"/> Application <input type="radio"/> Changed/Corrected Application		b. Agency Routing Number
2. DATE SUBMITTED 2019-10-18	Application Identifier 1017296	c. Previous Grants.gov Tracking Number
5. APPLICANT INFORMATION Organizational DUNS*: 0969975150000		
Legal Name*: Oregon Health & Science University Department: Research Genetics Division: Street1*: 3181 SW Sam Jackson Park Rd Street2: City*: Portland County: State*: OR: Oregon Province: Country*: USA: UNITED STATES ZIP / Postal Code*: 97239-3098		
Person to be contacted on matters involving this application Prefix: First Name*: secondary individual / identifier Suffix: Position/Title: Grants & Contracts Admin - S Street1*: 3181 SW Sam Jackson Park Rd Street2*: secondary individual / identifier City*: Portland County: State*: OR: Oregon Province: Country*: USA: UNITED STATES ZIP / Postal Code*: 97239-3098 Phone Number*: secondary individual / identifier Email: orserv@ohsu.edu		
6. EMPLOYER IDENTIFICATION NUMBER (EIN) or (TIN)*		1931176109A1
7. TYPE OF APPLICANT*		H: Public/State Controlled Institution of Higher Education
Other (Specify): Small Business Organization Type <input type="radio"/> Women Owned <input type="radio"/> Socially and Economically Disadvantaged		
8. TYPE OF APPLICATION*		If Revision, mark appropriate box(es).
<input checked="" type="radio"/> New <input type="radio"/> Resubmission <input type="radio"/> Renewal <input type="radio"/> Continuation <input type="radio"/> Revision		<input type="radio"/> A. Increase Award <input type="radio"/> B. Decrease Award <input type="radio"/> C. Increase Duration <input type="radio"/> D. Decrease Duration <input type="radio"/> E. Other (specify) :
Is this application being submitted to other agencies?* <input type="radio"/> Yes <input checked="" type="radio"/> No What other Agencies?		
9. NAME OF FEDERAL AGENCY* National Institutes of Health		10. CATALOG OF FEDERAL DOMESTIC ASSISTANCE NUMBER TITLE:
11. DESCRIPTIVE TITLE OF APPLICANT'S PROJECT* Coordinating center for collaborative marmoset research		
12. PROPOSED PROJECT Start Date* Ending Date* 07/01/2020 06/30/2025		13. CONGRESSIONAL DISTRICTS OF APPLICANT OR-003

14. PROJECT DIRECTOR/PRINCIPAL INVESTIGATOR CONTACT INFORMATION

Prefix: First Name*: Don Middle Name: Last Name*: Conrad Suffix:

Position/Title: Division Chief/Associate Professor

Organization Name*: Oregon Health & Science University

Department: Research Genetics

Division:

Street1*: 3181 SW Sam Jackson Park Rd

Street2:

City*: Portland

County:

State*: OR: Oregon

Province:

Country*: USA: UNITED STATES

ZIP / Postal Code*: 97239-3098

Phone Number*: 5033465430 Fax Number: Email*: conradon@ohsu.edu

15. ESTIMATED PROJECT FUNDING

a. Total Federal Funds Requested* \$3,277,343.00

b. Total Non-Federal Funds* \$0.00

c. Total Federal & Non-Federal Funds* \$3,277,343.00

d. Estimated Program Income* \$0.00

16. IS APPLICATION SUBJECT TO REVIEW BY STATE EXECUTIVE ORDER 12372 PROCESS?*

a. YES ☐ THIS PREAPPLICATION/APPLICATION WAS MADE AVAILABLE TO THE STATE EXECUTIVE ORDER 12372 PROCESS FOR REVIEW ON:

DATE:

b. NO ☒ PROGRAM IS NOT COVERED BY E.O. 12372; OR

☐ PROGRAM HAS NOT BEEN SELECTED BY STATE FOR REVIEW

17. By signing this application, I certify (1) to the statements contained in the list of certifications* and (2) that the statements herein are true, complete and accurate to the best of my knowledge. I also provide the required assurances * and agree to comply with any resulting terms if I accept an award. I am aware that any false, fictitious, or fraudulent statements or claims may subject me to criminal, civil, or administrative penalties. (U.S. Code, Title 18, Section 1001)

☒ I agree*

* The list of certifications and assurances, or an Internet site where you may obtain this list, is contained in the announcement or agency specific instructions.

18. SFLL or OTHER EXPLANATORY DOCUMENTATION

File Name:

19. AUTHORIZED REPRESENTATIVE

Prefix: First Name*: secondary individual / identifier Suffix:

Position/Title*: Director

Organization Name*: Oregon Health & Science University

Department: Office of Proposal & Award Man

Division:

Street1*: 3181 SW Sam Jackson Park Rd

Street2: secondary individual / identifier

City*: Portland

County:

State*: OR: Oregon

Province:

Country*: USA: UNITED STATES

ZIP / Postal Code*: 97239-3098

Phone Number*: 5034947784 Fax Number: 5034947787 Email*: orserv@ohsu.edu

Signature of Authorized Representative*

secondary individual / identifier

Date Signed*

10/18/2019

20. PRE-APPLICATION File Name:**21. COVER LETTER ATTACHMENT** File Name:

424 R&R and PHS-398 Specific

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Project/Performance Site Location(s)**Project/Performance Site Primary Location**

☐ I am submitting an application as an individual, and not on behalf of a company, state, local or tribal government, academia, or other type of organization.

Organization Name: Oregon Health & Science University
Duns Number: 0969975150000
Street1*: 3181 SW Sam Jackson Park Rd
Street2:
City*: Portland
County: Multnomah
State*: OR: Oregon
Province:
Country*: USA: UNITED STATES
Zip / Postal Code*: 97239-3098
Project/Performance Site Congressional District*: OR-003

Project/Performance Site Location 1

☐ I am submitting an application as an individual, and not on behalf of a company, state, local or tribal government, academia, or other type of organization.

Organization Name: Oregon National Primate Research Center
DUNS Number: 0969975150000
Street1*: 505 NW 185th Avenue
Street2: Oregon Health & Science University
City*: Beaverton
County: Washington
State*: OR: Oregon
Province:
Country*: USA: UNITED STATES
Zip / Postal Code*: 97006-3448
Project/Performance Site Congressional District*: OR-001

Project/Performance Site Location 2

☐ I am submitting an application as an individual, and not on behalf of a company, state, local or tribal government, academia, or other type of organization.

Organization Name:

DUNS Number:

Street1*:

Street2:

City*:

County:

State*:

Province:

Country*:

Zip / Postal Code*:

Project/Performance Site Congressional District*:

secondary individuals / identifiers

secondary individuals / identifiers

Project/Performance Site Location 3

☐ I am submitting an application as an individual, and not on behalf of a company, state, local or tribal government, academia, or other type of organization.

Organization Name:

DUNS Number:

Street1*:

Street2:

City*:

County:

State*:

Province:

Country*:

Zip / Postal Code*:

Project/Performance Site Congressional District*:

secondary individuals / identifiers

secondary individuals / identifiers

Additional Location(s)

File Name:

RESEARCH & RELATED Other Project Information

1. Are Human Subjects Involved?* <input type="radio"/> Yes <input checked="" type="radio"/> No	
1.a. If YES to Human Subjects Is the Project Exempt from Federal regulations? <input type="radio"/> Yes <input type="radio"/> No If YES, check appropriate exemption number: — 1 — 2 — 3 — 4 — 5 — 6 — 7 — 8 If NO, is the IRB review Pending? <input type="radio"/> Yes <input type="radio"/> No IRB Approval Date: Human Subject Assurance Number	
2. Are Vertebrate Animals Used?* <input type="radio"/> Yes <input checked="" type="radio"/> No	
2.a. If YES to Vertebrate Animals Is the IACUC review Pending? <input type="radio"/> Yes <input type="radio"/> No IACUC Approval Date: Animal Welfare Assurance Number	
3. Is proprietary/privileged information included in the application?* Yes No	
4.a. Does this project have an actual or potential impact - positive or negative - on the environment?* <input type="radio"/> Yes <input checked="" type="radio"/> No	
4.b. If yes, please explain: 4.c. If this project has an actual or potential impact on the environment, has an exemption been authorized or an environmental assessment (EA) or environmental impact statement (EIS) been performed? <input type="radio"/> Yes <input type="radio"/> No 4.d. If yes, please explain:	
5. Is the research performance site designated, or eligible to be designated, as a historic place?* <input type="radio"/> Yes <input checked="" type="radio"/> No	
5.a. If yes, please explain:	
6. Does this project involve activities outside the United States or partnership with international collaborators?* <input type="radio"/> Yes <input checked="" type="radio"/> No	
6.a. If yes, identify countries: 6.b. Optional Explanation:	
7. Project Summary/Abstract*	Filename U24-Marmoset_ProjSum.pdf
8. Project Narrative*	U24-Marmoset_ProjNarrative.pdf
9. Bibliography & References Cited	U24-Marmoset_References.pdf
10. Facilities & Other Resources	U24-Marmoset_Facilities.pdf
11. Equipment	U24-Marmoset_Equipment.pdf

PROJECT SUMMARY/ABSTRACT

The common marmoset (*Callithrix jacchus*) has emerged as a critically important and tractable non-human primate (NHP) model for neuroscience research accommodating genetic manipulation and directed breeding. Several barriers to the adoption of marmoset models by the neuroscience community exist, including a small census size in the United States (fewer than 2,500 animals), poor communication about resource availability, a poor understanding of the strengths and limitations of marmosets in research, and a lack of a formal structure for coordinating the sharing of information and resources related to marmoset research.

In this application, we propose to establish a Marmoset Coordinating Center (MCC) as part of the NIH Brain Research through Advancing Innovative Neurotechnologies (BRAIN) Initiative that will address these limitations by building upon our experience in NHP informatics and marmoset research. As the foundation for the MCC, we will build a new informatics framework for coordinating marmoset research based on the LabKey data management system. This infrastructure will be derived from the existing LabKey system in place at multiple National Primate Research Centers, and which has been optimized for NHP research, including marmosets, over years of production. This informatics system will be initialized with basic statistics on the marmoset laboratory populations provided by participating centers, making pre-recorded, individual-level information that is already recorded more broadly available to the neuroscience community. Demographic and genetic information will be shared and discussed among participating centers, to coordinate marmoset colony management in line with American Zoological Association practice guidelines.

Once operational, the MCC will be comprised of two parts: 1) a web-based portal to provide access to the marmoset data resources stored in LabKey, as well as background content on marmoset biology and neuroscience; 2) a concierge comprised of MCC staff and augmented by a scientific advisory board of marmoset neuroscience experts. The website will provide summaries of existing marmoset neuroscience projects, and allow interested investigators to search animal inventory and request animals. The concierge will be available to answer basic questions about the Center and the use of marmosets in neuroscience. Together, the data and human resources of the MCC will provide an essential portal into marmoset neuroscience research through collaboration, service agreement, or animal transfer.

PROJECT NARRATIVE

The common marmoset (*Callithrix jacchus*) has emerged as a critically important biomedical animal model in a variety of study disciplines. Increased demand for marmosets in scientific research studies has been most acute in neuroscience, where the need to study cognition, behavior, and mental illness in primate models with new genomic editing and gene targeting methodologies has surged. As access to marmosets is limited, and a national strategy is needed for coordinating marmoset research populations, the proposed project will establish a marmoset coordination center that joins real-time census data on marmosets and expert marmoset neuroscientists, which together will provide information and access to animals for scientists in the broader neuroscience community.

FACILITIES AND OTHER RESOURCES *Oregon Health & Science University*

ONPRC - Dr. Conrad

Environment: Oregon National Primate Research Center: ONPRC is one of seven national primate research centers, and the first of the centers established by the National Institutes of Health. Established in 1962, ONPRC became affiliated with Oregon Health & Science University in 1998, which is about 15 miles east of ONPRC near downtown Portland. The ONPRC is divided into five research divisions: Cardiometabolic Health, Genetics, Neuroscience, Reproductive & Developmental Sciences, and Pathobiology & Immunology, with 50 principal investigators, in addition to numerous graduate students, postdoctoral researchers and staff scientists. The center maintains a colony of more than 4,500 non-human primates including rhesus macaques, Japanese macaques, cynomolgus macaques, and baboons. Other animals housed at ONPRC include rats, mice, hamsters, rabbits, and frogs. ONPRC has state-of-the-art facilities for studying nonhuman primates and non-primate species, and through these resources has made countless significant discoveries in a wide range of scientific disciplines since its inception. ONPRC continues to expand to adapt to emerging areas of research.

location

the new facility housing advanced MRI, PET, PET-CT, and contrast-enhanced ultrasound imaging systems.

The ONPRC and its neighboring institute, the Vaccine & Gene Therapy Institute (VGTI), provide an exceptionally supportive environment for the performance of this project. Major strengths of the institution that directly impact our ability to successfully conduct the studies proposed in the present application include: a) the number of investigators at both the ONPRC and VGTI with long-standing expertise in reproductive biology, gene editing, and NHP model development; b) the availability of a wide array of core services (see below) providing assistance for every technological manipulation proposed in the application; and c) the unique magnitude and scope of the nonhuman primate resource.

Laboratories: location

location

Dr. Conrad's laboratory and office is location Dr. Conrad's laboratory (908 ft²) is located in location, is well-equipped with 9 work benches and 5 desks/workstations, storage cabinets, 2 sinks with hot, cold and deionized water systems, 110 and 220 volt electrical outlets, natural gas, vacuum lines and central air conditioning and ventilation. His laboratory includes location wet lab with benches suitable for molecular biology experiments, and a dry lab with 4 computer carrels suitable for computer programming. His laboratory has shared access to location, and includes centrifuges, incubators, shakers and chemical hoods for the extraction of nucleic acids using phenol/chloroform methods.

Animal: The ONPRC is an NIH-supported nonhuman primate research facility. The Laboratory Animal Care and Use Program is fully accredited by the Association for Assessment and Accreditation of Laboratory Animal Care International (AAALAC). Veterinary care and professional services supporting research protocols are provided by a complement of veterinarians with advanced training and/or certification in laboratory animal medicine, surgery, veterinary practice, primate medicine and pathology. Animal care and husbandry, and technical and administrative support are provided by trained and competent technicians. A majority of the animal care technicians are certified by the American Association for Laboratory Animal Science.

The ONPRC has a current census of ~4,500 rhesus macaques. Nonhuman primate location housing

location

location

are available to support infectious disease research. Containment support facilities include change/locker room, shower room, decontamination/locker room, equipment and personnel airlocks, dedicated necropsy and clinical treatment/surgical rooms and pass-through equipment decontamination (autoclave) for caging. Entry into location animal containment facilities is restricted to approved, appropriately trained personnel by “key-card controlled” access.

The conduct and reporting of the experiments in this proposal shall adhere to the principles enumerated in the “A Guide to the Care and Use of Laboratory Animals” prepared by the Committee on Care and Use of Laboratory Animals of the Institute of Laboratory Animal Resources (ILAR), National Research Council (NRC) (International Standard Book, Number 13: 978-0-309-15400-0, 2010). All procedures will be in accordance with the Health Resource Extension Act of 1985, Public Law 99-158 (1985).

Computer/Office: The PIs each have offices equipped with computers, printer and desk and have sufficient support, copiers, scanners and telecommunications necessary to accomplish the work described in the grant application. The Co-investigator at ONPRC is located in close proximity, promoting daily interactions. Conference rooms within the location, and location are available for research team meetings.

Dr. Conrad’s office has 120 ft² of office space location and additional office space for postdoctoral fellows/research technicians in the laboratory and location. He has administrative support and office equipment located outside his office. Dr. Conrad has a laptop (Apple MacBook); all computers are encrypted and have supporting software suitable for data storage, data analysis, word processing, graph/presentation preparation, e-mail, internet access, and are linked to available departmental laser printers and multi-function printer (HP Laser Jet Pro M452dn, Konica Minolta 284e).

The Genetics Dry Lab office in location which is near location, provides eight workstations and includes the Bioinformatics and Biostatistics Core Director and Bioinformatics Developer. In addition, this office space allows for collaborative efforts with the Computational Specialists and Biostatistician. Office printers are available, as well as the multi-function printer (HP Laser Jet Pro M452dn, Konica Minolta 284e).

The OHSU Intranet provides access to employee resources, research resources, healthcare information, supplies and purchasing information, safety and emergency information, workplace resources, and online training modules (e.g., laboratory safety). The Information Technology Group at ONPRC provides all employees with technical computing support as needed.

Administrative, accounting and grants management services: % effort administrative support (name) is assigned to provide administrative support for both laboratory and divisional activities. ONPRC Financial Analyst (name) provide guidance on grants, including budget preparation and grant submission.

Biohazards: The OHSU Office of Environmental Health & Safety (EHS) provides policies, programs, training and auditing for the safety of all staff and visitors at OHSU, including ONPRC. In coordination with OHSU Occupational Health (OH) staff located at ONPRC, ONPRC Facilities staff, the Division of Comparative Medicine (DCM), ONPRC researchers, and other stakeholders, EHS supports compliance with more than 60 different federal, state, and local agencies’ regulations.

Staff safety primarily focuses on:

- **Biosafety and Biosecurity** policies and programs cover location according to risk assessment and guidelines of the Biosafety in Microbiological and Biomedical Laboratories (BMBL) and the NIH Recombinant DNA Guidelines. The OHSU Institutional Biosafety Committee (IBC) provides support for biosafety programs involving recombinant DNA, wild-type pathogens, and biological toxins, with the ONPRC Institutional Animal Care and Use Committee (IACUC) providing support for animal studies. EHS Biosafety Officers (BSO) and Biosafety specialists work closely with the IBC, IACUC, stakeholders and OH health to assure training for use of Personal Protective Equipment (PPE), work practices, and exposure response to prepare staff for working with these biohazards and responding to any potential exposure incidents. Regular auditing, refresher training, and feedback for process improvement assures maintenance of a robust biosafety and biosecurity program. EHS works with ONPRC Facilities and administration to assure engineering controls within the facilities mitigate potential

Obtained by Rise for Animals.

exposure to biological hazards. Safety procedures are also in place regarding tissue samples that may harbor Cercopithecine herpesvirus 1 (CHV-1) or other pathogens provided to external entities through either the ONPRC Tissue Distribution Program (TDP) or by individual ONPRC investigators. To receive unfixed tissue or body fluid NHP samples from ONPRC, the recipient (Principal Investigator and BSO/Occupational Health officer) must sign a 'Macaque Tissue Biohazard Notice and Acknowledgment' acknowledging the potential hazards of working with NHP samples.

- **Chemical Safety** policies and programs follow OSHA Laboratory Standard 1910. The OHSU Chemical Hygiene Plan (CHP) was updated in late 2017 and includes the implementation of laboratory-specific CHPs similar to Biosafety program laboratory-specific manuals. The EHS Chemical Hygiene Officer (CHO), along with chemical safety specialists (CSS) and hazardous waste specialists (HWS), oversees the training, handling, and auditing of chemicals used at ONPRC by all staff and contractors. The CHO and CSS work with DCM, researchers, and Facilities to develop safe work practices for handling and disposal of chemicals. The CHO and CSS work with OH to develop exposure-response procedures. EHS works with Facilities and ONPRC administration to assure engineering controls within facilities mitigate potential exposure to chemical hazards. EHS works with the local POTW (Publicly Owned Treatment Works) and the Oregon Department of Environmental Quality (DEQ) to assure environmental and community safety from chemical exposure.
- **Radiation Safety** policies and programs follow local and federal regulations for the safe use and disposal of radioactive materials. The Radiation Safety Officer (RSO) and Assistant Radiation Safety Officer (ARSO) with the ONPRC Radiation Safety Committee develop safe work practices and training for the use and disposal of radioactive materials. OHSU's license is through the Oregon Health Authority with laboratories licensed separately for specific radioactive material use. Regular auditing and training of laboratories for use and disposal of radioactive materials is developed by the RSO and the ARSO. The increase in use of radioactive materials of short-lived radioisotopes for imaging is a developing area for the Radiation Safety Program at ONPRC.
- **Fire/Life Safety** policies and programs are follow local, state and federal fire/life safety codes for research facilities, including Oregon Fire Code and NFPA 45 for laboratories. The Fire/Life Safety Officer (FLSO) is a new position within EHS and works with the local Fire Inspector to regularly audit all of the ONPRC facilities for meeting fire code requirements. The FLSO participates in the annual fire drills done each year at ONPRC, oversees training in Fire/Life Safety of ONPRC staff including fire extinguisher use and evacuation procedures. The FLSO reviews the OSHA-mandated Safety Committee quarterly site inspections for any fire/life safety code violations and corrections. ONPRC has a strong emergency program that is continuously improving with Fire/Life Safety, Earthquake safety, and Personal Safety as focal points. EHS with the FLSO works with Facilities and ONPRC administration to assure that facilities meet the Fire/Life Safety Code requirements.

FACILITIES AND OTHER RESOURCES name / location

name / location

Computer

Animal records are maintained in a computerized database system (location) that offers easy access and sharing opportunities. All of the computing equipment and software required for this grant are in place. Every animal is provided with a unique identifier number that is tattooed on the animal.

Office

All necessary office and administrative space is available at the name / location

Animal Housing

Marmosets at location are presently housed location

location was recently renovated and is currently being populated with marmosets. By the time this projects is initiated, location to house marmoset breeders will be in place for the expanding marmoset colony. location

location

location can accommodate marmosets.

Caging for individual, paired and group housing is available. All of these cages are specifically designed for housing marmosets and tamarins and most of them were designed by location marmoset staff. The majority of the caging is aluminum frame with PVC-coated hardware cloth; there are a small number of stainless steel cages. All cages are equipped with nest boxes and with removable wooden branches. We also have high biocontainment marmoset cages that were designed by location in collaboration with location. These cages are designed to house single animals and have a number of features built in to protect staff working with infected marmosets, including a front lexan panel to eliminate urine splash and a flexible squeeze-back mechanism.

Clinical Care and Surgery

Radiography

Radiology facilities for diagnostic purposes are located location is equipped with an x-ray unit (300 MA, 125 kvp with bucky) and automatic film processors. location is equipped with a Sedacal digital x-ray unit with E-film software for storage and sharing capability of images. Radiation safety equipment such as lead gloves and aprons is available. location has lead-lined walls and door. Two units are available location. An automatic film developer is available location. A portable fluoroscope unit is available in

location

A proprietary information

proprietary information is located in location. The location Department of State Health Services inspects all x-ray units on a regular basis. A board-certified veterinary radiologist is available for consultation and case review.

Endoscopy

Laparoscopic equipment is primarily used in location but is portable. The laparoscopic tower system consists of Sony Trinitron Color Monitors, Sony DVD Recorder, Stryker Endoscopy Digital Camera Decks, Olympus Xenon light source, Storz electronic laparoflator, Stryker 888 camera heads, and Stryker image capture device.

Surgery

We maintain three surgery rooms where major surgery is performed on nonhuman primates. . A list of equipment in each surgery room is listed in this section. There are location where animals are prepared for surgery. These rooms are used to perform surgery: location nonhuman primate's major surgery; survival and nonsurvival (moderate use). location surgery nonhuman primate nonsurvival and survival (light use). location minor procedures room; survival (light use). location minor procedures on nonhuman primates; survival (light use). location nonhuman primate's major surgery; survival and nonsurvival (moderate use).

Pathology

The pathology facility has location necropsy (288 sq. ft.), hematology (162 sq.ft.), chemistry (160 sq. ft.), tissue processing (162 sq. ft.), slide processing and administration (224 sq. ft.), refrigerator/freezer room (148 sq. ft), storage room (132 sq. ft.), multiuse area (bacterial plating, automated immunohistochemistry, and additional clinical pathology microscopy station - 288 sq. ft.), four offices for the pathologists and technicians, and a room that houses the stereology microscope and visiting foreign and American veterinarians and students. It also has a 332 sq. ft. climate controlled slide, block and wet tissue storage room in the quarantine building and a 216 sq. ft. walk in refrigerator located outside and adjacent to the necropsy room.

The location pathology laboratories are fully equipped for state-of-the-art clinical and anatomic pathology assessments. The anatomic and clinical laboratories conform to Good Laboratory Practice (GLP) standards, and Standard Operating Procedures (SOPs) are on file for all procedures. The SOPs are routinely reviewed and updated by pathology staff and in-house quality control and assurance personnel.

The necropsy room has a, stainless steel state-of-the-art, down-draft necropsy table, ceiling mounted surgical lights, electronic balances, exhaust fans, refrigerators, power saws, perfusion equipment, cryopreservation equipment, and adequate necropsy instruments and supplies. Protective clothing, HEPA breathing hoods,

disposable gowns, gloves, masks, shoe covers, head covers, shields, safety gloves and glasses, and shield masks, are worn as needed when doing necropsies. Digital cameras are available for documentation of gross lesions. Refrigeration is available for -80°C or -20°C requirements. Storage of carcasses and tissues for disposal are kept in the 216 sq. ft. walk in refrigerator adjacent to the necropsy room. Conventional and special histologic preparations are processed in the histology laboratory, which is equipped with an automated tissue processor, embedding station, automatic tissue stainer, automatic immunohistochemistry stainer, automated coverslipper, cytospin, cryostat, oven, microscope, dissecting microscope, two microtomes, refrigerators, scales, a safe for GLP specimens, and ancillary equipment. The technical staff is experienced in using a variety of special stains and performing immunohistochemistry. A digital microscope camera is used to document histologic lesions. Glass slides and the most recent 5 years of paraffin blocks are stored in and adjacent to the histology laboratory. Older paraffin blocks and formalin fixed tissues are stored in a climate-controlled vented room approved by the Director of Environment and Safety. Frozen samples are stored as required (-80°C or -20°C) by individual case in the freezer room.

The clinical pathology laboratory contains a [proprietary information] fully automated chemistry analyzer, a [proprietary information] hematology analyzer, an ACL 8000 coagulation analyzer, a [proprietary information], two biological safety cabinets, microscopes, refrigerated centrifuge, and ancillary equipment. Adequate conventional equipment (centrifuges, hoods, balances, refrigerators, etc.) is available.

Molecular Services Core

[location] Facility, [location] including multiple smaller laboratories and a darkroom for individual light sensitive equipment. It is easily accessible to all research labs. MSC staff include the Director [secondary name], the manager [secondary name], and staff member [secondary name]. The MSC is dedicated to assist researchers in the development and implementation of state-of-the-art molecular approaches in the support of their research. The MSC has an active Users' Group that periodically reviews available services, technology, and operations. Therefore, the MSC is equipped with instrumentation to conduct most genomic and gene expression applications, and MSC personnel are trained in numerous technical and bioinformatic approaches

Services: Services provided by the MSC facility include RNA and DNA isolation, quality determination, and quantitation from a variety of sample sources including blood, tissues, cells, and body fluids, sequencing library preparations supporting whole genome, transcriptome, exome, smRNA, ChIP, and targeted sequencing applications, onsite low and mid-output next generation sequencing services, and standard sequencing data analysis and bioinformatics for DNA, RNA, and smRNA sequencing.

FACILITIES AND OTHER RESOURCES [name / location]

[name / location]

Informatics and Data Services (IDS)

Laboratory: Not applicable

Clinical: Not applicable

Computers: IDS Unit maintains two servers on the virtual server platform offered by the [name / location]. These servers house the Electronic Health Record system on [location], which is available for use by all staff at the [location]. One of the servers is the production server, which is backed up daily. The additional server is a test server which is used during the development process to obtain feedback from users. The test server is also used when the whole system is updated with [proprietary info]. Whole system updates are done at most twice a year, this is due to the amount of time needed to perform end-user testing [proprietary info].

Each staff of the IDS unit has a Mac Pro, with six cores and dedicated solid state storage to maintain an up to date EHR database. Employing computers with faster speeds reduces database update and compilation time when developing new features to the system.

Office: [REDACTED] where the [REDACTED] [REDACTED] are located. This allows the IDS staff to meet regularly with various users of the system and gather their feedback and specific unit needs. Also, it provides user access to in-house developers to quickly address any urgent problems units might experience.

EQUIPMENT *Oregon Health & Science University*

ONPRC - Dr. Conrad

Major equipment items required for performance of this project are available and provided by Dr. Conrad's laboratory.

The Conrad laboratory is equipped for performing routine molecular genetics work, cell culture, and histology. For molecular work, our laboratory is equipped with standard equipment -20 freezer (1), -80 freezers (2), a deli-style refrigerator (1), Biorad Thermocyclers (2), standard and refrigerated centrifuges, vertical, horizontal gel apparatus (2), scales, pH meter, and a Nanodrop spectrophotometer. For histology the lab has a dissection microscope and a full histology station. The lab has built its own droplet-based single cell isolation apparatus for high-throughput generation of single cell RNA-sequencing libraries, which has been used to isolate and prep over 70,000 cells to date.

The ONPRC/VGTI shared space also provide general equipment and facilities such as walk-in cold and freezer rooms, autoclaves, ultracentrifuges, and darkrooms with film processors. Shared equipment and work areas exist for processing blood specimens in preparation for subsequent hormone assays and performing tissue sectioning in preparation for immunostaining.

Computational Resources: ONPRC/OHSU provides a rich computational environment, including service units with highly-qualified staff that will assist us in the executing of this project. These services are:

1. *High-throughput computing resources:* The OHSU/ONPRC Data Center is location [REDACTED] completed in 2014. The Data Center provides space for 1000s of servers and more than 100 petabytes of data, with redundant and emergency power, HVAC and multiple layers of security. The facility is maintained by the OHSU Advanced Computing Center (ACC) staff, which consists of three Research System Engineers and two Database Administrators. This facility hosts the majority of ONPRC servers, including the servers supporting proprietary info [REDACTED] resources. The application and database servers for these systems are virtualized, with Microsoft SQL Server 2008 R2 used as the underlying database for each. Multiple layers of automatic monitoring are used to ensure hardware health and proper operation. The servers and data follow a regular backup schedule, consisting of a nightly mirror to a local disk array and a rotating tape backup. The tape backup uses commercial-grade backup software to perform a full backup every week and daily incremental backups. In addition, an off-site tape rotation to a secure location keeps mission-critical data safe while maintaining compliance with OHSU data retention policies.

proprietary info *Computing Cluster.* The OHSU Data Center also hosts proprietary info [REDACTED], a high-performance computing cluster created as part of a major collaboration proprietary info [REDACTED]. With over 8,300 Xeon cores and 68.8TB of memory distributed across 263 cutting-edge compute nodes with a 1.3PB high-speed proprietary info [REDACTED] system for hot storage, it is one of the most powerful supercomputers at an academic institution. It is available to OHSU investigators for large-scale sequence and data analyses. proprietary info [REDACTED] will be used for the majority of data analysis in this project, and was heavily utilized during the first funding period of this project.

2. *ONPRC Bioinformatics & Biostatistics Core:* The Bioinformatics & Biostatistics Core (BBC) provides statistical and big data analysis support to ONPRC investigators and other scientists. It employs multiple bioinformaticians and biostatisticians who regularly interact with secondary name [REDACTED], secondary name [REDACTED], and their staff. Their effort is available to assist with this project if needed. Varying levels of computational resources are in place to support the BBC's needs, including a Dell PowerEdge Linux server with 1GPU, 768GB of RAM and 50TB of short-term data storage. The BBC also has 900TB of data storage space within OHSU's proprietary info [REDACTED] architecture for longer-term storage of raw and processed data, part of which it rents out to ONPRC labs for a heavily subsidized rate. In addition, projects requiring more computational resources, such as the alignment of many sequencing samples in parallel, can utilize OHSU's supercomputer cluster, proprietary info [REDACTED].
3. proprietary info [REDACTED] *Databases:* ONPRC maintains three closely related databases that serve complementary functions. While they are separate websites, they are each created using a common platform, proprietary info [REDACTED], which provides for efficient development, and automatic synchronization of data between systems.

- i. **proprietary info** From 2012 onward, ONPRC implemented **proprietary info** a research oriented Electronic Health Record (EHR) system. **proprietary info** provides web-based access to clinical and research data on more than 20,000 animals, spanning more than 50 years. This system provides strict validation on newly entered data, and a flexible interface for user-driven queries. **proprietary info** hosts genetic data on the colony, including molecularly validated pedigree and ancestry data. Information from **proprietary info** automatically synced between other ONPRC systems.
 - ii. **proprietary info**: In 2014, **proprietary info** was established as a genomics resource and system to manage and analyze next generation sequence data (including all data generated by this project). **proprietary info** currently manages sequence data and analysis products from more than 2,500 animals (including parentage and MHC genotype data, RNAseq, ExonSeq and WGS). The website allows users to create automated, reproducible analysis pipelines. Pipeline jobs are queued to run in the background on the OHSU computing cluster. This site manages the majority of the computation of this project, allowing the management of large scale analyses with efficient use of staff time.
 - iii. The **proprietary info** site was established in 2017 and serves as the public face of this project. Registered users can access the **proprietary info** dataset, including download of raw data and features to explore the variant data, such as a genome browser. This site leverage **proprietary info**, automatically syncing anonymized data from these sites. In addition to the catalog of variants identified in our cohort, the site includes an extensive functional annotation pipeline to annotate variants based on potential function, minor allele frequency, known disease associations, and more. This resource enables any investigator to identify potential variants linked to genes or traits of interest.
4. *The ONPRC Primate Genetics Core (GC)*: This Core, directed by **secondary name** provides nonhuman primate (NHP) genotyping and genomics support services to ONPRC and external investigators. Current GC services include: 1) macaque parentage validation using a high-throughput 96 SNP genotyping assay; 2) macaque ancestry determination, using a medium-throughput 128-SNP assay; 3) MHC allele analysis using RNASeq-based methods to identify expressed alleles and haplotypes; and 4) custom or single-locus genotyping, for example: alleles associated with recent models discovered: Batten Disease/*CLN7*, Bardet Biedl Syndrome/*BBS7*, Epidermolysis Bullosa Simplex/*KRT5*, Hemochromatosis/*HFE2*, Pelizaeus-Merzbacher Disease/*PLP1*, Phenylketonuria/*PAH1* as well as more complex alleles such as the:TRIM5a-Cyp fusion, and the 5HTT-LPR VNTR allele. The GC also supports the construction of Illumina-compatible sequencing libraries for Genotyping-by-Sequencing (GBS), amplicon-sequencing and bisulfite sequence analysis. Finally, the GC manages and distributes samples from the ONPRC NHP DNA Bank, which currently comprises over 35,000 archived NHP samples.

EQUIPMENT **name / location**

name / location

Marmoset Program Equipment

The marmoset program has specially designed and constructed devices that are used for very short-term restraint of marmosets for procedures such as venipuncture. These devices consist of stainless steel posts upon which are mounted PVC pipe and Velcro strapping, allowing for hands-free restraint in an upright posture. Equipment that is specifically used by the marmoset program includes two **proprietary** **proprietary info** with a 7.5-10MHz probe and Doppler capability, **proprietary** quantitative magnetic resonance (QMR) imaging machine used to assess body composition, and a **proprietary** open circuit respirometry system. We have the following apparatus for behavioral testing: multiple video cameras, one Cambridge Automated Testing Battery (CANTAB) unit, multiple tablet cognition units, multiple cage balconies to which physical apparatuses can be attached, one automated conveyer belt, and various lexan apparatuses designed for attachment to the cage balcony, such as the detoured reach box. We have a vertical leap tower device and force-plate for measuring jump force, a treadmill for assessing exercise speed and a newly purchased Noldus CatWalk device. We have Noldus Observer XT version 14 for live observational scoring and video evaluations.

location **Surgery Suite**

- 1 Stainless steel surgical table

- proprietary surgical lights (ceiling mounted)
- proprietary info gas anesthesia machine with volume and pressure control modes
- 1 Dual suction machine
- 2 Heated circulating water blankets
- proprietary info warming units
- 2 In line blood/fluid warmers
- 1 Electrosurgical unit
- 2 Ventilators
- 1 Vital sign/respiratory gas monitor: heart rate, respiratory rate, SpO2, EtCO2, analyzed anesthetic agent gas and oxygen percentages

location **Procedure Suite**

- 1 Stainless steel surgical table
- proprietary info surgical lights (ceiling mounted)
- proprietary info gas anesthesia machine with volume and pressure control modes
- 2 Heated circulating water blankets
- proprietary info warmer unit
- 1 Suction machine
- 1 Ventilator
- 1 Vital sign/respiratory gas monitor: heart rate, respiratory rate, SpO2, EtCO2, analyzed anesthetic agent gas and oxygen percentages, invasive and noninvasive blood pressure, ECG
- proprietary info Safety Cabinet

location **Surgery Suite**

- 2 Stainless steel surgical tables
- proprietary info surgery lights (ceiling mounted)
- proprietary info gas anesthesia machine with volume and pressure control modes
- 1 Suction unit
- 1 Electrosurgical unit
- proprietary info warming blanket
- proprietary info warmer
- 1 Ventilator
- 1 Vital sign/respiratory gas monitor: heart rate, respiratory rate, SpO2, EtCO2, analyzed anesthetic agent gas and oxygen percentages, invasive and noninvasive blood pressure, ECG

Molecular Services Core

Equipment: The MSC provides access to an Illumina iSeq 100 and two Illumina MiSeq sequencers for low to mid-output NGS applications. Fully automated sequencing sample preparations of 8-96 samples are supported with a Sciclone G3 NGSx automated liquid handling system. A 10X Genomics Chromium controller and Fluidigm C1 are available for single cell NGS applications. Additional instrumentation includes an Applied Biosystems 3730xl DNA Analyzer for conventional DNA sequencing, a Sage PippinHT for automated size selection and PCR purification, an Agilent 2100 Bioanalyzer and 4200 TapeStation for determining RNA, DNA, and protein integrity, and a Nanodrop spectrophotometer and Invitrogen Qubit Fluorometer for DNA, RNA and protein sample quantitation. Multiple additional thermal cyclers are available to support these instruments.

The MSC also provides access to an Illumina iScan with autoloader to allow 24hr service without user intervention for high-throughput genotyping and gene expression analyses (allowing the processing of up to 96 multi-sample BeadChips per day). The iScan System supports rapid, sensitive, and accurate imaging of Illumina's array-based genetic analysis products. A Tecan Freedom Evo liquid handling platforms is also available for automation of all Illumina protocols.

AB QuanStudio 5 and QuanStudio 6 Real Time PCR Systems and an AB QuantStudio 3D Digital PCR System are available to support real-time PCR, TaqMan genotyping, gene expression, absolute quantification, and rare allele detection assays. The Core Facility also has a Tecan GENios multimode plate reader with fluorescence, absorbance and glow luminescence modes and a high-performance Tecan plate washer for both 96- and 384-well plates. Additionally, a BioRad Chemidoc gel documentation system with UV and chemiluminescence capabilities is available in the electrophoresis clean room. Two Beckman ultracentrifuges are available as well.

A dedicated computer server for sequence analysis is available and consists a Dell PowerEdge R830 server with two Xenon E5-4640 2.1GHz processors (48 cores), 32TB of useable space, and 256 GB RAM. proprietary info
[REDACTED] Software is supports start-to-finish analysis for next generation sequencing data applications.

RESEARCH & RELATED Senior/Key Person Profile (Expanded)

PROFILE - Project Director/Principal Investigator				
Prefix:	First Name*: Don	Middle Name	Last Name*: Conrad	Suffix:
Position/Title*:	Division Chief/Associate Professor			
Organization Name*:	Oregon Health & Science University			
Department:	Research Genetics			
Division:				
Street1*:	3181 SW Sam Jackson Park Rd			
Street2:				
City*:	Portland			
County:				
State*:	OR: Oregon			
Province:				
Country*:	USA: UNITED STATES			
Zip / Postal Code*:	97239-3098			
Phone Number*: 5033465430	Fax Number:			
E-Mail*: conradon@ohsu.edu				
Credential, e.g., agency login:	username			
Project Role*: PD/PI	Other Project Role Category:			
Degree Type: Ph.D.	Degree Year: 2007			
Attach Biographical Sketch*:	File Name:	U24-Marmoset_Biosketch-ONPRC-Conrad.pdf		
Attach Current & Pending Support:	File Name:			

PROFILE - Senior/Key Person

Prefix:	First Name*:	secondary individuals and identifiers excluded this page (20) through page 24	Suffix:
Position/Title*:			
Organization Name*:			
Department:			
Division:			
Street1*:			
Street2:			
City*:			
County:			
State*:			
Province:			
Country*:			
Zip / Postal Code*:			

BIOGRAPHICAL SKETCH

Provide the following information for the Senior/key personnel and other significant contributors.
Follow this format for each person. **DO NOT EXCEED FIVE PAGES.**

NAME: Donald F. Conrad

eRA COMMONS USER NAME (credential, e.g., agency login): username

POSITION TITLE: Associate Professor

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable. Add/delete rows as necessary.)*

INSTITUTION AND LOCATION	DEGREE (if applicable)	Completion Date MM/YYYY	FIELD OF STUDY
Dartmouth College, Hanover, NH	B.A.	06/1999	Biochemistry & Molecular Biology
Stanford University, Palo Alto, CA	M.S.	06/2000	Epidemiology
University of Chicago, Chicago, IL Advisor: Jonathan Pritchard	Ph.D.	10/2007	Human Genetics
Wellcome Trust Sanger Institute, Cambridge, UK Advisor: Matt Hurles	Postdoctoral	01/2011	Genomics

A. Personal Statement

I have over 15 years of experience in developing statistical and experimental approaches to mapping and functionally characterizing human genetic variation using genome scale technology. Highlights of this work include a method for indirectly identifying germline deletions from SNP genotypes (Conrad, et al. 2006a), the highest resolution array-based map of common copy number variation to date (Conrad, et al. 2009), and the first paper to describe the use of DNA capture arrays to sequence CNV breakpoints in a high-throughput fashion (Conrad, et al. 2010). As the lead scientist on a sub-group of the 1000 genomes project, I developed a statistical method for identifying germline and cell-line *de novo* mutations using next-generation sequencing data, and wrote a software package to implement this method (www.sourceforge.net/p/denovogear). I have extensive experience with managing large data projects such as the one proposed here, having personally performed CNV analysis on over 25,000 SNP arrays for cohort based studies such as the Wellcome Trust Case Control Consortium and others (Craddock et al. 2010 and other unpublished work), as well as analyzed whole genome sequencing datasets from hundreds of individuals. I was funded by the NIH as a member of the analysis working group for the GTEx Consortium, a project to understand the genetic basis of gene expression variation across the human body, using RNA sequencing data from 40 tissues collected from 1,000 post-mortem donors. Most recently, I have organized an NIH-funded clinical genomics consortium to study the genetic basis of male infertility, named GEMINI. GEMINI consists of over a dozen clinical sites around the world, and our co-Investigator collectively see 15,000 patients per year. In 2018, I was recruited to start the first Division of Genetics at the Oregon National Primate Research center. I serve on a number of ONPRC committees related to non-human primate work, including the Animal Utilization Committee and Research Advisory Council, and am actively engaged in NHP genetics and genomics research in reproduction and alcohol use. My experience in managing complex collaborative projects, and long-term sustained interest in the use of large datasets for research makes me an ideal candidate to help lead the marmoset coordinating center.

B. Positions and Honors

Positions and Employment:

2011-2017	Assistant Professor, Department of Genetics, Washington University School of Medicine, St. Louis, MO
2017-2018	Associate Professor, Department of Genetics, Washington University School of Medicine, St. Louis, MO
2018-	Associate Professor & Chief, Division of Genetics, Oregon National Primate Research Center, Oregon Health & Science University, Beaverton, OR

Honors:

2008	Best Dissertation in Biological Sciences (honorable mention), University of Chicago
2008	Finalist for Best Post-doctoral Trainee Platform Presentation (Basic) award, ASHG
2014	Inducted into Dartmouth College Sports Hall of Fame
2015	Eliot B. Shoolman Visiting Professor, Harvard Medical School
2017	Fulbright Specialist Grant, used to teach clinical genomics in Estonia

Editorial Boards:

2012 -	Andrology
2013-	Biology of Reproduction
2014-	Genome Research

Government Service:

2011	NHGRI Special Emphasis Panel for ENCODE technology development, <i>ad hoc</i> reviewer
2012	Consultant, CDC, Served as consultant on the design of a novel CGH array-based system for newborn screening from blood spots
2012	NICHD <i>ad hoc</i> reviewer for P01 submission (2 occasions)
2013	NHGRI Special Emphasis Panel for Undiagnosed Disease Networks, <i>ad hoc</i> reviewer
2016	NICHD ZHD1 DSR-L (50) "Gynomics", <i>ad hoc</i> reviewer
2018	NHGRI Special Emphasis Panel for Undiagnosed Disease Networks 2, <i>ad hoc</i> reviewer
2018	NICHD/NHGRI Workshop Genomic Medicine for Reproductive, Prenatal, & Neonatal Health
2013-2019	Member, NICHD Reproduction, Andrology and Gynecology Study Section (CHHD-R)

C. Contributions to Science

1. **Interpretation of human genetic variation in GWAS and medical genetics.** I have a long-term interest in improving the interpretation of human genetic variation identified in the context of genomewide association studies (GWAS) and medical genetics. As a member of large international consortia, such as the 1000 Genomes Project, I have been working to understand global patterns of human population genetic variation and how these influence our ability to map genetic causes of disease. As part of the GTEx consortium, I develop methods for studying the functional impact of CNVs on gene expression throughout the body, and to leverage GTEx results to improve our ability to predict the function consequences of patient-specific mutations. Most recently we have developed statistical methods that formally evaluate the significance of mutations identified in $n=1$ cases of suspected genetic disease.
 - a. **Conrad DF**, Jakobsson M, Coop G, Wen X, Wall JD, Rosenberg NA, Pritchard JK. A worldwide survey of haplotype variation and linkage disequilibrium in the human genome. *Nat Genet.* 2006 Nov;38(11):1251-1260.
 - b. MacArthur, DG.... **Conrad DF**, ...Gunter, C. Guidelines for investigating causality of sequence variants in human disease. *Nature.* 2014 Apr 24; 508(7497): 469-476. PMCID: PMC4180223.
 - c. Rivas MA, Prinen M, **Conrad DF**, et al. Effect of predicted protein-truncating genetic variants on the human transcriptome. *Science.* 2015 May 8; 348 (6235); 666-669. PMCID: PMC4537935.
 - d. Wilfert AB, Chao, KR, Kaushal M, Jain S, Zollner S, Adams DR, **Conrad DF**. Genome-wide significance testing of variation from single case exomes. *Nat Genet.* 2016 Dec; 48(12):1455-1461. PMCID: PMC5127779.

2. **Genetic epidemiology of infertility and its comorbidities.** Along with colleagues at the University of Utah, I have organized a large international consortium of clinical and basic scientists that study the genetic basis of male infertility, called GEMINI, which is currently funded by the NIH. Our mission is to identify novel genetic causes of infertility and ultimately assist clinicians in using genetic information to improve the management of male infertility. Our published work to date has described both novel risk factors for male infertility, as well as informatic tools developed to enhance the identification of infertility mutations.
 - a. A. M. Lopes, K. I. Aston, ... 25 authors..., D. T. Carrell, **D.F. Conrad**. Human Spermatogenic Failure Purges Deleterious Mutation Load from the Autosomes and Both Sex Chromosomes, including the Gene DMRT1. PLoS Genetics. 9(3):e1003349, 2013. PMCID: PMC3605256.
 - b. Huang N, Wen Y, Guo X, Li Z, Dai J, Ni B, Yu J, Lin Y, Zhou W, Yao B, Jiang Y, Sha J, **Conrad DF***, Hu Z*. A Screen for Genomic Disorders of Infertility Identifies MAST2 Duplications Associated with Nonobstructive Azoospermia in Humans. Biol Reprod. 2015 Sep;93(3):61. PMCID: PMC4710186.
***=joint senior author**
 - c. Nagirnaja L, Aston KI, **Conrad DF**. Genetic intersection of male infertility and cancer. Fertil Steril. 2018 109(1):20-26. PMCID: PMC5761685.
 - d. Jung M, Wells D, Rusch J, Ahmad S, Marchini J, Myers SR, **Conrad DF**. Unified single-cell analysis of testis gene regulation and pathology in five mouse strains. eLife. 2019 Jun 25;8. pii: e43966. PMCID: PMC6615865
3. **Mapping and characterization of human structural variation.** During my doctoral work I created some of the first genomic maps of submicroscopic variation in human chromosome structure, a class of genetic variants referred to as "structural variation" (SV). At the time, there were very few practical approaches for detecting SV from whole genomes. Much of my early work involved statistical methods development that greatly enhanced our ability to detect and genotype SV from SNP genotypes and oligonucleotide array CGH. While a post-doc at the Sanger, I lead the generation of the highest resolution CGH-based map of human SV ever created, which is still used as a gold standard in the field for benchmarking new methods. The resulting maps have been heavily used by the medical genetics community to improve interpretation of patient data, and by the research community as a resource for imputation into GWAS datasets, leading to two map papers with over 1,000 citations each.
 - a. **Conrad DF**, Andrews TD, Carter NP, Hurles ME, Pritchard JK. A high-resolution survey of deletion polymorphism in the human genome. Nat Genet. 2006 Jan;38(1):75-81. Epub 2005 Dec 4. PMID: 16327808
 - b. Redon R, Ishikawa S, Fitch KR, Feuk L, Perry GH, ..., **Conrad DF**, et.al. Global variation in copy number in the human genome. Nature. 2006 Nov 23;444(7118):444-454. PMCID: PMC2669898
 - c. **Conrad DF**, Pinto D, Redon R, Feuk L, Gokcumen O, et.al. Origins and functional impact of copy number variation in the human genome. Nature. 2010 Apr 1;464(7289):704-712. PMCID: PMC3330748.
 - d. Chiang C, Scott AJ, Davis JR, Tsang EK, Li X, Kim Y, Hadzic T, Damani FN, Ganel L; GTEx Consortium., Montgomery SB, Battle A, **Conrad DF***, Hall IM*. The impact of structural variation on human gene expression. Nat Genet. 2017 49(5):692-699. PMCID: PMC5406250.
4. **Analysis of human germline mutation processes.** My lab is actively developing and applying methods to detect and characterize human germline mutation. In 2008, I wrote what I believe was the first software explicitly meant to identify germline mutations from genomewide sequencing data of related individuals, which I named DeNovoGear (DNG). As part of the 1000 genomes consortium, I used DNG to analyze whole genome sequencing data from two parent-offspring trios to perform the first comparative analysis of whole genome germline mutation rates among human families. This work has led to an improved estimate of the human germline point mutation rate. The most extensive application of DNG is through the Deciphering Developmental Disorders study, a national clinic genetics project in the UK, which is using DNG to screen for potentially diagnostic germline point mutations in over 12,000 families reporting an idiopathic developmental disorder (www.ddduk.org). As a post-doc, I pioneered the use of targeted sequence capture as an experimental platform for quickly extracting and sequencing CNV breakpoints from pooled tissue samples, allowing us to reveal the surprising frequency of NHEJ and replication-based mutation that produces germline CNVs.

- a. **Conrad DF**, Bird C, Blackburne B, Lindsay S, Mamanova L, et.al. Mutation spectrum revealed by breakpoint sequencing of human germline CNVs. Nat Genet. 2010;42(5):385-391. PMID: PMC3428939.
- b. **Conrad DF**, Keebler JE, DePristo MA, Lindsay SJ, Zhang Y, Casals F, Idaghdour Y, Hartl CL, Torroja C, Garimella KV, Zilversmit M, Cartwright RA, Rouleau GA, Daly MJ, EA, Hurles ME, and Awadalla P. Variation in genome-wide mutation rates within and between human families. Nat Genet, 43:712-714, 2011. PMID: PMC3322360.
- c. Ramu A, Noordam, MJ, Schwartz RS, Wuster A, Hurles ME, Cartwright RA, **Conrad DF**. DeNovoGear: *de novo* indel and point mutation discovery and phasing. Nature Methods. 10:985-7, 2013 PMID: PMC4003501.

D. Additional Information: Research Support and/or Scholastic Performance

Ongoing Research Support

P51 OD011092 (Barr-Gillespie) 05/01/2019-04/30/2024
NIH/OD

Support private support

The major goal of this project is to provide the support for specialized facilities, scientific and technical personnel, and NHP species needed for the conduct of biomedical research at the Oregon National Primate Research Center.

Role: Associate Professor, Division Chief

R01 HG007178 (Conrad) 07/01/2018-02/29/2020
NIH/NHGRI No-cost extension

Analysis of *De Novo* Mutation from sequencing of related individuals and cells

The goal of this project is to build a statistical framework for detecting *de novo* mutations from sequencing of DNA and RNA from related individuals, tissues and cells.

Role: PI

R01 HD078641 (Conrad, Aston, Multi-PI) 09/10/2014-05/31/2020
NIH/NICHD

Genomics of Spermatogenic Impairment

The goal of this project is to characterize the genetic basis of human spermatogenic impairment using genetic epidemiology.

Role: MPI

P60 AA010760 (Richards) 01/01/2016-12/31/2020
NIH/NIAAA

Behavioral Genomics of Alcohol Neuroadaptation

This research Center is comprised of 6 components and focuses on the behavioral and genetic consequences of alcohol use and the genetic risk factors involved in the etiology of alcohol use.

Role: Core Lead, Molecular Bioinformatics Core

Completed Research Support

R01 HG007178-04S1 (Conrad) 09/14/2017-02/28/2019
NIH/NHGRI

Analysis of *De Novo* Mutation from sequencing of related individuals and cells

The goal of this project is to build a statistical framework for detecting *de novo* mutations from sequencing of DNA and RNA from related individuals, tissues and cells.

Role: PI

R01 MH101810 (Conrad) 08/01/2013-06/30/2018
NIH/NIMH

Modeling the effects of structural variation in GTEx data and Mendelian disease

The goal of this study is to learn the impact of variation in chromosome structure on gene expression in the Genotype Tissue Expression (GTEx) project, and then use this information to build a model to predict the functional impact of *de novo* and rare structural variants.

Role: PI

R01 MH101810-03S1 (Conrad)
NIH/NIMH

07/01/2016-06/30/2018

Modeling the effects of structural variation in GTEx data and Mendelian disease

The goal of this study is to learn the impact of variation in chromosome structure on gene expression in the Genotype Tissue Expression (GTEx) project, and then use this information to build a model to predict the functional impact of *de novo* and rare structural variants.

Role: PI

private support

02/01/2016-01/31/2019

The goals of this project are to improve our understanding of sex differences in susceptibility to glioblastoma. We will map sex differences in the transcriptional programs of neurons, and identify which of these differences contribute to sex differences in the thresholds for transformation of normal neurons into cancerous ones. We will then use single-cell RNAseq to compare the expression profiles of wild type neurons to those that have been edited at genes thought to modulate expression differences between the sexes.

Role: Co-I

U54 HD087011 (Constantino, Schlaggar. MPI)
NIH/NICHD

09/18/2015-05/31/2020

Washington University Intellectual and Developmental Disabilities Research Center

The Intellectual and Developmental Disabilities Research Center at the Washington University School of Medicine is a scientific program composed of three core facilities, one dedicated to studies of cellular and molecular mechanisms of causation in IDD, one dedicated to the identification of "signatures" of developmental disability that can be imaged in the developing brain, and one dedicated to in-depth clinical assessment of human subjects and the translation of new understanding of causal mechanisms into higher impact intervention.

Role: Core Faculty, Clinical Translational Core

BIOGRAPHICAL SKETCH

Provide the following information for the Senior/key personnel and other significant contributors.
Follow this format for each person. **DO NOT EXCEED FIVE PAGES.**

NAME: secondary names / identifiers excluded this page through page 70

RESEARCH & RELATED BUDGET - SECTION A & B, Budget Period 1

ORGANIZATIONAL DUNS*: 0969975150000

Budget Type*: ☒ Project ☐ Subaward/Consortium

Enter name of Organization: Oregon Health & Science University

Start Date*: 07-01-2020

End Date*: 06-30-2021

Budget Period: 1

A. Senior/Key Person

Prefix	First Name*	Middle Name	Last Name*	Suffix	Project Role*	Base Salary (\$)	Calendar Months	Academic Months	Summer Months	Requested Salary (\$)*	Fringe Benefits (\$)*	Funds Requested (\$)*	
1 .	Don		Conrad		PD/PI	base salary and percent effort				9,615.00	2,979.00	12,594.00	
2 .	secondary name / identifier									6,138.00	2,059.00	8,197.00	
Total Funds Requested for all Senior Key Persons in the attached file													
Additional Senior Key Persons:			File Name:			Total Senior/Key Person							20,791.00

B. Other Personnel

Number of Personnel*	Project Role*	Calendar Months	Academic Months	Summer Months	Requested Salary (\$)*	Fringe Benefits*	Funds Requested (\$)*
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						
1	Lab Manager	percent effort			19,136.00	30.00	19,166.00
1	Computational Biologist				15,836.00	46.00	15,882.00
1	Software Development Programmer				84,460.00	25,337.00	109,797.00
3	Total Number Other Personnel				Total Other Personnel		144,845.00
					Total Salary, Wages and Fringe Benefits (A+B)		165,636.00

RESEARCH & RELATED Budget {A-B} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTION C, D, & E, Budget Period 1**ORGANIZATIONAL DUNS*:** 0969975150000**Budget Type*:** ☒ Project ☐ Subaward/Consortium**Organization:** Oregon Health & Science University**Start Date*:** 07-01-2020**End Date*:** 06-30-2021**Budget Period:** 1

C. Equipment Description	
List items and dollar amount for each item exceeding \$5,000	
Equipment Item	Funds Requested (\$)*
Total funds requested for all equipment listed in the attached file	
Total Equipment	
Additional Equipment: File Name:	

D. Travel	Funds Requested (\$)*
1. Domestic Travel Costs (Incl. Canada, Mexico, and U.S. Possessions)	2,000.00
2. Foreign Travel Costs	
Total Travel Cost	2,000.00

E. Participant/Trainee Support Costs	Funds Requested (\$)*
1. Tuition/Fees/Health Insurance	
2. Stipends	
3. Travel	
4. Subsistence	
5. Other:	
Number of Participants/Trainees	Total Participant Trainee Support Costs

RESEARCH & RELATED Budget (C-E) (Funds Requested)

RESEARCH & RELATED BUDGET - SECTIONS F-K, Budget Period 1**ORGANIZATIONAL DUNS*:** 0969975150000**Budget Type*:** ☒ Project ☐ Subaward/Consortium**Organization:** Oregon Health & Science University**Start Date*:** 07-01-2020**End Date*:** 06-30-2021**Budget Period:** 1

F. Other Direct Costs	Funds Requested (\$)*
1. Materials and Supplies	3,000.00
2. Publication Costs	
3. Consultant Services	6,000.00
4. ADP/Computer Services	
5. Subawards/Consortium/Contractual Costs	306,530.00
6. Equipment or Facility Rental/User Fees	
7. Alterations and Renovations	
8. Other Costs	20,000.00
Total Other Direct Costs	335,530.00

G. Direct Costs	Funds Requested (\$)*
Total Direct Costs (A thru F)	503,166.00

H. Indirect Costs			
Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base (\$)	Funds Requested (\$)*
1 . Modified Total Direct Costs (MTDC)	75	246,636.00	184,977.00
		Total Indirect Costs	184,977.00
Cognizant Federal Agency	DHHS, Arif Karim, 415-437-7820		
(Agency Name, POC Name, and POC Phone Number)			

I. Total Direct and Indirect Costs	Funds Requested (\$)*
Total Direct and Indirect Institutional Costs (G + H)	688,143.00

J. Fee	Funds Requested (\$)*

K. Total Costs and Fee	Funds Requested (\$)*
	688,143.00

L. Budget Justification*	File Name: U24-Marmoset_Budgetjustification-ONPRC.pdf (Only attach one file.)
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RESEARCH & RELATED Budget {F-K} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTION A & B, Budget Period 2

ORGANIZATIONAL DUNS*: 0969975150000

Budget Type*: ☒ Project ☐ Subaward/Consortium

Enter name of Organization: Oregon Health & Science University

Start Date*: 07-01-2021

End Date*: 06-30-2022

Budget Period: 2

A. Senior/Key Person

Prefix	First Name*	Middle Name	Last Name*	Suffix	Project Role*	Base Salary (\$)	Calendar Months	Academic Months	Summer Months	Requested Salary (\$)*	Fringe Benefits (\$)*	Funds Requested (\$)*	
1.	Don		Conrad		PD/PI	base salary and percent effort				9,615.00	2,979.00	12,594.00	
2.	secondary name / identifier									6,322.00	2,121.00	8,443.00	
Total Funds Requested for all Senior Key Persons in the attached file													
Additional Senior Key Persons:			File Name:			Total Senior/Key Person							21,037.00

B. Other Personnel

Number of Personnel*	Project Role*	Calendar Months	Academic Months	Summer Months	Requested Salary (\$)*	Fringe Benefits*	Funds Requested (\$)*
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						
1	Lab Manager	percent effort			19,710.00	31.00	19,741.00
1	Computational Biologist				16,311.00	47.00	16,358.00
1	Software Development Programmer				86,994.00	26,097.00	113,091.00
3	Total Number Other Personnel				Total Other Personnel		149,190.00
					Total Salary, Wages and Fringe Benefits (A+B)		170,227.00

RESEARCH & RELATED Budget {A-B} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTION C, D, & E, Budget Period 2**ORGANIZATIONAL DUNS*:** 0969975150000**Budget Type*:** ☒ Project ☐ Subaward/Consortium**Organization:** Oregon Health & Science University**Start Date*:** 07-01-2021**End Date*:** 06-30-2022**Budget Period:** 2

C. Equipment Description	
List items and dollar amount for each item exceeding \$5,000	
Equipment Item	Funds Requested (\$)*
Total funds requested for all equipment listed in the attached file	
Total Equipment	
Additional Equipment: File Name:	

D. Travel	Funds Requested (\$)*
1. Domestic Travel Costs (Incl. Canada, Mexico, and U.S. Possessions)	2,000.00
2. Foreign Travel Costs	
Total Travel Cost	2,000.00

E. Participant/Trainee Support Costs	Funds Requested (\$)*
1. Tuition/Fees/Health Insurance	
2. Stipends	
3. Travel	
4. Subsistence	
5. Other:	
Number of Participants/Trainees	Total Participant Trainee Support Costs

RESEARCH & RELATED Budget (C-E) (Funds Requested)

RESEARCH & RELATED BUDGET - SECTIONS F-K, Budget Period 2**ORGANIZATIONAL DUNS*:** 0969975150000**Budget Type*:** ☒ Project ☐ Subaward/Consortium**Organization:** Oregon Health & Science University**Start Date*:** 07-01-2021**End Date*:** 06-30-2022**Budget Period:** 2

F. Other Direct Costs	Funds Requested (\$)*
1. Materials and Supplies	3,000.00
2. Publication Costs	
3. Consultant Services	6,000.00
4. ADP/Computer Services	
5. Subawards/Consortium/Contractual Costs	308,739.00
6. Equipment or Facility Rental/User Fees	
7. Alterations and Renovations	
8. Other Costs	5,000.00
Total Other Direct Costs	322,739.00

G. Direct Costs	Funds Requested (\$)*
Total Direct Costs (A thru F)	494,966.00

H. Indirect Costs			
Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base (\$)	Funds Requested (\$)*
1 . Modified Total Direct Costs (MTDC)	75	186,227.00	139,670.00
		Total Indirect Costs	139,670.00
Cognizant Federal Agency	DHHS, Arif Karim, 415-437-7820		
(Agency Name, POC Name, and POC Phone Number)			

I. Total Direct and Indirect Costs	Funds Requested (\$)*
Total Direct and Indirect Institutional Costs (G + H)	634,636.00

J. Fee	Funds Requested (\$)*

K. Total Costs and Fee	Funds Requested (\$)*
	634,636.00

L. Budget Justification*	File Name: U24-Marmoset_Budgetjustification-ONPRC.pdf (Only attach one file.)
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RESEARCH & RELATED Budget {F-K} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTION A & B, Budget Period 3

ORGANIZATIONAL DUNS*: 0969975150000

Budget Type*: ☒ Project ☐ Subaward/Consortium

Enter name of Organization: Oregon Health & Science University

Start Date*: 07-01-2022

End Date*: 06-30-2023

Budget Period: 3

A. Senior/Key Person

Prefix	First Name*	Middle Name	Last Name*	Suffix	Project Role*	Base Salary (\$) base salary and percent effort	Calendar Months	Academic Months	Summer Months	Requested Salary (\$)*	Fringe Benefits (\$)*	Funds Requested (\$)*	
1.	Don		Conrad		PD/PI					9,615.00	2,979.00	12,594.00	
2.	secondary name / identifier									6,511.00	2,185.00	8,696.00	
Total Funds Requested for all Senior Key Persons in the attached file													
Additional Senior Key Persons:			File Name:			Total Senior/Key Person							21,290.00

B. Other Personnel

Number of Personnel*	Project Role*	Calendar Months	Academic Months	Summer Months	Requested Salary (\$)*	Fringe Benefits*	Funds Requested (\$)*
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						
1	Lab Manager	percent effort			20,301.00	32.00	20,333.00
1	Computational Biologist				16,801.00	48.00	16,849.00
1	Software Development Programmer				89,604.00	26,880.00	116,484.00
3	Total Number Other Personnel				Total Other Personnel		153,666.00
Total Salary, Wages and Fringe Benefits (A+B)							174,956.00

RESEARCH & RELATED Budget {A-B} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTION C, D, & E, Budget Period 3**ORGANIZATIONAL DUNS*:** 0969975150000**Budget Type*:** ☒ Project ☐ Subaward/Consortium**Organization:** Oregon Health & Science University**Start Date*:** 07-01-2022**End Date*:** 06-30-2023**Budget Period:** 3

C. Equipment Description	
List items and dollar amount for each item exceeding \$5,000	
Equipment Item	Funds Requested (\$)*
Total funds requested for all equipment listed in the attached file	
Total Equipment	
Additional Equipment: File Name:	

D. Travel	Funds Requested (\$)*
1. Domestic Travel Costs (Incl. Canada, Mexico, and U.S. Possessions)	2,000.00
2. Foreign Travel Costs	
Total Travel Cost	2,000.00

E. Participant/Trainee Support Costs	Funds Requested (\$)*
1. Tuition/Fees/Health Insurance	
2. Stipends	
3. Travel	
4. Subsistence	
5. Other:	
Number of Participants/Trainees	Total Participant Trainee Support Costs

RESEARCH & RELATED Budget (C-E) (Funds Requested)

RESEARCH & RELATED BUDGET - SECTIONS F-K, Budget Period 3**ORGANIZATIONAL DUNS*:** 0969975150000**Budget Type*:** ☒ Project ☐ Subaward/Consortium**Organization:** Oregon Health & Science University**Start Date*:** 07-01-2022**End Date*:** 06-30-2023**Budget Period:** 3

F. Other Direct Costs	Funds Requested (\$)*
1. Materials and Supplies	3,000.00
2. Publication Costs	
3. Consultant Services	6,000.00
4. ADP/Computer Services	
5. Subawards/Consortium/Contractual Costs	308,739.00
6. Equipment or Facility Rental/User Fees	
7. Alterations and Renovations	
8. Other Costs	5,000.00
Total Other Direct Costs	322,739.00

G. Direct Costs	Funds Requested (\$)*
Total Direct Costs (A thru F)	499,695.00

H. Indirect Costs			
Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base (\$)	Funds Requested (\$)*
1 . Modified Total Direct Costs (MTDC)	75	190,956.00	143,217.00
		Total Indirect Costs	143,217.00
Cognizant Federal Agency	DHHS, Arif Karim, 415-437-7820		
(Agency Name, POC Name, and POC Phone Number)			

I. Total Direct and Indirect Costs	Funds Requested (\$)*
Total Direct and Indirect Institutional Costs (G + H)	642,912.00

J. Fee	Funds Requested (\$)*

K. Total Costs and Fee	Funds Requested (\$)*
	642,912.00

L. Budget Justification*	File Name: U24-Marmoset_Budgetjustification-ONPRC.pdf (Only attach one file.)
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RESEARCH & RELATED Budget {F-K} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTION A & B, Budget Period 4

ORGANIZATIONAL DUNS*: 0969975150000

Budget Type*: ☒ Project ☐ Subaward/Consortium

Enter name of Organization: Oregon Health & Science University

Start Date*: 07-01-2023

End Date*: 06-30-2024

Budget Period: 4

A. Senior/Key Person

Prefix	First Name*	Middle Name	Last Name*	Suffix	Project Role*	Base Salary (\$)	Calendar Months	Academic Months	Summer Months	Requested Salary (\$)*	Fringe Benefits (\$)*	Funds Requested (\$)*
1 .	Don		Conrad		PD/PI	base salary and percent effort				9,615.00	2,979.00	12,594.00
2 .	secondary name / identifier									6,707.00	2,250.00	8,957.00
Total Funds Requested for all Senior Key Persons in the attached file												
Additional Senior Key Persons:			File Name:							Total Senior/Key Person		21,551.00

B. Other Personnel

Number of Personnel*	Project Role*	Calendar Months	Academic Months	Summer Months	Requested Salary (\$)*	Fringe Benefits*	Funds Requested (\$)*
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						
1	Lab Manager	percent effort			20,910.00	33.00	20,943.00
1	Computational Biologist				17,305.00	50.00	17,355.00
1	Software Development Programmer				92,292.00	27,686.00	119,978.00
3	Total Number Other Personnel				Total Other Personnel		158,276.00
					Total Salary, Wages and Fringe Benefits (A+B)		179,827.00

RESEARCH & RELATED Budget {A-B} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTION C, D, & E, Budget Period 4**ORGANIZATIONAL DUNS*:** 0969975150000**Budget Type*:** ☒ Project ☐ Subaward/Consortium**Organization:** Oregon Health & Science University**Start Date*:** 07-01-2023**End Date*:** 06-30-2024**Budget Period:** 4**C. Equipment Description**

List items and dollar amount for each item exceeding \$5,000

Equipment Item	Funds Requested (\$)*
----------------	-----------------------

Total funds requested for all equipment listed in the attached file**Total Equipment****Additional Equipment:** File Name:**D. Travel****Funds Requested (\$)***

1. Domestic Travel Costs (Incl. Canada, Mexico, and U.S. Possessions)

2,000.00

2. Foreign Travel Costs

Total Travel Cost**2,000.00****E. Participant/Trainee Support Costs****Funds Requested (\$)***

1. Tuition/Fees/Health Insurance

2. Stipends

3. Travel

4. Subsistence

5. Other:

Number of Participants/Trainees**Total Participant Trainee Support Costs**

RESEARCH & RELATED Budget (C-E) (Funds Requested)

RESEARCH & RELATED BUDGET - SECTIONS F-K, Budget Period 4**ORGANIZATIONAL DUNS*:** 0969975150000**Budget Type*:** ☒ Project ☐ Subaward/Consortium**Organization:** Oregon Health & Science University**Start Date*:** 07-01-2023**End Date*:** 06-30-2024**Budget Period:** 4

F. Other Direct Costs	Funds Requested (\$)*
1. Materials and Supplies	3,000.00
2. Publication Costs	
3. Consultant Services	6,000.00
4. ADP/Computer Services	
5. Subawards/Consortium/Contractual Costs	308,739.00
6. Equipment or Facility Rental/User Fees	
7. Alterations and Renovations	
8. Other Costs	5,000.00
Total Other Direct Costs	322,739.00

G. Direct Costs	Funds Requested (\$)*
Total Direct Costs (A thru F)	504,566.00

H. Indirect Costs			
Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base (\$)	Funds Requested (\$)*
1 . Modified Total Direct Costs (MTDC)	75	195,827.00	146,870.00
Total Indirect Costs			146,870.00
Cognizant Federal Agency	DHHS, Arif Karim, 415-437-7820		
(Agency Name, POC Name, and POC Phone Number)			

I. Total Direct and Indirect Costs	Funds Requested (\$)*
Total Direct and Indirect Institutional Costs (G + H)	651,436.00

J. Fee	Funds Requested (\$)*

K. Total Costs and Fee	Funds Requested (\$)*
	651,436.00

L. Budget Justification*	File Name: U24-Marmoset_Budgetjustification-ONPRC.pdf (Only attach one file.)
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RESEARCH & RELATED Budget {F-K} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTION A & B, Budget Period 5

ORGANIZATIONAL DUNS*: 0969975150000

Budget Type*: ☒ Project ☐ Subaward/Consortium

Enter name of Organization: Oregon Health & Science University

Start Date*: 07-01-2024

End Date*: 06-30-2025

Budget Period: 5

A. Senior/Key Person

Prefix	First Name*	Middle Name	Last Name*	Suffix	Project Role*	Base Salary (\$)	Calendar Months	Academic Months	Summer Months	Requested Salary (\$)*	Fringe Benefits (\$)*	Funds Requested (\$)*	
1.	Don		Conrad		PD/PI	base salary and percent effort				9,615.00	2,979.00	12,594.00	
2.	secondary name / identifier									6,908.00	2,318.00	9,226.00	
Total Funds Requested for all Senior Key Persons in the attached file													
Additional Senior Key Persons:			File Name:			Total Senior/Key Person							21,820.00

B. Other Personnel

Number of Personnel*	Project Role*	Calendar Months	Academic Months	Summer Months	Requested Salary (\$)*	Fringe Benefits*	Funds Requested (\$)*
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						
1	Lab Manager	percent effort			21,537.00	34.00	21,571.00
1	Computational Biologist				17,824.00	51.00	17,875.00
1	Software Development Programmer				95,060.00	28,518.00	123,578.00
3	Total Number Other Personnel				Total Other Personnel		163,024.00
					Total Salary, Wages and Fringe Benefits (A+B)		184,844.00

RESEARCH & RELATED Budget {A-B} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTION C, D, & E, Budget Period 5**ORGANIZATIONAL DUNS*:** 0969975150000**Budget Type*:** ☒ Project ☐ Subaward/Consortium**Organization:** Oregon Health & Science University**Start Date*:** 07-01-2024**End Date*:** 06-30-2025**Budget Period:** 5**C. Equipment Description**

List items and dollar amount for each item exceeding \$5,000

Equipment Item	Funds Requested (\$)*
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Total funds requested for all equipment listed in the attached file**Total Equipment****Additional Equipment:** File Name:**D. Travel****Funds Requested (\$)***

1. Domestic Travel Costs (Incl. Canada, Mexico, and U.S. Possessions)

2,000.00

2. Foreign Travel Costs

Total Travel Cost**2,000.00****E. Participant/Trainee Support Costs****Funds Requested (\$)***

1. Tuition/Fees/Health Insurance

2. Stipends

3. Travel

4. Subsistence

5. Other:

Number of Participants/Trainees**Total Participant Trainee Support Costs**

RESEARCH & RELATED Budget (C-E) (Funds Requested)

RESEARCH & RELATED BUDGET - SECTIONS F-K, Budget Period 5**ORGANIZATIONAL DUNS*:** 0969975150000**Budget Type*:** ☒ Project ☐ Subaward/Consortium**Organization:** Oregon Health & Science University**Start Date*:** 07-01-2024**End Date*:** 06-30-2025**Budget Period:** 5

F. Other Direct Costs	Funds Requested (\$)*
1. Materials and Supplies	3,000.00
2. Publication Costs	
3. Consultant Services	6,000.00
4. ADP/Computer Services	
5. Subawards/Consortium/Contractual Costs	308,739.00
6. Equipment or Facility Rental/User Fees	
7. Alterations and Renovations	
8. Other Costs	5,000.00
Total Other Direct Costs	322,739.00

G. Direct Costs	Funds Requested (\$)*
Total Direct Costs (A thru F)	509,583.00

H. Indirect Costs			
Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base (\$)	Funds Requested (\$)*
1 . Modified Total Direct Costs (MTDC)	75	200,844.00	150,633.00
Total Indirect Costs			150,633.00
Cognizant Federal Agency	DHHS, Arif Karim, 415-437-7820		
(Agency Name, POC Name, and POC Phone Number)			

I. Total Direct and Indirect Costs	Funds Requested (\$)*
Total Direct and Indirect Institutional Costs (G + H)	660,216.00

J. Fee	Funds Requested (\$)*

K. Total Costs and Fee	Funds Requested (\$)*
	660,216.00

L. Budget Justification*	File Name: U24-Marmoset_Budgetjustification-ONPRC.pdf (Only attach one file.)
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RESEARCH & RELATED Budget {F-K} (Funds Requested)

BUDGET JUSTIFICATION, Oregon Health & Science University

Salaries: OHSU's budgeting guidance includes mandatory and contractual annual merit increases. Amounts requested are consistent with this budgeting practice and do not include cost of living increases in out years. Fringe benefits are calculated using actual rates where available. The Federal Salary Cap in effect at the time of application has been applied to affected individuals.

Key Personnel

Don Conrad, Ph.D., (Principal Investigator, [REDACTED], Years 1-5). Along with [REDACTED], Dr. Conrad will serve as joint director of the Marmoset Coordinating Center (MCC). Dr. Conrad brings over 15 years of experience in the analysis of large-scale genetic data analysis. Together with [REDACTED] Dr. Conrad will manage and meet biweekly with the members of the MCC to discuss progress, pending marmoset inquiries, and to plan future developments. He will meet biweekly with the informatics development team to coordinate strategy and evaluate milestones. He will manage [REDACTED] and the central administration of the MCC, including reviewing website updates, activity reports, and communication with NIH program staff. Dr. Conrad will participate in presentation of results at BRAIN and/or marmoset-related meetings, NIH-requested workshops and teleconferences, and national or international scientific meetings as appropriate.

[REDACTED]

Travel

We request \$2,000 per year for travel to face-to-face meetings of MCC members, strategic meetings involving the broader marmoset neuroscience community, or to present MCC-related work at academic conferences.

Other Expenses

Materials and Supplies:

Sample collection and processing: \$3,000, Year 1 to 5. We are requesting funds to underwrite shipping, processing and storage of marmoset DNA from centers participating in the MCC.

Consultant Services:

We are requesting \$6,000 annually in all years for consulting costs for two external Scientific Advisory Board members. The advisory board members are marmoset neuroscientists will serve as part of the concierge function of the MCC, reviewing requests for information that are received through the MCC web portal, participating in biweekly teleconferences, and where appropriate, communicating directly with scientists engaged with MCC through written opinions or teleconference.

Computational Expenses:

We are requesting \$20,000 in Year 1 to purchase hardware for the marmoset coordination center databases and website, as well as to purchase services from the OHSU Advanced Computing Center related to database and website setup and security review. We are requesting \$5,000/yr in Years 2 to 5 to cover the recurring costs of storage and website hosting at OHSU, expected software and hardware updates, and proprietary info usage fees incurred by marmoset data processing (e.g. genotype calling from raw sequencing data).

RESEARCH & RELATED BUDGET - Cumulative Budget

	Totals (\$)	
Section A, Senior/Key Person		106,489.00
Section B, Other Personnel		769,001.00
Total Number Other Personnel	15	
Total Salary, Wages and Fringe Benefits (A+B)		875,490.00
Section C, Equipment		
Section D, Travel		10,000.00
1. Domestic	10,000.00	
2. Foreign		
Section E, Participant/Trainee Support Costs		
1. Tuition/Fees/Health Insurance		
2. Stipends		
3. Travel		
4. Subsistence		
5. Other		
6. Number of Participants/Trainees		
Section F, Other Direct Costs		1,626,486.00
1. Materials and Supplies	15,000.00	
2. Publication Costs		
3. Consultant Services	30,000.00	
4. ADP/Computer Services		
5. Subawards/Consortium/Contractual Costs	1,541,486.00	
6. Equipment or Facility Rental/User Fees		
7. Alterations and Renovations		
8. Other 1	40,000.00	
9. Other 2		
10. Other 3		
Section G, Direct Costs (A thru F)		2,511,976.00
Section H, Indirect Costs		765,367.00
Section I, Total Direct and Indirect Costs (G + H)		3,277,343.00
Section J, Fee		
Section K, Total Costs and Fee (I + J)		3,277,343.00

RESEARCH & RELATED BUDGET - SECTION A & B, Budget Period 1

ORGANIZATIONAL DUNS*: secondary names/identifiers

Budget Type*: ☐ Project ☒ Subaward/Consortium

Enter name of Organization: secondary names/identifiers

Start Date*: 07-01-2020

End Date*: 06-30-2021

Budget Period: 1

A. Senior/Key Person

Prefix	First Name*	Middle Name	Last Name*	Suffix	Project Role*	Base Salary (\$)	Calendar Months	Academic Months	Summer Months	Requested Salary (\$)*	Fringe Benefits (\$)*	Funds Requested (\$)*
1.	secondary names/identifiers					base salary and percent effort				9,615.00	3,365.00	12,980.00
2.										9,093.00	3,182.00	12,275.00
3.										9,615.00	3,365.00	12,980.00
4.										7,432.00	2,601.00	10,033.00

Total Funds Requested for all Senior Key Persons in the attached file

Additional Senior Key Persons:

File Name:

Total Senior/Key Person

48,268.00

B. Other Personnel

Number of Personnel*	Project Role*	Calendar Months	Academic Months	Summer Months	Requested Salary (\$)*	Fringe Benefits*	Funds Requested (\$)*
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						
1	Senior Information Processing Consultant	percent effort			9,073.00	3,176.00	12,249.00
1	Total Number Other Personnel					Total Other Personnel	12,249.00
						Total Salary, Wages and Fringe Benefits (A+B)	60,517.00

RESEARCH & RELATED Budget (A-B) (Funds Requested)

RESEARCH & RELATED BUDGET - SECTION C, D, & E, Budget Period 1**ORGANIZATIONAL DUNS*:** secondary names/identifiers**Budget Type*:** ☐ Project ☒ Subaward/Consortium**Organization:** secondary names/identifiers**Start Date*:** 07-01-2020**End Date*:** 06-30-2021**Budget Period:** 1**C. Equipment Description**

List items and dollar amount for each item exceeding \$5,000

Equipment Item**Funds Requested (\$)*****Total funds requested for all equipment listed in the attached file****Total Equipment****Additional Equipment:** File Name:**D. Travel****Funds Requested (\$)***

1. Domestic Travel Costs (Incl. Canada, Mexico, and U.S. Possessions)

2. Foreign Travel Costs

Total Travel Cost**E. Participant/Trainee Support Costs****Funds Requested (\$)***

1. Tuition/Fees/Health Insurance

2. Stipends

3. Travel

4. Subsistence

5. Other:

Number of Participants/Trainees**Total Participant Trainee Support Costs**

RESEARCH & RELATED Budget {C-E} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTIONS F-K, Budget Period 1**ORGANIZATIONAL DUNS*:** secondary names/identifiers**Budget Type*:** ☐ Project ☒ Subaward/Consortium**Organization:** secondary names/identifiers**Start Date*:** 07-01-2020**End Date*:** 06-30-2021**Budget Period:** 1

F. Other Direct Costs	Funds Requested (\$)*
Total Other Direct Costs	

G. Direct Costs	Funds Requested (\$)*
Total Direct Costs (A thru F)	60,517.00

H. Indirect Costs			
Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base (\$)	Funds Requested (\$)*
1 . Organized Research Modified Total Direct Costs	55	60,517.00	33,285.00
		Total Indirect Costs	33,285.00
Cognizant Federal Agency			
(Agency Name, POC Name, and POC Phone Number)			

I. Total Direct and Indirect Costs	Funds Requested (\$)*
Total Direct and Indirect Institutional Costs (G + H)	93,802.00

J. Fee	Funds Requested (\$)*
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K. Total Costs and Fee	Funds Requested (\$)*
	93,802.00

L. Budget Justification*	File Name: U24-Marmoset_Budgetjustification-WNPRC.pdf (Only attach one file.)
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RESEARCH & RELATED Budget {F-K} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTION A & B, Budget Period 2

ORGANIZATIONAL DUNS*: secondary names/identifiers

Budget Type*: ☐ Project ☒ Subaward/Consortium

Enter name of Organization: secondary names/identifiers

Start Date*: 07-01-2021

End Date*: 06-30-2022

Budget Period: 2

A. Senior/Key Person

Prefix	First Name*	Middle Name	Last Name*	Suffix	Project Role*	Base Salary (\$)	Calendar Months	Academic Months	Summer Months	Requested Salary (\$)*	Fringe Benefits (\$)*	Funds Requested (\$)*
1.	secondary names/identifiers					base salary and percent effort				9,615.00	3,365.00	12,980.00
2.										9,093.00	3,182.00	12,275.00
3.										9,615.00	3,365.00	12,980.00
4.										7,432.00	2,601.00	10,033.00

Total Funds Requested for all Senior Key Persons in the attached file

Additional Senior Key Persons:

File Name:

Total Senior/Key Person

48,268.00

B. Other Personnel

Number of Personnel*	Project Role*	Calendar Months	Academic Months	Summer Months	Requested Salary (\$)*	Fringe Benefits*	Funds Requested (\$)*
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						
1	Senior Information Processing Consultant	percent effort			9,073.00	3,176.00	12,249.00
1	Total Number Other Personnel					Total Other Personnel	12,249.00
					Total Salary, Wages and Fringe Benefits (A+B)		60,517.00

RESEARCH & RELATED Budget (A-B) (Funds Requested)

RESEARCH & RELATED BUDGET - SECTION C, D, & E, Budget Period 2**ORGANIZATIONAL DUNS*:** secondary names/identifiers**Budget Type*:** ☐ Project ☒ Subaward/Consortium**Organization:** secondary names/identifiers**Start Date*:** 07-01-2021**End Date*:** 06-30-2022**Budget Period:** 2**C. Equipment Description**

List items and dollar amount for each item exceeding \$5,000

Equipment Item**Funds Requested (\$)*****Total funds requested for all equipment listed in the attached file****Total Equipment****Additional Equipment:** File Name:**D. Travel****Funds Requested (\$)***

1. Domestic Travel Costs (Incl. Canada, Mexico, and U.S. Possessions)

2. Foreign Travel Costs

Total Travel Cost**E. Participant/Trainee Support Costs****Funds Requested (\$)***

1. Tuition/Fees/Health Insurance

2. Stipends

3. Travel

4. Subsistence

5. Other:

Number of Participants/Trainees**Total Participant Trainee Support Costs**

RESEARCH & RELATED Budget {C-E} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTIONS F-K, Budget Period 2**ORGANIZATIONAL DUNS*:** secondary names/identifiers**Budget Type*:** ☐ Project ☒ Subaward/Consortium**Organization:** secondary names/identifiers**Start Date*:** 07-01-2021**End Date*:** 06-30-2022**Budget Period:** 2

F. Other Direct Costs	Funds Requested (\$)*
Total Other Direct Costs	

G. Direct Costs	Funds Requested (\$)*
Total Direct Costs (A thru F)	60,517.00

H. Indirect Costs			
Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base (\$)	Funds Requested (\$)*
1 . Organized Research Modified Total Direct Costs	55.5	60,517.00	33,587.00
		Total Indirect Costs	33,587.00
Cognizant Federal Agency			
(Agency Name, POC Name, and POC Phone Number)			

I. Total Direct and Indirect Costs	Funds Requested (\$)*
Total Direct and Indirect Institutional Costs (G + H)	94,104.00

J. Fee	Funds Requested (\$)*
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K. Total Costs and Fee	Funds Requested (\$)*
	94,104.00

L. Budget Justification*	File Name: U24-Marmoset_Budgetjustification-WNPRC.pdf (Only attach one file.)
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RESEARCH & RELATED Budget {F-K} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTION A & B, Budget Period 3

ORGANIZATIONAL DUNS*: secondary names/identifiers

Budget Type*: ☐ Project ☒ Subaward/Consortium

Enter name of Organization: secondary names/identifiers

Start Date*: 07-01-2022

End Date*: 06-30-2023

Budget Period: 3

A. Senior/Key Person

Prefix	First Name*	Middle	Last Name*	Suffix	Project Role*	Base	Calendar	Academic	Summer	Requested	Fringe	Funds Requested (\$)*
						Salary (\$)	Months	Months	Months	Salary (\$)*	Benefits (\$)*	
1.	secondary names/identifiers					base salary and percent effort				9,615.00	3,365.00	12,980.00
2.										9,093.00	3,182.00	12,275.00
3.										9,615.00	3,365.00	12,980.00
4.										7,432.00	2,601.00	10,033.00

Total Funds Requested for all Senior Key Persons in the attached file

Additional Senior Key Persons:

File Name:

Total Senior/Key Person

48,268.00

B. Other Personnel

Number of Personnel*	Project Role*	Calendar Months	Academic Months	Summer Months	Requested Salary (\$)*	Fringe Benefits*	Funds Requested (\$)*
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						
1	Senior Information Processing Consultant	percent effort			9,073.00	3,176.00	12,249.00
1	Total Number Other Personnel				Total Other Personnel		12,249.00
					Total Salary, Wages and Fringe Benefits (A+B)		60,517.00

RESEARCH & RELATED Budget {A-B} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTION C, D, & E, Budget Period 3**ORGANIZATIONAL DUNS*:** secondary names/identifiers**Budget Type*:** ☐ Project ☒ Subaward/Consortium**Organization:** secondary names/identifiers**Start Date*:** 07-01-2022**End Date*:** 06-30-2023**Budget Period:** 3**C. Equipment Description**

List items and dollar amount for each item exceeding \$5,000

Equipment Item**Funds Requested (\$)*****Total funds requested for all equipment listed in the attached file****Total Equipment****Additional Equipment:** File Name:**D. Travel****Funds Requested (\$)***

1. Domestic Travel Costs (Incl. Canada, Mexico, and U.S. Possessions)

2. Foreign Travel Costs

Total Travel Cost**E. Participant/Trainee Support Costs****Funds Requested (\$)***

1. Tuition/Fees/Health Insurance

2. Stipends

3. Travel

4. Subsistence

5. Other:

Number of Participants/Trainees**Total Participant Trainee Support Costs**

RESEARCH & RELATED Budget {C-E} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTIONS F-K, Budget Period 3**ORGANIZATIONAL DUNS*:** secondary names/identifiers**Budget Type*:** ☐ Project ☒ Subaward/Consortium**Organization:** secondary names/identifiers**Start Date*:** 07-01-2022**End Date*:** 06-30-2023**Budget Period:** 3

F. Other Direct Costs	Funds Requested (\$)*
Total Other Direct Costs	

G. Direct Costs	Funds Requested (\$)*
Total Direct Costs (A thru F)	60,517.00

H. Indirect Costs			
Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base (\$)	Funds Requested (\$)*
1 . Organized Research Modified Total Direct Costs	55.5	60,517.00	33,587.00
		Total Indirect Costs	33,587.00
Cognizant Federal Agency			
(Agency Name, POC Name, and POC Phone Number)			

I. Total Direct and Indirect Costs	Funds Requested (\$)*
Total Direct and Indirect Institutional Costs (G + H)	94,104.00

J. Fee	Funds Requested (\$)*
---------------	------------------------------

K. Total Costs and Fee	Funds Requested (\$)*
	94,104.00

L. Budget Justification*	File Name: U24-Marmoset_Budgetjustification-WNPRC.pdf (Only attach one file.)
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RESEARCH & RELATED Budget {F-K} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTION A & B, Budget Period 4

ORGANIZATIONAL DUNS*: secondary names/identifiers

Budget Type*: ☐ Project ☒ Subaward/Consortium

Enter name of Organization: secondary names/identifiers

Start Date*: 07-01-2023

End Date*: 06-30-2024

Budget Period: 4

A. Senior/Key Person

Prefix	First Name*	Middle Name	Last Name*	Suffix	Project Role*	Base Salary (\$)	Calendar Months	Academic Months	Summer Months	Requested Salary (\$)*	Fringe Benefits (\$)*	Funds Requested (\$)*
1.	secondary names/identifiers					base salary and percent effort				9,615.00	3,365.00	12,980.00
2.										9,093.00	3,182.00	12,275.00
3.										9,615.00	3,365.00	12,980.00
4.										7,432.00	2,601.00	10,033.00
Total Funds Requested for all Senior Key Persons in the attached file												
Additional Senior Key Persons:			File Name:							Total Senior/Key Person		48,268.00

B. Other Personnel

Number of Personnel*	Project Role*	Calendar Months	Academic Months	Summer Months	Requested Salary (\$)*	Fringe Benefits*	Funds Requested (\$)*
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						
1	Senior Information Processing Consultant	percent effort			9,073.00	3,176.00	12,249.00
1	Total Number Other Personnel					Total Other Personnel	12,249.00
Total Salary, Wages and Fringe Benefits (A+B)							60,517.00

RESEARCH & RELATED Budget (A-B) (Funds Requested)

RESEARCH & RELATED BUDGET - SECTION C, D, & E, Budget Period 4**ORGANIZATIONAL DUNS*:**

secondary names/identifiers

Budget Type*: ☐ Project ☒ Subaward/Consortium**Organization:** secondary names/identifiers**Start Date*:** 07-01-2023**End Date*:** 06-30-2024**Budget Period:** 4**C. Equipment Description**

List items and dollar amount for each item exceeding \$5,000

Equipment Item**Funds Requested (\$)*****Total funds requested for all equipment listed in the attached file****Total Equipment****Additional Equipment:** File Name:**D. Travel****Funds Requested (\$)***

1. Domestic Travel Costs (Incl. Canada, Mexico, and U.S. Possessions)

2. Foreign Travel Costs

Total Travel Cost**E. Participant/Trainee Support Costs****Funds Requested (\$)***

1. Tuition/Fees/Health Insurance

2. Stipends

3. Travel

4. Subsistence

5. Other:

Number of Participants/Trainees**Total Participant Trainee Support Costs**

RESEARCH & RELATED Budget {C-E} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTIONS F-K, Budget Period 4**ORGANIZATIONAL DUNS*:** secondary names/identifiers**Budget Type*:** ☐ Project ☒ Subaward/Consortium**Organization:** secondary names/identifiers**Start Date*:** 07-01-2023**End Date*:** 06-30-2024**Budget Period:** 4

F. Other Direct Costs	Funds Requested (\$)*
Total Other Direct Costs	

G. Direct Costs	Funds Requested (\$)*
Total Direct Costs (A thru F)	60,517.00

H. Indirect Costs			
Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base (\$)	Funds Requested (\$)*
1 . Organized Research Modified Total Direct Costs	55.5	60,517.00	33,587.00
		Total Indirect Costs	33,587.00
Cognizant Federal Agency			
(Agency Name, POC Name, and POC Phone Number)			

I. Total Direct and Indirect Costs	Funds Requested (\$)*
Total Direct and Indirect Institutional Costs (G + H)	94,104.00

J. Fee	Funds Requested (\$)*
---------------	------------------------------

K. Total Costs and Fee	Funds Requested (\$)*
	94,104.00

L. Budget Justification*	File Name: U24-Marmoset_Budgetjustification-WNPRC.pdf (Only attach one file.)
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RESEARCH & RELATED Budget {F-K} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTION A & B, Budget Period 5

ORGANIZATIONAL DUNS*: secondary names/identifiers

Budget Type*: ☐ Project ☒ Subaward/Consortium

Enter name of Organization: secondary names/identifiers

Start Date*: 07-01-2024

End Date*: 06-30-2025

Budget Period: 5

A. Senior/Key Person

Prefix	First Name*	Middle Name	Last Name*	Suffix	Project Role*	Base Salary (\$)	Calendar Months	Academic Months	Summer Months	Requested Salary (\$)*	Fringe Benefits (\$)*	Funds Requested (\$)*
1.	secondary names/identifiers					base salary and percent effort				9,615.00	3,365.00	12,980.00
2.										9,093.00	3,182.00	12,275.00
3.										9,615.00	3,365.00	12,980.00
4.										7,432.00	2,601.00	10,033.00

Total Funds Requested for all Senior Key Persons in the attached file

Additional Senior Key Persons:

File Name:

Total Senior/Key Person

48,268.00

B. Other Personnel

Number of Personnel*	Project Role*	Calendar Months	Academic Months	Summer Months	Requested Salary (\$)*	Fringe Benefits*	Funds Requested (\$)*
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						
1	Senior Information Processing Consultant	percent effort			9,073.00	3,176.00	12,249.00
1	Total Number Other Personnel					Total Other Personnel	12,249.00
						Total Salary, Wages and Fringe Benefits (A+B)	60,517.00

RESEARCH & RELATED Budget (A-B) (Funds Requested)

RESEARCH & RELATED BUDGET - SECTION C, D, & E, Budget Period 5

ORGANIZATIONAL DUNS*: secondary names/identifiers
Budget Type*: ☐ Project ☒ Subaward/Consortium
Organization: secondary names/identifiers

Start Date*: 07-01-2024 End Date*: 06-30-2025 Budget Period: 5

C. Equipment Description	
List items and dollar amount for each item exceeding \$5,000	
Equipment Item	Funds Requested (\$)*
Total funds requested for all equipment listed in the attached file	
Total Equipment	
Additional Equipment: File Name:	

D. Travel	Funds Requested (\$)*
1. Domestic Travel Costs (Incl. Canada, Mexico, and U.S. Possessions)	
2. Foreign Travel Costs	
Total Travel Cost	

E. Participant/Trainee Support Costs	Funds Requested (\$)*
1. Tuition/Fees/Health Insurance	
2. Stipends	
3. Travel	
4. Subsistence	
5. Other:	
Number of Participants/Trainees	Total Participant Trainee Support Costs

RESEARCH & RELATED Budget {C-E} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTIONS F-K, Budget Period 5**ORGANIZATIONAL DUNS*:** secondary names/identifiers**Budget Type*:** ☐ Project ☒ Subaward/Consortium**Organization:** secondary names/identifiers**Start Date*:** 07-01-2024**End Date*:** 06-30-2025**Budget Period:** 5

F. Other Direct Costs	Funds Requested (\$)*
Total Other Direct Costs	

G. Direct Costs	Funds Requested (\$)*
Total Direct Costs (A thru F)	60,517.00

H. Indirect Costs			
Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base (\$)	Funds Requested (\$)*
1 . Organized Research Modified Total Direct Costs	55.5	60,517.00	33,587.00
		Total Indirect Costs	33,587.00
Cognizant Federal Agency			
(Agency Name, POC Name, and POC Phone Number)			

I. Total Direct and Indirect Costs	Funds Requested (\$)*
Total Direct and Indirect Institutional Costs (G + H)	94,104.00

J. Fee	Funds Requested (\$)*
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K. Total Costs and Fee	Funds Requested (\$)*
	94,104.00

L. Budget Justification*	File Name: U24-Marmoset_Budgetjustification-WNPRC.pdf (Only attach one file.)
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RESEARCH & RELATED Budget {F-K} (Funds Requested)

BUDGET JUSTIFICATION, secondary names/identifiers

RESEARCH & RELATED BUDGET - Cumulative Budget

	Totals (\$)
Section A, Senior/Key Person	241,340.00
Section B, Other Personnel	61,245.00
Total Number Other Personnel	5
Total Salary, Wages and Fringe Benefits (A+B)	302,585.00
Section C, Equipment	
Section D, Travel	
1. Domestic	
2. Foreign	
Section E, Participant/Trainee Support Costs	
1. Tuition/Fees/Health Insurance	
2. Stipends	
3. Travel	
4. Subsistence	
5. Other	
6. Number of Participants/Trainees	
Section F, Other Direct Costs	
1. Materials and Supplies	
2. Publication Costs	
3. Consultant Services	
4. ADP/Computer Services	
5. Subawards/Consortium/Contractual Costs	
6. Equipment or Facility Rental/User Fees	
7. Alterations and Renovations	
8. Other 1	
9. Other 2	
10. Other 3	
Section G, Direct Costs (A thru F)	302,585.00
Section H, Indirect Costs	167,633.00
Section I, Total Direct and Indirect Costs (G + H)	470,218.00
Section J, Fee	
Section K, Total Costs and Fee (I + J)	470,218.00

RESEARCH & RELATED BUDGET - SECTION A & B, Budget Period 1

ORGANIZATIONAL DUNS*: secondary names / identifiers

Budget Type*: ☐ Project ☒ Subaward/Consortium

Enter name of Organization: secondary names / identifiers

Start Date*: 07-01-2020

End Date*: 06-30-2021

Budget Period: 1

A. Senior/Key Person

Prefix	First Name*	Middle Name	Last Name*	Suffix	Project Role*	Base Salary (\$)	Calendar Months	Academic Months	Summer Months	Requested Salary (\$)*	Fringe Benefits (\$)*	Funds Requested (\$)*
1.	secondary names / identifiers					base salary and percent effort				5,952.00	1,774.00	7,726.00
2.										6,692.00	1,994.00	8,686.00
3.										5,161.00	1,538.00	6,699.00
Total Funds Requested for all Senior Key Persons in the attached file												
Additional Senior Key Persons:		File Name:									Total Senior/Key Person	23,111.00

B. Other Personnel

Number of Personnel*	Project Role*	Calendar Months	Academic Months	Summer Months	Requested Salary (\$)*	Fringe Benefits*	Funds Requested (\$)*
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						
2	Research Associate	percent effort			50,635.00	15,089.00	65,724.00
2	Total Number Other Personnel				Total Other Personnel		65,724.00
					Total Salary, Wages and Fringe Benefits (A+B)		88,835.00

RESEARCH & RELATED Budget (A-B) (Funds Requested)

RESEARCH & RELATED BUDGET - SECTION C, D, & E, Budget Period 1**ORGANIZATIONAL DUNS*:** secondary names / identifiers**Budget Type*:** ☐ Project ☒ Subaward/Consortium**Organization:** secondary names / identifiers**Start Date*:** 07-01-2020**End Date*:** 06-30-2021**Budget Period:** 1**C. Equipment Description**

List items and dollar amount for each item exceeding \$5,000

Equipment Item	Funds Requested (\$)*
1 . Server Computer	20,000.00
Total funds requested for all equipment listed in the attached file	
Total Equipment	20,000.00

Additional Equipment: File Name:**D. Travel****Funds Requested (\$)***

1. Domestic Travel Costs (Incl. Canada, Mexico, and U.S. Possessions)
2. Foreign Travel Costs

Total Travel Cost**E. Participant/Trainee Support Costs****Funds Requested (\$)***

1. Tuition/Fees/Health Insurance
2. Stipends
3. Travel
4. Subsistence
5. Other:

Number of Participants/Trainees**Total Participant Trainee Support Costs**

RESEARCH & RELATED Budget (C-E) (Funds Requested)

RESEARCH & RELATED BUDGET - SECTIONS F-K, Budget Period 1**ORGANIZATIONAL DUNS*:** secondary names / identifiers**Budget Type*:** ☐ Project ☒ Subaward/Consortium**Organization:** secondary names / identifiers**Start Date*:** 07-01-2020**End Date*:** 06-30-2021**Budget Period:** 1

F. Other Direct Costs	Funds Requested (\$)*
1. Materials and Supplies	
2. Publication Costs	
3. Consultant Services	10,000.00
4. ADP/Computer Services	
5. Subawards/Consortium/Contractual Costs	
6. Equipment or Facility Rental/User Fees	
7. Alterations and Renovations	
Total Other Direct Costs	10,000.00

G. Direct Costs	Funds Requested (\$)*
Total Direct Costs (A thru F)	118,835.00

H. Indirect Costs			
Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base (\$)	Funds Requested (\$)*
1. Identifier Federal MTDC	95	98,835.00	93,893.00
Total Indirect Costs			93,893.00
Cognizant Federal Agency			
(Agency Name, POC Name, and POC Phone Number)			

I. Total Direct and Indirect Costs	Funds Requested (\$)*
Total Direct and Indirect Institutional Costs (G + H)	212,728.00

J. Fee	Funds Requested (\$)*

K. Total Costs and Fee	Funds Requested (\$)*
	212,728.00

L. Budget Justification*	File Name: U24-Marmoset_Budgetjustification-SNPRC.pdf (Only attach one file.)
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RESEARCH & RELATED Budget {F-K} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTION A & B, Budget Period 2

ORGANIZATIONAL DUNS*: secondary names / identifiers

Budget Type*: ☐ Project ☒ Subaward/Consortium

Enter name of Organization: secondary names / identifiers

Start Date*: 07-01-2021

End Date*: 06-30-2022

Budget Period: 2

A. Senior/Key Person

Prefix	First Name*	Middle	Last Name*	Suffix	Project Role*	Base	Calendar	Academic	Summer	Requested	Fringe	Funds Requested (\$)*
			Name			Salary (\$)	Months	Months	Months	Salary (\$)*	Benefits (\$)*	
1.	secondary names / identifiers					base salary and percent effort				5,952.00	1,774.00	7,726.00
2.										6,692.00	1,994.00	8,686.00
3.										5,161.00	1,538.00	6,699.00
Total Funds Requested for all Senior Key Persons in the attached file												
Additional Senior Key Persons:			File Name:								Total Senior/Key Person	23,111.00

B. Other Personnel

Number of Personnel*	Project Role*	Calendar Months	Academic Months	Summer Months	Requested Salary (\$)*	Fringe Benefits*	Funds Requested (\$)*
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						
2	Research Associate	percent effort			59,290.00	17,668.00	76,958.00
2	Total Number Other Personnel				Total Other Personnel		76,958.00
Total Salary, Wages and Fringe Benefits (A+B)							100,069.00

RESEARCH & RELATED Budget (A-B) (Funds Requested)

RESEARCH & RELATED BUDGET - SECTION C, D, & E, Budget Period 2**ORGANIZATIONAL DUNS*:** secondary names / identifiers**Budget Type*:** ☐ Project ☒ Subaward/Consortium**Organization:** secondary names / identifiers**Start Date*:** 07-01-2021**End Date*:** 06-30-2022**Budget Period:** 2**C. Equipment Description**

List items and dollar amount for each item exceeding \$5,000

Equipment Item **Funds Requested (\$)*****Total funds requested for all equipment listed in the attached file****Total Equipment****Additional Equipment:** File Name:**D. Travel****Funds Requested (\$)***

1. Domestic Travel Costs (Incl. Canada, Mexico, and U.S. Possessions)

2. Foreign Travel Costs

Total Travel Cost**E. Participant/Trainee Support Costs****Funds Requested (\$)***

1. Tuition/Fees/Health Insurance

2. Stipends

3. Travel

4. Subsistence

5. Other:

Number of Participants/Trainees**Total Participant Trainee Support Costs**

RESEARCH & RELATED Budget {C-E} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTIONS F-K, Budget Period 2**ORGANIZATIONAL DUNS*:** secondary names / identifiers**Budget Type*:** ☐ Project ☒ Subaward/Consortium**Organization:** secondary names / identifiers**Start Date*:** 07-01-2021**End Date*:** 06-30-2022**Budget Period:** 2

F. Other Direct Costs	Funds Requested (\$)*
1. Materials and Supplies	
2. Publication Costs	
3. Consultant Services	10,000.00
4. ADP/Computer Services	
5. Subawards/Consortium/Contractual Costs	
6. Equipment or Facility Rental/User Fees	
7. Alterations and Renovations	
Total Other Direct Costs	10,000.00

G. Direct Costs	Funds Requested (\$)*
Total Direct Costs (A thru F)	110,069.00

H. Indirect Costs			
Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base (\$)	Funds Requested (\$)*
1. Identifier MTDC	95	110,069.00	104,566.00
Total Indirect Costs			104,566.00
Cognizant Federal Agency			
(Agency Name, POC Name, and POC Phone Number)			

I. Total Direct and Indirect Costs	Funds Requested (\$)*
Total Direct and Indirect Institutional Costs (G + H)	214,635.00

J. Fee	Funds Requested (\$)*
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K. Total Costs and Fee	Funds Requested (\$)*
	214,635.00

L. Budget Justification*	File Name: U24-Marmoset_Budgetjustification-SNPRC.pdf (Only attach one file.)
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RESEARCH & RELATED Budget {F-K} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTION A & B, Budget Period 3

ORGANIZATIONAL DUNS*: secondary names / identifiers

Budget Type*: ☐ Project ☒ Subaward/Consortium

Enter name of Organization: secondary names / identifiers

Start Date*: 07-01-2022

End Date*: 06-30-2023

Budget Period: 3

A. Senior/Key Person

Prefix	First Name*	Middle	Last Name*	Suffix	Project Role*	Base	Calendar	Academic	Summer	Requested	Fringe	Funds Requested (\$)*
			Name			Salary (\$)	Months	Months	Months	Salary (\$)*	Benefits (\$)*	
1.			secondary names / identifiers			base salary and percent effort				5,952.00	1,774.00	7,726.00
2.										6,692.00	1,994.00	8,686.00
3.										5,161.00	1,538.00	6,699.00
Total Funds Requested for all Senior Key Persons in the attached file												
Additional Senior Key Persons: File Name:											Total Senior/Key Person	23,111.00

B. Other Personnel

Number of Personnel*	Project Role*	Calendar Months	Academic Months	Summer Months	Requested Salary (\$)*	Fringe Benefits*	Funds Requested (\$)*
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						
2	Research Associate	percent effort			59,290.00	17,668.00	76,958.00
2	Total Number Other Personnel					Total Other Personnel	76,958.00
Total Salary, Wages and Fringe Benefits (A+B)							100,069.00

RESEARCH & RELATED Budget (A-B) (Funds Requested)

RESEARCH & RELATED BUDGET - SECTION C, D, & E, Budget Period 3**ORGANIZATIONAL DUNS*:** secondary names / identifiers**Budget Type*:** ☐ Project ☒ Subaward/Consortium**Organization:** secondary names / identifiers**Start Date*:** 07-01-2022**End Date*:** 06-30-2023**Budget Period:** 3**C. Equipment Description**

List items and dollar amount for each item exceeding \$5,000

Equipment Item**Funds Requested (\$)*****Total funds requested for all equipment listed in the attached file****Total Equipment****Additional Equipment:** File Name:**D. Travel****Funds Requested (\$)***

1. Domestic Travel Costs (Incl. Canada, Mexico, and U.S. Possessions)

2. Foreign Travel Costs

Total Travel Cost**E. Participant/Trainee Support Costs****Funds Requested (\$)***

1. Tuition/Fees/Health Insurance

2. Stipends

3. Travel

4. Subsistence

5. Other:

Number of Participants/Trainees**Total Participant Trainee Support Costs**

RESEARCH & RELATED Budget {C-E} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTIONS F-K, Budget Period 3**ORGANIZATIONAL DUNS*:** secondary names / identifiers**Budget Type*:** ☐ Project ☒ Subaward/Consortium**Organization:** secondary names / identifiers**Start Date*:** 07-01-2022**End Date*:** 06-30-2023**Budget Period:** 3

F. Other Direct Costs	Funds Requested (\$)*
1. Materials and Supplies	
2. Publication Costs	
3. Consultant Services	10,000.00
4. ADP/Computer Services	
5. Subawards/Consortium/Contractual Costs	
6. Equipment or Facility Rental/User Fees	
7. Alterations and Renovations	
Total Other Direct Costs	10,000.00

G. Direct Costs	Funds Requested (\$)*
Total Direct Costs (A thru F)	110,069.00

H. Indirect Costs			
Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base (\$)	Funds Requested (\$)*
1. identifier MTDC	95	110,069.00	104,566.00
Total Indirect Costs			104,566.00
Cognizant Federal Agency			
(Agency Name, POC Name, and POC Phone Number)			

I. Total Direct and Indirect Costs	Funds Requested (\$)*
Total Direct and Indirect Institutional Costs (G + H)	214,635.00

J. Fee	Funds Requested (\$)*

K. Total Costs and Fee	Funds Requested (\$)*
	214,635.00

L. Budget Justification*	File Name: U24-Marmoset_Budgetjustification-SNPRC.pdf (Only attach one file.)
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RESEARCH & RELATED Budget {F-K} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTION A & B, Budget Period 4

ORGANIZATIONAL DUNS*: secondary names / identifiers

Budget Type*: ☐ Project ☒ Subaward/Consortium

Enter name of Organization: secondary names / identifiers

Start Date*: 07-01-2023

End Date*: 06-30-2024

Budget Period: 4

A. Senior/Key Person

Prefix	First Name*	Middle	Last Name*	Suffix	Project Role*	Base	Calendar	Academic	Summer	Requested	Fringe	Funds Requested (\$)*
	Name					Salary (\$)	Months	Months	Months	Salary (\$)*	Benefits (\$)*	
1.	secondary names / identifiers					base salary and percent effort				5,952.00	1,774.00	7,726.00
2.										6,692.00	1,994.00	8,686.00
3.										5,161.00	1,538.00	6,699.00
Total Funds Requested for all Senior Key Persons in the attached file												
Additional Senior Key Persons:			File Name:								Total Senior/Key Person	23,111.00

B. Other Personnel

Number of	Project Role*	Calendar Months	Academic Months	Summer Months	Requested Salary (\$)*	Fringe Benefits*	Funds Requested (\$)*
Personnel*							
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						
2	Research Associate	percent effort			59,290.00	17,668.00	76,958.00
2	Total Number Other Personnel					Total Other Personnel	76,958.00
Total Salary, Wages and Fringe Benefits (A+B)							100,069.00

RESEARCH & RELATED Budget (A-B) (Funds Requested)

RESEARCH & RELATED BUDGET - SECTION C, D, & E, Budget Period 4

ORGANIZATIONAL DUNS*: secondary names / identifiers

Budget Type*: ☐ Project ☒ Subaward/Consortium

Organization: secondary names / identifiers

Start Date*: 07-01-2023 End Date*: 06-30-2024 Budget Period: 4

C. Equipment Description	
List items and dollar amount for each item exceeding \$5,000	
Equipment Item	Funds Requested (\$)*
Total funds requested for all equipment listed in the attached file	
Total Equipment	
Additional Equipment: File Name:	

D. Travel	Funds Requested (\$)*
1. Domestic Travel Costs (Incl. Canada, Mexico, and U.S. Possessions)	
2. Foreign Travel Costs	
Total Travel Cost	

E. Participant/Trainee Support Costs	Funds Requested (\$)*
1. Tuition/Fees/Health Insurance	
2. Stipends	
3. Travel	
4. Subsistence	
5. Other:	
Number of Participants/Trainees	Total Participant Trainee Support Costs

RESEARCH & RELATED Budget {C-E} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTIONS F-K, Budget Period 4**ORGANIZATIONAL DUNS*:** secondary names / identifiers**Budget Type*:** ☐ Project ☒ Subaward/Consortium**Organization:** secondary names / identifiers**Start Date*:** 07-01-2023**End Date*:** 06-30-2024**Budget Period:** 4

F. Other Direct Costs	Funds Requested (\$)*
1. Materials and Supplies	
2. Publication Costs	
3. Consultant Services	10,000.00
4. ADP/Computer Services	
5. Subawards/Consortium/Contractual Costs	
6. Equipment or Facility Rental/User Fees	
7. Alterations and Renovations	
Total Other Direct Costs	10,000.00

G. Direct Costs	Funds Requested (\$)*
Total Direct Costs (A thru F)	110,069.00

H. Indirect Costs			
Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base (\$)	Funds Requested (\$)*
1. identifier MTDC	95	110,069.00	104,566.00
Total Indirect Costs			104,566.00
Cognizant Federal Agency			
(Agency Name, POC Name, and POC Phone Number)			

I. Total Direct and Indirect Costs	Funds Requested (\$)*
Total Direct and Indirect Institutional Costs (G + H)	214,635.00

J. Fee	Funds Requested (\$)*

K. Total Costs and Fee	Funds Requested (\$)*
	214,635.00

L. Budget Justification*	File Name: U24-Marmoset_Budgetjustification-SNPRC.pdf (Only attach one file.)
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RESEARCH & RELATED Budget {F-K} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTION A & B, Budget Period 5

ORGANIZATIONAL DUNS*: secondary names / identifiers

Budget Type*: ☐ Project ☒ Subaward/Consortium

Enter name of Organization: secondary names / identifiers

Start Date*: 07-01-2024

End Date*: 06-30-2025

Budget Period: 5

A. Senior/Key Person

Prefix	First Name*	Middle Name	Last Name*	Suffix	Project Role*	Base Salary (\$)	Calendar Months	Academic Months	Summer Months	Requested Salary (\$)*	Fringe Benefits (\$)*	Funds Requested (\$)*
1.	secondary names / identifiers					base salary and percent effort				5,952.00	1,774.00	7,726.00
2.										6,692.00	1,994.00	8,686.00
3.										5,161.00	1,538.00	6,699.00
Total Funds Requested for all Senior Key Persons in the attached file												
Additional Senior Key Persons:			File Name:							Total Senior/Key Person		23,111.00

B. Other Personnel

Number of Personnel*	Project Role*	Calendar Months	Academic Months	Summer Months	Requested Salary (\$)*	Fringe Benefits*	Funds Requested (\$)*
	Post Doctoral Associates						
	Graduate Students						
	Undergraduate Students						
	Secretarial/Clerical						
2	Research Associate	percent effort			59,290.00	17,668.00	76,958.00
2	Total Number Other Personnel					Total Other Personnel	76,958.00
Total Salary, Wages and Fringe Benefits (A+B)							100,069.00

RESEARCH & RELATED Budget (A-B) (Funds Requested)

RESEARCH & RELATED BUDGET - SECTION C, D, & E, Budget Period 5**ORGANIZATIONAL DUNS*:** secondary names / identifiers**Budget Type*:** ☐ Project ☒ Subaward/Consortium**Organization:** secondary names / identifiers**Start Date*:** 07-01-2024**End Date*:** 06-30-2025**Budget Period:** 5**C. Equipment Description**

List items and dollar amount for each item exceeding \$5,000

Equipment Item**Funds Requested (\$)*****Total funds requested for all equipment listed in the attached file****Total Equipment****Additional Equipment:** File Name:**D. Travel****Funds Requested (\$)***

1. Domestic Travel Costs (Incl. Canada, Mexico, and U.S. Possessions)

2. Foreign Travel Costs

Total Travel Cost**E. Participant/Trainee Support Costs****Funds Requested (\$)***

1. Tuition/Fees/Health Insurance

2. Stipends

3. Travel

4. Subsistence

5. Other:

Number of Participants/Trainees**Total Participant Trainee Support Costs**

RESEARCH & RELATED Budget {C-E} (Funds Requested)

RESEARCH & RELATED BUDGET - SECTIONS F-K, Budget Period 5**ORGANIZATIONAL DUNS*:** secondary names / identifiers**Budget Type*:** ☐ Project ☒ Subaward/Consortium**Organization:** secondary names / identifiers**Start Date*:** 07-01-2024**End Date*:** 06-30-2025**Budget Period:** 5

F. Other Direct Costs	Funds Requested (\$)*
1. Materials and Supplies	
2. Publication Costs	
3. Consultant Services	10,000.00
4. ADP/Computer Services	
5. Subawards/Consortium/Contractual Costs	
6. Equipment or Facility Rental/User Fees	
7. Alterations and Renovations	
Total Other Direct Costs	10,000.00

G. Direct Costs	Funds Requested (\$)*
Total Direct Costs (A thru F)	110,069.00

H. Indirect Costs			
Indirect Cost Type	Indirect Cost Rate (%)	Indirect Cost Base (\$)	Funds Requested (\$)*
1. identifier MTDC	95	110,069.00	104,566.00
Total Indirect Costs			104,566.00
Cognizant Federal Agency			
(Agency Name, POC Name, and POC Phone Number)			

I. Total Direct and Indirect Costs	Funds Requested (\$)*
Total Direct and Indirect Institutional Costs (G + H)	214,635.00

J. Fee	Funds Requested (\$)*
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K. Total Costs and Fee	Funds Requested (\$)*
	214,635.00

L. Budget Justification*	File Name: U24-Marmoset_Budgetjustification-SNPRC.pdf (Only attach one file.)
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RESEARCH & RELATED Budget {F-K} (Funds Requested)

BUDGET JUSTIFICATION, [REDACTED]

Equipment

In order to support the health record, pedigree, and genomic data generated by this project for the marmoset coordination team a dedicated computing server with sufficient memory space is requested similar to what is present for the baboon genome core: a dedicated computer server for sequence analysis is available and consists a Dell PowerEdge R830 server with two Xenon E5-4640 2.1GHz processors (48 cores), 32TB of useable space, and 256 GB RAM. \$20,000 is requested in Year 1 only.

Consultant Services

[REDACTED]

[REDACTED] specializes in primatological neuroscience and has experience both in neuroimaging and behavioral assessments in the marmosets and other primates. [REDACTED] will provide expertise in characterizing marmosets for neuroscience research and will serve as a consultant throughout the project. Annual consultant fees of \$[REDACTED] base salary.

RESEARCH & RELATED BUDGET - Cumulative Budget

	Totals (\$)	
Section A, Senior/Key Person		115,555.00
Section B, Other Personnel		373,556.00
Total Number Other Personnel	10	
Total Salary, Wages and Fringe Benefits (A+B)		489,111.00
Section C, Equipment		20,000.00
Section D, Travel		
1. Domestic		
2. Foreign		
Section E, Participant/Trainee Support Costs		
1. Tuition/Fees/Health Insurance		
2. Stipends		
3. Travel		
4. Subsistence		
5. Other		
6. Number of Participants/Trainees		
Section F, Other Direct Costs		50,000.00
1. Materials and Supplies		
2. Publication Costs		
3. Consultant Services	50,000.00	
4. ADP/Computer Services		
5. Subawards/Consortium/Contractual Costs		
6. Equipment or Facility Rental/User Fees		
7. Alterations and Renovations		
8. Other 1		
9. Other 2		
10. Other 3		
Section G, Direct Costs (A thru F)		559,111.00
Section H, Indirect Costs		512,157.00
Section I, Total Direct and Indirect Costs (G + H)		1,071,268.00
Section J, Fee		
Section K, Total Costs and Fee (I + J)		1,071,268.00

Total Direct Costs less Consortium F&A

NIH policy (NOT-OD-05-004) allows applicants to exclude consortium/contractual F&A costs when determining if an application falls at or beneath any applicable direct cost limit. When a direct cost limit is specified in an FOA, the following table can be used to determine if your application falls within that limit.

Categories	Budget Period 1	Budget Period 2	Budget Period 3	Budget Period 4	Budget Period 5	TOTALS
Total Direct Costs less Consortium F&A	375,988	356,813	361,542	366,413	371,430	1,832,186

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OMB Number: 0925-0001

Expiration Date: 03/31/2020

1. Vertebrate Animals Section

Are vertebrate animals euthanized? ☐ Yes ☐ No

If "Yes" to euthanasia

Is the method consistent with American Veterinary Medical Association (AVMA) guidelines?

☐ Yes ☐ No

If "No" to AVMA guidelines, describe method and provide scientific justification

.....

2. *Program Income Section

*Is program income anticipated during the periods for which the grant support is requested?

☐ Yes ☒ No

If you checked "yes" above (indicating that program income is anticipated), then use the format below to reflect the amount and source(s). Otherwise, leave this section blank.

*Budget Period	*Anticipated Amount (\$)	*Source(s)
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3. Human Embryonic Stem Cells Section

*Does the proposed project involve human embryonic stem cells? ☐ Yes ☒ No

If the proposed project involves human embryonic stem cells, list below the registration number of the specific cell line(s) from the following list: http://grants.nih.gov/stem_cells/registry/current.htm. Or, if a specific stem cell line cannot be referenced at this time, check the box indicating that one from the registry will be used:

☐ Specific stem cell line cannot be referenced at this time. One from the registry will be used.

Cell Line(s) (Example: 0004):

4. Inventions and Patents Section (Renewal applications)

*Inventions and Patents: ☐ Yes ☐ No

If the answer is "Yes" then please answer the following:

*Previously Reported: ☐ Yes ☐ No

5. Change of Investigator/Change of Institution Section

☐ Change of Project Director/Principal Investigator

Name of former Project Director/Principal Investigator

Prefix:

*First Name:

Middle Name:

*Last Name:

Suffix:

☐ Change of Grantee Institution

*Name of former institution:

PHS 398 Research Plan

OMB Number: 0925-0001

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SPECIFIC AIMS

The common marmoset (*Callithrix jacchus*) has emerged as a critically important and tractable non-human primate (NHP) model for neuroscience research accommodating genetic manipulation and directed breeding. Several barriers to the adoption of marmoset models by the neuroscience community exist, including a small census size in the United States (fewer than 2,500 animals), poor communication about resource availability, a poor understanding of the strengths and limitations of marmosets in research, and a lack of a formal structure for coordinating the sharing of information and resources related to marmoset research.

In this application, we propose to establish a Marmoset Coordinating Center that will address these limitations by building upon our experience in NHP informatics and marmoset research.

Aim 1. Establish the informatics framework for the BRAIN Initiative Marmoset Coordinating Center.

We will build a new informatics framework for coordinating marmoset research based on [REDACTED] [REDACTED]. This infrastructure will be derived from [REDACTED] [REDACTED] which have been optimized for NHP research, including marmosets, over years of production. This malleable and dynamic informatics system will be initialized with basic statistics on the marmoset laboratory populations provided by participating centers, making pre-recorded, individual-level information more broadly available to the neuroscience community. This infrastructure will then update by a combination of automated data intake from participating centers [REDACTED] as well as by manual submission from others. The Marmoset Coordinating Center will generate a unified genotype callset from all available marmoset sequencing data aggregated across centers, using a validated pipeline tailored for NHP use. Genotype data will be combined with pedigree information to construct a number of useful genetic data summaries that will be paired to each marmoset event record. Demographic and genetic information will be shared and discussed among participating centers, to enable evaluation of colony management against American Zoological Association practice guidelines.

Aim 2. Activate an internet-based system to connect marmoset experts and resources to neuroscience researchers from other communities.

We will construct a web-based portal that will provide access to the marmoset data resources generated in Aim 1, as well as background content on marmoset biology and neuroscience. This website, designed using principles from other successful resource portals such as the NIH Neurobiobank and the NIH Common Fund GTEx Project, will provide summaries of existing marmoset neuroscience projects, and allow interested investigators to search animal inventory and request animals. The Marmoset Coordinating Center will be staffed by a concierge team, who will be available to answer basic questions about the Center and the use of marmosets in neuroscience. We have assembled a group of marmoset neuroscience experts from around the country [REDACTED]; this concierge team will convene monthly to review formal requests for animals or advice. Requests will be evaluated using a standard protocol, and decisions on prioritization will be made in partnership with NIH program staff. As a final step we will guide interested parties to the scientific protocol planning units of participating centers, which will represent a natural handoff to a collaboration, service agreement, or animal transfer.

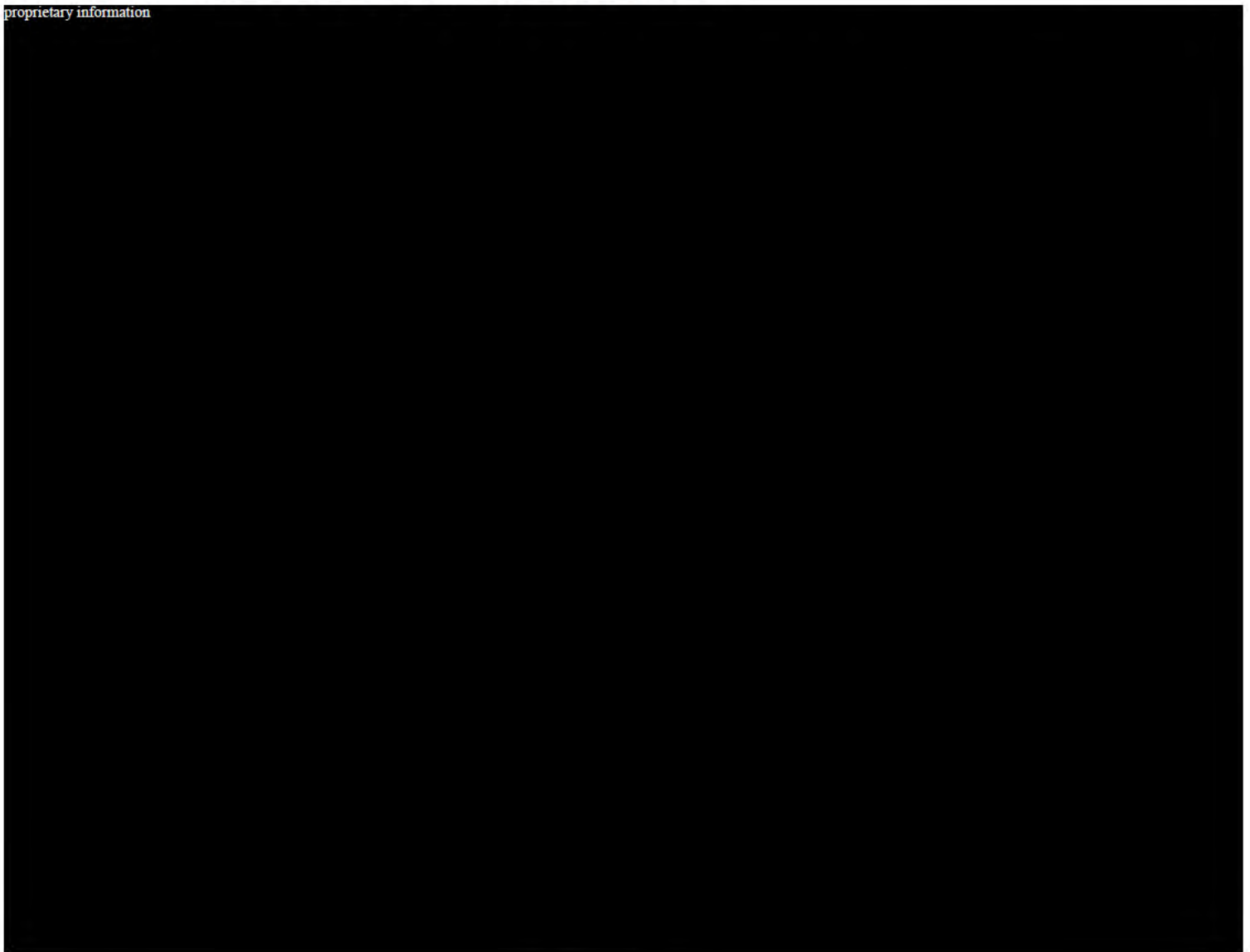
INTRODUCTION

The Brain Research through Advancing Innovative Neurotechnologies (BRAIN) Initiative is an ambitious research program that aims to revolutionize our knowledge of the human brain through the development and application of innovative new technologies. The proposed scope of the BRAIN Initiative is massive: the NIH leads several federal agencies in the organization of the project, which currently operates under a 12-year, \$4.5 billion strategic plan, called BRAIN 2025.

SIGNIFICANCE

BRAIN 2025 notes that non-human primate (NHP) models are essential for providing research access to neuronal circuitry of the cerebral cortex, a structure with a high level of complexity shared by all primates, but lacking in rodents and all other conventional model organisms. Rhesus macaques are by far the most prevalent non-human primate (NHP) model used by neuroscientists, but their size, troop social structure, longevity and slow reproductive cycle make them less than ideal for genetic and transgenerational research. The marmoset, in contrast, has a number of research advantages including their small size, ease in handling, lack of zoonotic disease risk, rapid reproductive maturation, and compressed life cycle. Marmosets have the highest reproductive output of any anthropoid primate producing litters (1-4 infants) every six months. Marmosets mature quickly for an NHP, weaning at 3 months, becoming sexually mature between 12-18 months, and reaching adult size at 2 years. Marmosets are considered geriatric at 10 years of age, with a reported maximum age of 22 years. They are of particular interest to the neuroscience research community due to their closely shared evolutionary history with humans, similar cognitive characteristics and relatively smooth cortex that allows for precise access to specific brain targets. Unfortunately, one of the largest problems facing those interested in neuroscience modeling in marmosets is the lack of animals available for research.

proprietary information



In order to meet the increased marmoset resource need, the NIH BRAIN initiative has proposed a coordinated increase in the marmoset colonies of the US. To meet this need, investigators from three National Primate Research Centers – [redacted] have formed a

[redacted] collaborative, interdisciplinary team to coordinate national marmoset breeding efforts.

History and Qualifications of the Applicants

History of ONPRC: Currently in its 60th year of operation, ONPRC has served a broad range of local, regional, and national investigators performing biomedical research in NHP models with the goal of improving human health. ONPRC has thriving divisions of Neuroscience and Genetics that benefit from a number of supporting, including the rhesus macaque colony pedigree, comprising ~8,650 individuals and spanning 10 generations, accompanying medical health records that provide a wealth of data for exploring the genetic contribution to complex traits, and sample biobanks representing thousands of ONPRC animals. With NIH support, scientists in the Division of Genetics have developed a number of important NHP informatics resources described below. We propose to leverage this expertise in information resource management to coordinate the growing marmoset colonies.

History of [redacted]

[redacted] established since the early 1960s. Ground-breaking NHP studies – including model development, basic mechanistic studies and translational studies of vaccines and therapeutics – have taken place at [redacted], advancing treatment of HBV, HCV, SIV/AIDS, Ebola, Zika, and *B. pertussis*. [redacted] uses macaques, baboons and marmosets in research programs involving NHP models of human disease not available at other NPRCs. The Genomics Core has recently been expanded to include a significant number of investigators that will provide advice in Data Sciences and Bioinformatics. This year, the Core performed sequence analysis on 1469 samples of RNA and DNA for various investigators and support of the primate colonies. [redacted] is one of only two NPRCs holding marmosets.

History of [redacted]

[redacted] dedicated to conducting humane research with NHPs to advance knowledge in basic primate biology and to improve human animal health concerns. The [redacted] has approximately 1,600 animals, 175 employees and serves more than 200 scientists and clinicians from around the world who conduct research in primate biology with relevance to human and animal health. Specific focus areas include neuroscience, energy metabolism and chronic disease, global infectious disease, and regenerative and reproductive medicine. The [redacted] was the site of the world's first *in vitro*-fertilized monkey in 1984 and its first pluripotent stem cells (first monkey, then human, in the 1990s). Recent discoveries made by [redacted] scientists include calorie restriction playing a role in prolonging nonhuman primate lives and the role of brain steroids in the regulation of reproductive development and function. [redacted] is one of only two NPRCs with a marmoset breeding colony.

Marmoset Coordination Center Administration

We introduce here the primary leadership for the proposed Marmoset Coordination Center.

ONPRC Site Leadership: **Dr. Donald Conrad**, Associate Professor and Chief of the Division of Genetics, was recruited to ONPRC in 2018 to lead the Division of Genetics, following [redacted]

[redacted] He has a broad background in human genetics and genomics and led landmark studies in the field[1][2][3]. He runs GEMINI, an NIH-funded clinical genomics consortium of over a dozen sites from around the world. At ONPRC, Dr. Conrad serves on the animal utilization committee and participates in NHP research on reproduction and alcohol use.

[redacted] Site Leadership: [redacted] is a broadly trained biologist who has studied marmosets for more than 20 years. [redacted] focuses on the marmoset as a model for human health and disease. [redacted] experience has involved extensive development and design of phenotyping tools modified either from rodent assessments or from clinical geriatric assessments, including marmoset activity, strength, feeding patterning, and cognitive function[4, 5]. These tools have been used to characterize a number of disease etiologies important to geriatric research and current American disease trends including obesity and metabolic syndrome, functional health decline and frailty[6-8].

[redacted] Site Leadership: [redacted], Professor of Neuroscience and Director of [redacted], has a long history in neuroscience, studying the mechanisms by which ovarian steroids exert their effects in the brain for the last 35 years. Highlights of [redacted] work include using

hyperandrogenemic rhesus macaques and prenatally androgenized macaques as a model for development of polycystic ovary syndrome (PCOS)[9]. [REDACTED] studies the roles of neurosteroids in the marmoset brain, recently discovering that extraovarian estrogen contributes to the negative feedback regulation of GnRH release in the female marmoset monkey.

This leadership team brings together a broad expertise ideally suited for the building and implementation of this coordination center. In order to effectively manage the national marmoset breeding resource, it is necessary to have expertise in genetic management software and implementation, marmoset breeding and behavior, marmoset management, neuroscience and behavior.

INNOVATION

National identification system. We will establish a national identification system for all marmoset colonies participating in the MCC. We will explore the possibility of physically marking each animal with a unique identifier such as implantable microchip or a visible symbol (e.g. a tattoo).

Real-time surveillance of marmoset populations. The database for the MCC will allow for nightly, secure, automated updates of individual-level marmoset records from all participating colonies. This will allow the marmoset community unprecedented awareness of resource availability.

Joint genetic analysis of marmoset genomes. The MCC will operate an informatics pipeline that allows for on-demand generation of high-quality genotype calls from all available marmoset sequencing data, minimizing batch effects and data incompatibilities that would arise when combining genotypes from diverse pipelines.

Standardization of EHR terminology using a digital translator. Standardization of terminology in recordkeeping is critical, but individual colonies do not currently use consistent terms. We will work with participating colonies to build data processing functions for the MCC that translate site-specific electronic health record (EHR) terminology into a standardized vocabulary used by the MCC.

A marmoset concierge team for the neuroscience community. We have assembled a national panel of experts in marmoset neuroscience to provide deep, diverse knowledge to labs that are interested in using marmoset models for research.

APPROACH

Preliminary Studies

[REDACTED] Health Record System: The management of NHP clinical and research data is essential to research, and this problem is not unique to marmosets. The NIH National Primate Research Centers (NPRCs) house the largest research NHP colonies in this country. The majority of NPRCs, including the two centers with marmoset colonies, manage their clinical and research data using a common research-oriented Electronic Health Record platform. This system was originally developed [REDACTED] and has undergone extensive development and validation since its inception. This system is built using [REDACTED], which is designed for the

proprietary info

management of research data. Interaction with [REDACTED] requires no additional software (Fig. 1). Across these NPRCs, [REDACTED] allows staff and researchers to easily search decades of data from tens of thousands of animals, including more than 500 marmosets. At each center, this system performs most of the functional needs outlined in this RFA, including colony management. It should be noted that while NPRCs have elected to limit data access to internal users, this is an institutional decision, not an inherent limitation of the software. As described in greater detail in the Approach, this project will take advantage of the features in this robust, vetted system, as well as the large amount of marmoset data already housed in the [REDACTED] user base extends far beyond NHPs, and the [REDACTED] is used by a diverse range of groups, including the HIV Vaccine Trial Network, Genomics England, the Seattle Cancer Care Alliance, the Department of Energy, and multiple biotech companies. This diversity is highly advantageous, because all groups contribute to the expansion of core features, producing a robust, highly secure system.

A key aim of this RFA is to support [REDACTED] genetic management of marmoset colonies. Our team has considerable experience in the aggregation, analysis, and presentation of NHP genomic data. One example

[REDACTED] website aggregates genomic data across rhesus macaque colonies, totaling more than 1,000 macaques, provides consistent processing of these data, QC, and functional annotation of genomic variants (Fig. 2). While

[REDACTED] this project are directly applicable to any NHP species, including marmosets. The infrastructure created to efficiently process and manage these genomic datasets can also be applied to marmoset data acquired through this project.

Aim 1. Establish the informatics framework for the BRAIN Initiative Marmoset Coordination Center

Rationale: Marmosets are a critical animal model for neuroscience research, yet there is a national shortage of available animals. The major captive U.S. populations are spread across multiple institutions, with large colonies also located in other countries. A centralized repository to share information across these colonies will support neuroscience researchers by improving access to subjects, and enhanced information sharing can support the health of captive populations through more effective genetic management. In addition to tracking wild-type animals, the expected introduction of genetically altered marmosets exacerbates the need to proactively create infrastructure to track the existence and location of research subjects. The key features of this system are outlined in Fig. 3.

Aim 1A: Build a centralized web-based system to manage marmoset clinical and research data.

[REDACTED] is a modern research-oriented health record system, developed specifically for NHP data. It is heavily used across multiple major NIH NPRCs, where it actively performs most of the functions outlined in this RFA. Our project will adapt this robust system, tailoring its capabilities to the needs of the

Marmoset Coordination Center. The MCC will benefit heavily by the existence of thousands of animal records already stored electronically in proprietary info

proprietary info

Data Import: The MCC will allow data import through multiple mechanisms, designed to minimize the effort required by each colony (**Fig. 4**). Because the

location

already maintain their colony records in the
proprietary info we will be able to establish a secure, automated data sync between these centers and the MCC, using

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proprietary info This will populate the MCC with demographic, genetic, and clinical data from the 596 living marmosets at these colonies. These data will be automatically updated nightly with no human involvement, ensuring a robust core dataset in the MCC. We anticipate these data will become available during the first year of this project.

While the NPRCs represent a sizable fraction of the marmosets used in biomedical research, it is essential to expand the MCC beyond NPRCs. The LabKey platform allows similar data synchronizations to be created using other data sources as input (such as SQL databases), and our team will work with interested colonies to create other automated mechanisms. Because some colonies will not have sophisticated colony management systems, the MCC will also support excel-based upload, which we anticipate will be a popular form of data import for smaller colonies. Any interested colony will receive a personalized, password-protected data import portal. We will prioritize all BRAIN initiative-funded colonies and ensure these data are incorporated into the MCC.

proprietary info

Figure 4. Schematic of data import and QC in the MCC. The MCC will be designed to support multiple modes of data import, minimizing the burden on participating colonies, while ensuring accurate data. For colony storing their data in proprietary info which includes the marmoset colonies of location we will create an automated nightly sync to populate MCC with data. If colonies store data in other platforms, we will work with these groups to create similar automatic processes. If a colony does not have an electronic system, we will support excel-based upload of data. All incoming data will go through extensive automated QC and validation, patterned after the real-time QC performed on data entry proprietary info

To maximize the value of the integrated data, the MCC will enforce validation and work to standardize terminology across incoming data. Because we recognize that any additional obstacles will reduce the likelihood of participation, we will take steps to minimize this effort for data submitters. At time of import, validation will be performed, and in certain cases errors can be detected and corrected automatically. For most types of data, we have an existing library of validations, based on the collective experience of data entry [REDACTED]; however, these can be expanded. While standardization of terminology is critical, individual marmoset colonies do not currently use consistent terms (a simple example being “female” vs. “f”). Rather than force data submitters to conform, which might require their staff to manually convert values, likely to introduce ongoing errors into data collection, the MCC will allow automatic translation of incoming data, using sets of terms that can be customized per colony. The onboarding process for each new center will include a review of their existing data by our analysts, at which point any adaptations to data submission will be implemented. This is a vital capability provided by our proposal, ensuring robust and accurate accumulation of data from multiple institutions on a daily basis.

Types of Data Shared Through MCC: [REDACTED] has a well-established data model for managing NHP data; however, it supports flexibility and the creation novel datasets. The data stored in existing [REDACTED] systems includes: demographics, pedigree data (including observed and genetic parentage), reproductive histories, laboratory tests (CBCs, hematology, viral status, etc.), and assignment histories. The clinical data can include free-text comments, more structured observations (i.e. body condition scores or assessments), medication records, weights, surgical histories, and case/problem histories. The system has the capability of storing non-text data (whole genome sequence data being one example). We are prepared to expand the MCC to accept any relevant clinical and research data a colony is willing to provide.

We anticipate that centers will provide different levels of detail per marmoset. Our goal is to capture a standard set of demographics and pedigree information on all living marmosets at participating centers. More detailed information, including clinical and research histories, will be required for animals the submitting laboratory or center designates as available for researchers. In addition to primary clinical and research data, animals can also be tagged with traits or higher-level terms (i.e. available neuroimaging, cognitive behavior data, or neuroendocrine data) which we believe will be highly useful for identifying marmosets with a particular combination of required characteristics.

National Marmoset Census: We anticipate that one of the major features the MCC can provide is a national census of captive marmosets. Registered users will be able to quickly view breakdowns of living marmosets by age, gender, location, availability, etc. These data can inform breeding and planning decisions across all colonies. As the genetic characterization of marmosets improves, this information will be incorporated into these reports.

Universal Marmoset IDs: When a marmoset is registered with the MCC, it will receive a unique de-identified ID. These IDs will serve several purposes. The majority of views in the MCC will contain only this anonymized value, which we believe will reduce concerns existing colonies may have with sharing data. The universal ID will also help track marmosets if they are shipped between colonies, as animals frequently receive a site-specific ID after shipping. We will explore the possibility of implanting marmosets with unique microchip tags, or marking them in a way that will permanently identify them but will not compromise any required research conditions.

Individual-Level Data: If a specific marmoset is of interest, the user will be able to load an ‘Animal Details’ page, displaying all available data on this marmoset, including demographics, pedigree, clinical history, medications, and any research/procedure history data. The MCC will be patterned after [REDACTED]. The set of information available will be expanded based on the information provided by participant colonies, and could include non-text datatypes such as imaging or sequence data.

Software, Hardware, and Website Hosting: Our team is experienced in the development and maintenance of web-based scientific applications, and we have access to sophisticated infrastructure to support this project. Through separate NIH-funded projects our team develops and maintains multiple research-oriented web-based systems, [REDACTED]. The skills and resources developed for these projects are directly applicable to the MCC.

The MCC will be an application based on [REDACTED] application. The webserver is written in java, with most user-facing webpages written in JavaScript, using various frameworks, [REDACTED]

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All code created for this project will be open-source, maintained in public GitHub repositories.

The MCC website will be hosted by ONPRC, leveraging existing infrastructure. The webserver and database will be housed on a virtual Linux server, maintained by OHSU's Advanced Computing Center (ACC), a dedicated team of experts that support research computing. The virtual server will reside on hardware physically located in the OHSU Data Center, a state-of-the-art, dedicated facility constructed in 2014 that houses the majority of OHSU servers and the ^{proprietary info} cluster. The MCC server will receive regular security updates and patches, managed by ACC. The database and server will be regularly backed up to a separate physical location. Data managed by the MCC will be stored using the OHSU Research Data Store (RDS), a high-capacity network attached storage platform with more than 6 petabytes of total space. The space available to the MCC can be expanded as the amount of marmoset genomic and other research data grows.

A key function of the MCC will be to aggregate and leverage marmoset genetic data to aid in breeding decisions. Our team has already developed sophisticated infrastructure to support high-throughput analysis and integration of NHP genomic data, including whole genome data, whole-exome data, and various types of reduced representation sequencing, such as genotype-by-sequencing (GBS) data (Fig. 5). Genomic data analyzed in the MCC will be analyzed using highly automated pipelines orchestrated through our

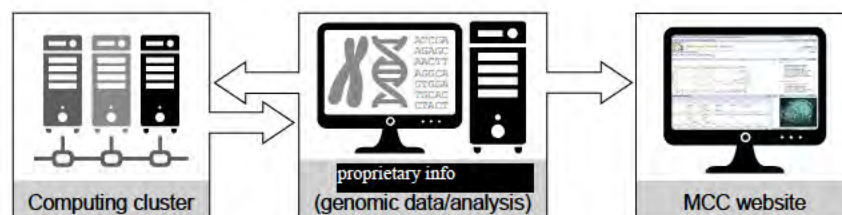


Figure 5. Schematic of the computational infrastructure available to the MCC. Generic or sequence data will be managed using our existing ^{proprietary info} server, which orchestrates highly-automated analysis pipelines. Computationally intensive tasks will be executed on the OHSU ^{proprietary info} computing cluster. The resulting files and aggregated data will be available through the MCC web interface.

proprietary info

Computationally intensive tasks will be run using the OHSU ^{proprietary info} a slurm-based cluster with more 9,000 Xeon cores, and 80 TB of RAM, spread across 263 cutting-edge compute nodes. The resulting files and aggregated data (such as variant calls or kinship coefficients) will be available through the MCC interface.

Data Security and Open Data Access: The primary mission of the MCC is to support data sharing across neuroscience researchers and marmoset colonies. Nonetheless, we recognize that this is not the current standard across NHP colonies. There are legitimate concerns related to sharing NHP information, including scrutiny from animal rights activists. We propose to address these concerns in several ways: 1) access to MCC animal data will only be available to registered users, 2) the MCC will exclude or redact personal information from all incoming data, including names of investigators and staff, 3) the MCC will use anonymized animal IDs for all animal-level data, and 4) participating colonies can choose the level of data they provide. While our initial plan is for all registered users to have equal data access, including aggregated and animal-level data, ^{proprietary info}

^{proprietary info} has the capability to enforce tiered access if this becomes required. While we expect marmoset data in the MCC to require registration and user-login, more general content (such as information about marmoset neuroscience models) will not require a login.

Aim 1B Generate detailed genetic summaries of marmoset populations

Rationale: In order to maintain an effective colony resource for neuroscience-related research, breeding strategies must rely on accurate pedigree information (kinship), and information on genetic diversity of the colony (to limit inbreeding and maintain genetic fitness).

Marmoset genetic data. We anticipate receiving existing genetic data from participating marmoset colonies from whole genome sequencing, exome sequencing, genotype-by-sequencing (GbS) or targeted sequencing/genotyping. To ensure consistent data processing, we will prefer that raw data be shared, such as the ^{proprietary info} files; however, if this is not possible or if the colony would prefer to perform more analysis locally we will accept called variants as an ^{proprietary info} file if the submitter can document data processing (described below). Smaller colonies may not have the ability to generate their own genetic data; in those cases, we will request 1.5ug of DNA from each marmoset in the colony, which will be archived at ONPRC and used for sequencing as needed.

Minimum information about pedigreed animals. To allow comparability across sites we will implement a minimum standard of information to be shared with the MCC. We will request a description of the DNA source (i.e. from venous blood, hair follicles, etc.), data quality control, and sequencing details. Along with the genomic information, we will request pedigree information from each colony. These data will be primarily stored in the [proprietary info] which will in turn be used to populate other specialist software such as the [proprietary info] software. Using the infant, sire and dam information for each animal in the colony, we will use [proprietary info] which is designed to reconstruct multigenerational and complex pedigrees, to generate pedigree information for each colony. As an example, the [location] marmoset pedigree contains four unrelated pedigrees. Pedigree 1 is the largest pedigree and consists of 98 founding members and 12 generations of descendants with a current total of 2311 animals, there are currently 351 living animals in [location] Marmoset colony. We will also request provenance information on colony founders. Given that original IDs are not always retained when marmosets have moved from one colony to another, we can also explore relationships across marmoset colonies participating in this initiative (see below), and leverage the Universal Marmoset IDs assigned as part of this project to help track animals that have moved.

Sequence data analysis and variant calling: We expect that multiple types of sequence data will be available, including whole genome, whole exome, and reduced representation methods such as genotyping by sequencing (GBS). The primary expected use of these data is accurate and comprehensive variant calling, for the purpose of defining pedigree relationships and genetic characterization. Our team has extensive experience working with NHP genomic data. In particular, we will apply wisdom and infrastructure our team developed for the Macaque Genotype and Phenotype project, a project to aggregate and analyze genomic data from 1000s of rhesus macaques. All genomic data in the MCC will undergo standard processing. After incoming sequence data pass initial quality control, we will generate variant and genotype calls using our established pipeline, which is based on [proprietary info]. Briefly, the reads are mapped to the most current *Callithrix jacchus* genomic reference ([proprietary info]) post-processed to remove duplicates, and [proprietary info] is run on each sample. Samples are then merged, processed with [proprietary info] and filtered[11, 12]. We insure biological rigor of the variant data using multiple approaches: 1) evaluate X and Y chromosome genotypes to confirm expected sex, 2) if multiple forms of data are available for an animal, we will compare concordance across data types, 3) use available pedigree data to confirm the Mendelian inheritance of genotypes.

Rigor and reproducibility: We have already generated reference data that will aid variant calling. Using GBS data from 84 animals, we generated a set of >21,000 high confidence genotypes for robust genetic analysis using this approach. These sites will be used to recalibrate variant quality scores and calculate [proprietary info] scores for efficient filtering of data from different colonies ([proprietary info]). We have generated exome (n=4) and whole genome (n=4) sequence from quartets of animals (sire, dam and two offspring) to provide a higher density SNP set for estimating genotype quality. We anticipate an additional 48 exome sequences prior to the start of year one from highly informative animals. High confidence sites from this expanded dataset will provide a set of common variants against which to integrate data from a variety of panels. The passing variants will be made available to others using [proprietary info] format, available through the MCC website.

Generating a high confidence genetic database: The variant data will be combined with the marmoset pedigree data. The MCC will screen the data from each colony, or each new batch of data from new offspring from each colony. Allele frequencies will be estimated taking relatedness into account, using maximum likelihood methods as implemented in [proprietary info]. Haplotype estimation will be conducted using [proprietary info] genotypes resulting in Mendelian errors will be blanked and recorded. We will remove from analysis SNPs that have low call rates (e.g., <95% of samples). We will verify genotyping calls in our existing data using our pedigree data and the program [proprietary info] to identify and remove from further analyses any poorly-performing markers that generate typing inconsistencies. We can also estimate the error probabilities by sample which will detect any potential lingering pedigree errors or sample mislabeling in the colony, which will be addressed as described, below.

Establishing the correct pedigree relationships across the colonies, as well as documenting original colony members' ancestral origins is necessary for strategies to maintain broad genetic diversity. If there are discrepancies between infant and inferred parents, we will compare the infant's genotypes against all other breeding individuals in the colony or breeding group in that cage to identify the true parent(s) to unambiguously assign and validate parentage. We will use the program [proprietary info] and combine a maximum likelihood approach at the relationship level with a maximum parsimony requirement at the level of pedigree configuration. Because the pedigree information from past generations may be incomplete, it is possible that apparently

unrelated animals in the colony are in fact related. We will use a method to detect possible genetic connections between separate, extended pedigrees that we have used successfully before[18]. In some instances, we may suggest that the colony managers draw a repeat sample for genotyping.

Managing kinship and inbreeding, and maintaining colony genetic diversity - To the extent that a breeding colony is closed to introduction of new animals known to be unrelated to the current population, genetic variability is a function of the variability present in the founding members of the population. The [proprietary info] determines founder contributions to subsequent generations and is used to assign a priority score to potential breeders on this basis[19]. Avoidance of inbreeding is a standard means of reducing loss of variability. The [proprietary info] is used to monitor inbreeding between potential breeding pairs.

Pedigree based estimates of inbreeding do not fully capture key outcomes of inbreeding on diversity across the genome. For example, mating records are often unknown for animals at the top of pedigree, or for animals brought from other centers, so pedigree-based estimation of inbreeding will not be accurate for the earliest or newest members of a colony. We will estimate relatedness between all animals using [proprietary info]. We will calculate runs of homozygosity for whole genome and exome data, and proportion of heterozygous sites for all data using [proprietary info] and custom scripts. Associating each Animal ID with its pedigree and generation number allows us to test for loss of heterozygosity through generations. **Fig. 6** demonstrates this entire process for a subset of the [location] colony. Here we found a rapid decrease in heterozygous sites (a key indicator of inbreeding) over a short span of generations. Because of this finding, we are reallocating breeding pairs in the [location] colony.

[proprietary info]

Integration, sharing of genetic information, and genetic management: Our team includes geneticists with decades of experience in human and NHP genetics, and we draw from the extensive expertise of the NPRC system in the management of NHP breeding colonies. The ability of the data in the MCC to inform breeding will depend heavily on the genetic data that is available for these subjects. The [proprietary info] is currently used to house multiple types of genetic data, including [proprietary info], microsatellites, whole-exome, and whole-genome sequence data. The MCC will integrate the ancestry and parentage genotype data for each animal to assess desirability of an animal for breeding or research. The proposed genetic, pedigree and demographic analyses are intended to facilitate maintenance of the most valuable and reproductively efficient populations. We will share all refined, high quality SNP genotypes with the participating centers as well as summary statistics on inbreeding from the pedigree and genetic information. We will provide clear guidance about alterations in breeding pairs needed to maximize diversity (see Aim 1C, below). We will be able to evaluate the success of any changes in breeding pairs on the diversity of colonies through further rounds of data analysis.

Rigor – We will use our measures of genetic diversity and kinship to assess the extent of unwanted inbreeding and to guide selective

breeding across the colonies. Assembling breeding groups using animals derived from across marmoset colonies will provide unrelated sires and dams for breeding and should lead to an overall increase in captive marmoset diversity.

Aim 1C Provide advice on breeding strategies for participating centers

The American Zoological Association (AZA) has developed strategies for monitoring and maintaining breeding efforts across institutions known as Species Survival Plans (SSP)[22, 23]. The goals of SSPs are to ensure the conservation of high-risk species, while maintaining genetic diversity in the captive population. The AZA uses shared software packages to maintain electronic health records (proprietary info) which allows program managers and studbook keepers to monitor the status of the population and assess potential breeders. The published Studbooks and SSP's include Mate Suitability Indices (MSI) that provide breeding guidance based on the following criteria: 1) proposed changes in genetic diversity given the parents 2) relative rareness or commonness of the parents 3) inbreeding coefficients, and 4) proportion of the parents' pedigrees that are known[22, 24]. Animals with the best MSI's are recommended for continuing breeding and growth of the population. Upkeep and sharing of the electronic records allow Institutional Managers to evaluate the current population size, age pyramids, and genetic diversity with the goals of maintaining 90% genetic diversity for the next 100 years. Each year a draft breeding and transfer proposal with eligible animals included for breeding (i.e. exclusion of animals based on age or illness) is released to the institutions that maintain the species, and they are given 30 days to comment before implementation of that year's plan.

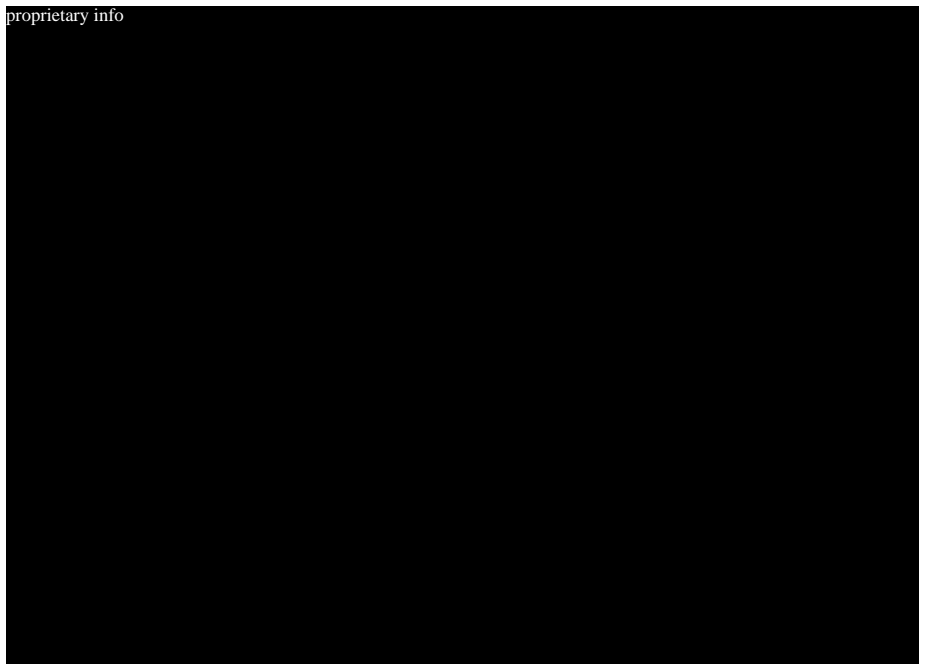
The captive common marmoset colonies used for biomedical research have historically been closely monitored by individual colony managers and population biology specialists, but to date, there have been no efforts to manage the captive colonies of marmosets across institutions in the US. To adopt strategies similar to the AZA SSPs it will be necessary to monitor the following items in the US marmoset colonies: 1) genetic diversity 2) mating suitability 3) needs of the institutions housing the marmosets, and 4) appropriate space, together with infrastructure support and staff with marmoset expertise, at various institutions. Individual marmoset colonies have used combinations of software packages including (proprietary info), as well as others, to evaluate relatedness, inbreeding, and breeding potential. To move forward, the proposed Coordination Center will integrate the health records of marmosets in the US into (proprietary info) full breeding evaluations. This will allow the Coordination Center to devise reports that are similar to the AZA SSP's with recommendations for breeding, movement and maintenance based on MSI's. We will provide these reports for informational purposes, but we are not suggesting that the MCC can, or will attempt to, dictate breeding and location decisions as happens within a zoo federation.

Aim 2. Activate an internet-based system to connect marmoset experts and resources to neuroscience researchers from other communities

Aim 2A Build the Marmoset Coordination Center Website

The Marmoset Coordination Center (MCC) will implement a web-based portal, the Marmoset Information Support Website (MISW), that will provide access to the marmoset data resources generated in Aim1 as well as background content on marmoset biology and neuroscience (**Fig. 7**). The spirit of a collaborative community whose goal is to enable paradigm-shifting breakthroughs in neuroscience research will be evident immediately. In addition to standard 'About' and 'Contact' pages, the website will be divided into three main sections, reflecting its primary goals: learn, search and request. These parts of the website will be easily accessed through the main menu as well as through action buttons on the homepage. Sensitive information, such as summaries of current projects, animal data, and the requests portal will be secure and password-protected.

(proprietary info)



Learn: A major duty of the MCC is to provide information and support to neuroscience researchers who are interested in using marmosets in their research programs. To this end, this page will serve as a resource offering advice about the advantages and disadvantages of incorporating marmosets in the research efforts in a laboratory. For example, we will provide content on marmoset husbandry, marmoset nutrition, colony management, marmoset social housing and breeding, and infant care[25].

The MISW will be developed with content that will provide basic information on marmoset biology[26] and brain architecture, and the use of state-of-the-art methods in electrophysiology, chemogenetics, optogenetics, PET and fMRI, and calcium imaging in cortical neural ensembles[27]. It will also provide up-to-date information on emerging genomic editing methodologies for generating marmoset models of human diseases, and the testing of gene therapy strategies based on new somatic cell genomic editing. The MISW will also maintain a list of links to others sites and important resources relevant to the use of marmosets in biomedical research. The MISW links and references lists will be updated monthly. Examples of relevant links and resources include the following:

1. marmohub.org white papers: general and individual targeted white papers for: BRAIN Initiative, NEI, NIA, NICHD, NIDCD, NIMH, NINDS, ORIP[28] *Marmoset Community White Paper* (2019)
2. ACLAM, *The Common Marmoset in Captivity and Biomedical Research* (2019)

Search: A secure, password protected list of current marmoset projects at all contributing institutions will be made available to interested neuroscientists. Projects will be listed by topic and will be searchable. A list of projects will be useful especially for neuroscientists who are used to working with other animal models and are interested in evaluating the utility of adding marmosets to their research program. Finally, all relevant publications by contributing members that use marmosets as well as by researchers who have used resources offered through the MCC will be listed.

Researchers will be able to view and query information from marmoset colonies, including demographics, genetics data and clinical/research data from available animals. Key features will be a census of all marmosets, various reports summarizing animals, and the ability to drill down on a given animal for details. Amount of detail will vary by animal. Some of the NHP traits that neuroscientists would be interested in include:

- a. Birth weight and maternal weight gain during pregnancy
- b. Litter size, sex of littermates and litter birth order
- c. Growth, weight over time
- d. Neonatal behavioral assessments
- e. Temperament assessments
- f. Cognitive assessment and training
- g. Any experimental exposure and clinically required surgeries including caesarian section
- h. Imaging (MRI//PET)
- i. Clinical health, such as cbc/chem/glucose and long-term or repeated treatments, including anti-inflammatory steroids, antibiotics, etc.
- j. Genomic data

Request: Through a secure, password protected portal, investigators will be able to request marmosets, as well as connect with experts to help them evaluate the best way to incorporate marmosets into their research programs.

Leveraging the Marmoset Information Content of the NPRC Consortia Website.

A Marmoset Working Group (MWG) was established through a collaboration between the National Primate Research Centers, NIH - Office of Research Infrastructure Programs (ORIP) / Division of Comparative Medicine (DCM), and colleagues at [location]. The purpose of this group is to strengthen communications, leverage system-wide resources, and facilitate sharing of information and best practices across US institutions housing common marmosets. The group is currently Co-Chaired by [names] of [location] and [names] of [location], and includes over 100 scientists with knowledge/experience/interest in the use of marmosets in biomedical research. Within the overall MWG there are seven subgroups covering topics ranging from husbandry and veterinary care to neuroimaging and genetics and genomics. Each of the Co-P.I.s and Co-I.s of this application are members of the MWG with privileged access to the MWG website, which is embedded within the framework of the NPRCresearch.org website. The MWG consortium website is password protected to enable free scientific communication among participants. The content includes basic information that will in some cases overlap with that to be provided by the proposed MISW, while much of the MWG site

Obtained by Rise for Animals.

would contain information on ongoing studies or clinical care that would not be appropriate for distribution to the broader scientific community or the public. We propose an arrangement with the MWG wherein content that is developed in the MWG site and is vetted by the group leaders as appropriate for the MISW would be mirrored at the MISW site. By the same token, MISW-derived content will be provided to the MWG for consideration of mirrored presentation on their site.

Aim 2B Establish and Operate a Concierge Team for the MCC

Given the breadth and complexity of modern neuroscience research, we propose that the best way to evaluate requests from the community is with a team of experts, which we term the “Concierge Team”, or more formally, the MCC Advisory Board. For the initial iteration of this team, we have assembled a mixture of internal and external scientists (names [REDACTED])

[REDACTED] It is anticipated that the makeup of this team will evolve as the MCC becomes operational and we adjust to empirical needs.

The Advisory Board for the MCC will serve as a cross-institutional marmoset research allocation group that will review all neuroscience-related requests for marmoset resources from the MCC. (names [REDACTED])

[REDACTED] have extensive experience with marmoset biology, behavior, nutrition, and health phenotyping; [names [REDACTED]] provide neuroscience-research related expertise; and [names [REDACTED]]

[REDACTED] have several decades experience in neotropical primate colony management and investigator support. Their collective experience and expertise will allow for an objective review in determining prioritization of marmoset resources. The MCC Advisory Board will be in close contact with the NIH to ensure updated knowledge regarding the goals and aims of the BRAIN initiative.

Mechanism for requesting marmosets. Animals earmarked for neuroscience research will be available to the research community through the following process: Researchers requesting marmoset resources will submit a research request via the SMCC website. The request must include a project description, number, and age/sex requirements of the requested marmosets, as well as the funding source. The significance of the proposed project to neuroscience must be stated. The request will be reviewed by the Advisory Board to determine whether it fits within the purview of neuroscience research, the requesting researcher will be contacted and asked if there are genotypic or phenotypic characteristics of interest. Researchers will be able to indicate via the web portal genetic, temperament, and health span phenotypes that are of importance.

Prioritization Criteria. The following criteria will be used for vetting the request and allocating marmosets:

1. Whether the project is viable and the allocated resources will be sufficient
2. Whether the project has NIH funding secured
3. Whether the requested genotypic and phenotypic characteristics of marmosets are available
4. Whether the project has non-NIH funding secured
5. Non-funded requests

In an effort to be equitable with marmoset resources, no one scientist will receive > 20% of available animals in any given year. Exceptions will be made only in unusual circumstances. Available animals from each institution will be entered into a database quarterly, along with demographic, genotypic, and phenotypic data. The MCC will match characteristics of available marmosets to each specific request. The MCC Advisory Board will meet monthly via web-conferencing to discuss and approve or deny researcher requests. An annual portfolio review will be conducted by the MCC for discussion and feedback.

Vision for MCC Participation: National and International Sites

One of the most important determinants of success for a marmoset coordination center will be buy-in from a large number of marmoset colonies. Based on our research into US marmoset populations, as well as the leadership position many of our members have in marmoset committees and working groups, we are well positioned to approach groups for enrollment. We will devote part of an FTE for the MCC administrator to recruit new participants. We will request assistance from BRAIN program officers to incentivize participation, as the overhead of participating in the MCC may seem unattractive to some. Upon agreement, we will establish a meeting with IT, admin, and neuroscience representatives of the MCC to establish a plan for integrating the new site. While we will focus initially on bringing in US centers, it would be a remarkable accomplishment and huge boon for the neuroscience community to expand the scope of the MCC to incorporate international partners as well.

PHS Human Subjects and Clinical Trials Information

OMB Number: 0925-0001 and 0925-0002

Expiration Date: 03/31/2020

Are Human Subjects Involved

☐ Yes ☒ No

Is the Project Exempt from Federal regulations?

☐ Yes ☐ No

Exemption Number

☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8

Does the proposed research involve human specimens and/or data

☐ Yes ☒ No

Other Requested information

MULTIPLE PD/PI LEADERSHIP PLAN

The multiple PI approach was determined to be the best fit for the current proposal based on the distinct expertise required and the complexity of the overall project. Drs. Don Conrad, Oregon National Primate Research Center (ONPRC), Oregon Health & Science University, [REDACTED]

[REDACTED] are responsible for ensuring proper conduct of the overall research project.

Dr. Conrad will manage the informatics and web development team for the Marmoset Coordinating Center (MCC), including [REDACTED] and a software developer TBN. [REDACTED] will organize and supervise the neuroscience concierge component of the MCC, through his role as chair of the advisory panel, and will advise on neuroscience-relevant content development for the web portal. [REDACTED] will oversee the genetics team based from [REDACTED], including [REDACTED].

In order to ensure cohesive progress in the project, the PIs will communicate in person at least monthly and to set incremental goals for the completion of each aim. PIs will coordinate amongst themselves to ensure that at least one PI is available for all major meetings (e.g. teleconferences or face-to-face) involving members of Center scientists and extramural scientists.

As all three PIs are colleagues and collaborators on NIH funded projects, disagreements are not anticipated. If any occur on any matter, either scientific or budget related and cannot be resolved by the PIs, these disagreements will first be discussed by members of the Center Steering Committee which includes all co-investigators of the current study and NIH Program Staff.

REFERENCES

1. Conrad DF, Pinto D, Redon R, Feuk L, Gokcumen O, Zhang Y, Aerts J, Andrews TD, Barnes C, Campbell P, Fitzgerald T, Hu M, Ihm CH, Kristiansson K, Macarthur DG, Macdonald JR, Onyiah I, Pang AW, Robson S, Stirrups K, Valsesia A, Walter K, Wei J, Wellcome Trust Case Control C, Tyler-Smith C, Carter NP, Lee C, Scherer SW, Hurles ME. Origins and functional impact of copy number variation in the human genome. *Nature*. 2010;464(7289):704-12. PMID: PMC3330748.
2. Conrad DF, Keebler JE, DePristo MA, Lindsay SJ, Zhang Y, Casals F, Idaghdour Y, Hartl CL, Torroja C, Garimella KV, Zilversmit M, Cartwright R, Rouleau GA, Daly M, Stone EA, Hurles ME, Awadalla P, Genomes P. Variation in genome-wide mutation rates within and between human families. *Nat Genet*. 2011;43(7):712-4. PMID: PMC3322360.
3. Deciphering Developmental Disorders S. Prevalence and architecture of de novo mutations in developmental disorders. *Nature*. 2017;542(7642):433-8. PMID: PMC6016744.
4. Tardif SD, Mansfield KG, Ratnam R, Ross CN, Ziegler TE. The marmoset as a model of aging and age-related diseases. *ILAR J*. 2011;52(1):54-65. PMID: PMC3775658.
5. Ross CN, Davis K, Dobek G, Tardif SD. Aging Phenotypes of Common Marmosets (*Callithrix jacchus*). *J Aging Res*. 2012;2012:567143. PMID: PMC3312272.
6. Power ML, Ross CN, Schulkin J, Tardif SD. The development of obesity begins at an early age in captive common marmosets (*Callithrix jacchus*). *Am J Primatol*. 2012;74(3):261-9. PMID: PMC3767183.
7. Ross CN, Power ML, Tardif SD. Establishing meal patterns by lickometry in the marmoset monkey (*Callithrix jacchus*): translational applications from the bench to the field and the clinic. *Am J Primatol*. 2012;74(10):901-14. PMID: PMC3423480.
8. Ross CN, Power ML, Artavia JM, Tardif SD. Relation of food intake behaviors and obesity development in young common marmoset monkeys. *Obesity (Silver Spring)*. 2013;21(9):1891-9. PMID: PMC3722271.
9. Abbott DH, Rayome BH, Dumesic DA, Lewis KC, Edwards AK, Wallen K, Wilson ME, Appt SE, Levine JE. Clustering of PCOS-like traits in naturally hyperandrogenic female rhesus monkeys. *Hum Reprod*. 2017;32(4):923-36. PMID: PMC6251677.
10. Van der Auwera GA, Carneiro MO, Hartl C, Poplin R, Del Angel G, Levy-Moonshine A, Jordan T, Shakir K, Roazen D, Thibault J, Banks E, Garimella KV, Altshuler D, Gabriel S, DePristo MA. From FastQ data to high confidence variant calls: the Genome Analysis Toolkit best practices pipeline. *Curr Protoc Bioinformatics*. 2013;43:11 0 1-33. PMID: PMC4243306.
11. Bimber BN, Ramakrishnan R, Cervera-Juanes R, Madhira R, Peterson SM, Norgren RB, Jr., Ferguson B. Whole genome sequencing predicts novel human disease models in rhesus macaques. *Genomics*. 2017;109(3-4):214-20. PMID: PMC5513488.
12. Bimber BN, Yan MY, Peterson SM, Ferguson B. mGAP: the macaque genotype and phenotype resource, a framework for accessing and interpreting macaque variant data, and identifying new models of human disease. *BMC Genomics*. 2019;20(1):176. PMID: PMC6402181.
13. Almasy L, Blangero J. Multipoint quantitative-trait linkage analysis in general pedigrees. *Am J Hum Genet*. 1998;62(5):1198-211. PMID: PMC1377101.
14. Sobel E, Lange K. Descent graphs in pedigree analysis: applications to haplotyping, location scores, and marker-sharing statistics. *Am J Hum Genet*. 1996;58(6):1323-37. PMID: PMC1915074.
15. Sobel E, Papp JC, Lange K. Detection and integration of genotyping errors in statistical genetics. *Am J Hum Genet*. 2002;70(2):496-508. PMID: PMC384922.
16. McPeck MS, Sun L. Statistical tests for detection of misspecified relationships by use of genome-screen data. *Am J Hum Genet*. 2000;66(3):1076-94. PMID: PMC1288143.
17. Sun L, Wilder K, McPeck MS. Enhanced pedigree error detection. *Hum Hered*. 2002;54(2):99-110.
18. MacCluer JW, Blangero J, Comuzzie AG, Ebbesson LO, Howard BV, Cole SA. Genetics of cardiovascular disease in minority populations. In: Duggirala R, Comuzzie AG, Williams-Blangero S, Kole C, editors. *Genome Mapping and Genomics in Human and Non-Human Primates*. Heidelberg: Springer; 2015. p. 155-79.
19. PEDSYS: A Pedigree Database Management System. Texas Biomedical Research Institute.
20. Manichaikul A, Mychaleckyj JC, Rich SS, Daly K, Sale M, Chen WM. Robust relationship inference in genome-wide association studies. *Bioinformatics*. 2010;26(22):2867-73. PMID: PMC3025716.
21. Danecek P, Auton A, Abecasis G, Albers CA, Banks E, DePristo MA, Handsaker RE, Lunter G, Marth GT, Sherry ST, McVean G, Durbin R, Genomes Project Analysis G. The variant call format and VCFtools. *Bioinformatics*. 2011;27(15):2156-8. PMID: PMC3137218.

22. Association of Zoos and Aquariums. Species Survival Plan® (SSP) Program Handbook. Silver Spring, MD: Association of Zoos and Aquariums; 2019.
23. Association of Zoos and Aquariums. Taxon Advisory Group (TAG) Handbook. Silver Spring, MD: Association of Zoos and Aquariums; 2019.
24. Association of Zoos and Aquariums. AZA Regional Studbook Keeper Handbook. Silver Spring, MD: Association of Zoos and Aquariums; 2019.
25. Fukushima M, Ichinohe N, Okano H. Neuroanatomy of the marmoset. In: Fox JG, Marini RP, Wachtman LM, Tardif SD, Mansfield KG, editors. The Common Marmoset in Captivity and Biomedical Research. Cambridge, MA, USA: Academic Press; 2019. p. 43-62.
26. Arruda MF, Yamamoto ME, Pessoa DMA, Araujo A. Taxonomy and natural history. In: Fox JG, Marini RP, Wachtman LM, Tardif SD, Mansfield KG, editors. The Common Marmoset in Captivity and Biomedical Research. Cambridge, MA, USA: Academic Press; 2019. p. 3-16.
27. Converse AK, Aubert Y, Farhoud M, Weichert JP, Rowland IJ, Ingrisano NM, Allers KA, Sommer B, Abbott DH. Positron emission tomography assessment of 8-OH-DPAT-mediated changes in an index of cerebral glucose metabolism in female marmosets. *Neuroimage*. 2012;60(1):447-55. PMID: PMC3763841.
28. pending publication In press pending publication

CONSORTIUM ARRANGEMENTS

The appropriate programmatic and administrative personnel of each organization involved (Oregon Health & Science University, [secondary names and identifiers]) in this proposal are aware of the agency's consortium agreement policy and are prepared to establish the necessary inter-organizational agreements consistent with that policy. Don Conrad, Ph.D., is the Principal Investigator responsible for ensuring proper conduct of the project at the research site of Oregon National Primate Research Center (ONPRC), Oregon Health & Science University, as well as the overall Contact Principal Investigator. Also serving [secondary names and identifiers] responsible for ensuring proper conduct of the project at the consortium site [secondary names and identifiers] and [secondary names and identifiers] responsible for ensuring proper conduct of the project at the consortium site [secondary names and identifiers]. A contractual collaboration between Drs. Conrad, [secondary names] is proposed for all years of the project.

The terms and conditions of the agreement will stipulate ownership of all data, reports, materials, inventions and if applicable, future use, developed under the subcontract agreement in accordance with NIH Grants Policy.

The current needs of the neuroscience research community far exceed the number of marmosets currently available for research. Given this increasing demand, it is critical that breeding colonies at established facilities with expertise in marmoset care and husbandry increase their production capabilities. Additionally, there is increasing need to have access to animals that have been carefully genetically characterized. To achieve the coordination of these efforts, ONPRC, [location] and [location] are partnering to form a Marmoset Coordination Center (MCC). Each group will be responsible for leading development and management of the MCC in distinct areas: [location] will leverage the expertise in marmoset care, pedigree analysis, genetics, and reproductive management, to lead the "Genetics Team"; ONPRC will lead the informatics team responsible for designing and building [proprietary info] database that will house individual-level marmoset data for the MCC; [location] will lead the neuroscience concierge team responsible for interfacing with the non-NHP neuroscience community and generating neuroscience-relevant content for the MCC web portal.

Under this unique BRAIN Initiative U24, the MCC will develop a digital repository for genomic and pedigree records for captive marmosets. Together, the [location] and [location] house the two largest colonies of marmosets in the United States. Additionally, the two centers share the use of a [proprietary info] Health Records (EHR) system that serves as a searchable record database and on-line veterinary and research management platform, the system having been first developed by David O'Connor, Ph.D. at the [location] and subsequently adopted by the ONPRC and the [location].

At the [location] [secondary names], Attending Veterinarian and the Associate Director of the [location] and [secondary names] Senior Information Processing Consultant and unit head of Informatics and Data Services, will work closely with Drs. Conrad and [secondary names] on the development of a new digital repository [proprietary info] to link the clinical, pedigree and genetic databases between the [location] and the [location], as well as other participating marmoset colony sites. Additionally, [secondary names and identifiers] will provide expertise in reproduction, development, and neurobiology of the common marmoset and its utility in current biomedical research to guide investigators in the neuroscience community on the utilization of marmosets in their research.

All three teams will meet regularly to ensure success in the implementation of the Marmoset Coordination Center for neuroscience research.

secondary names and identifiers

Don Conrad, Ph.D.
Division of Genetics
Oregon National Primate Research Center
505 NW 185th Avenue
Beaverton, OR. 97006

11 October 2019

Dear Dr. Conrad,

I am pleased to write in strong support of your grant proposal titled "Coordinating center for collaborative marmoset research," and to serve as secondary names and identifiers on this project. The establishment of the coordination center is critically important for the further development of marmosets in neuroscience-related research activities. Harnessing the excellent resources and scientists at three of our nation's secondary names and identifiers into this collaborative effort will be the most effective and efficient means of coordinating these resources and distribution to the scientific community.

As you know, I have extensive experience with the marmoset as a model of aging and multiple sclerosis. I have a history of working successfully and collaboratively with secondary names and identifiers. My role in the Coordinating Center will utilize my expertise in primate neuroscience as a member of the concierge group to provide advice and counsel on the needs of the neuroscience community for marmoset research resources. The expectation is that I will provide % effort of service annually to the project, at a rate base salary.

I look forward to working with you and your team and wish you the best of luck in the review of this proposal.

Best wishes,

secondary names and identifiers

secondary names and identifiers

October 11, 2019

Don Conrad, PhD
Associate Professor and Chief
Division of Genetics
Oregon National Primate Research Center
Oregon Health & Science University

Re: Marmoset Coordination Center Scientific Advisor Board

Dear Don,

I'm writing to express my support for the proposed Marmoset Coordination Center and my willingness to serve as a member of the Scientific Advisory Board (SAB). As someone who actively studies genetics in the context of nonhuman primates neuroscience, I deeply appreciate the opportunities provided by the marmoset model and recognize the current need for a more organized approach to providing access to marmosets for appropriate research. Having discussed your plans for the Marmoset Coordinating Center I am enthusiastic that this will be a useful platform for moving the field ahead.

I am pleased as a member of the SAB to contribute my expertise in evaluating the utility of marmosets in neuroscience research. I have been studying primate genetics in the context of brain and behavior for nearly 20 years, with specific focus on developing and evaluating nonhuman primates as translational models for human disease. Over the years, I have worked with rhesus macaques, marmosets, tamarins, and squirrel monkeys. For more than a decade I have been part of the NIH-sponsored Nonhuman Primate Genetics and Genomics Working Group whose goal has been to support genetic research in nonhuman primates and develop tools to bring this work to colony managers, veterinarians, and the research community. I also served on, and Chaired, the NIH Nonhuman Primate Genome Banking Working Group, which developed and maintains a repository of more than 1000 animals representing 10 species. I have also served on the NIH NHP Specialized Breeding Working Group and co-Chair the NIH NHP New Model Development Working Group. I also serve as genetics liaison for the NIH NHP Breeding Colony Management Group. Through these roles I regularly interact with representatives from across the nonhuman primate community both in research and colony management.

secondary names and identifiers

I was at secondary names and identifiers

first as a post-doctoral fellow and then as Assistant Professor. During my time there I authored several papers focused on marmoset chimerism and the emerging importance of nonhuman primates, specifically New World monkeys, in the post-genomic era. I received grant funding to investigate marmoset genetics and served as site PI on an NIH-funded study of aging in marmosets.

secondary names and identifiers

I performed the population genetics studies to determine which specific individuals from our marmoset colony would be distributed to the secondary names and identifiers

secondary names and identifiers

In 2014, I moved to [REDACTED] where I am an Associate Professor in the Department of Psychiatry and Human Behavior. I was also made a [REDACTED] [REDACTED] in the Division of Veterinary Medicine. Although most of my direct work with nonhuman primates is now focused on rhesus macaques, I maintain a biobank that includes more than 100 blood samples, 150 DNA samples, and 19 whole brains from the [REDACTED] colony. I served as a consultant on an NIH grant on marmoset nutrition and microbiome and on the Scientific Advisory Board of [REDACTED].

I believe that the importance of developing a national Marmoset Coordinating Center is critical to ensuring meaningful management and oversight of marmoset breeding and research capacity. By reaching across institutions, you have assembled a strong and impressive multidisciplinary team that is ideally positioned to support these efforts. Your proposal will serve to significantly enhance marmoset neuroscience research and maximize the effectiveness of this emerging translational model.

Thank you for inviting me to serve on the SAB. I am excited to work with you on this important and exciting project.

Sincerely,

[REDACTED]

secondary names and identifiers

October 8, 2019

Don Conrad, PhD
Associate Professor and Chief,
Division of Genetics
Oregon National Primate Research Center
Oregon Health & Science University

Re: Marmoset Coordination Center Scientific Advisor Board

Dear Don,

I am delighted to serve on the Scientific Advisory Board (SAB) of the proposed Marmoset Coordination Center. This is such an important initiative and I strongly agree with the need for a more organized approach to providing access to marmosets for the advancement of neuroscience research. Having discussed your plans for the Marmoset Coordinating Center I am enthusiastic that this will be a useful platform for moving the field ahead.

As a member of the SAB I expect to contribute expertise in evaluating the utility of marmosets in neuroscience research. In fact, given my behavioral and neurophysiological work in primate social interaction and social cognition, multi-sensory processing, attention and working memory, as well as my ongoing experience studying these paradigms in marmosets, I would be best qualified to evaluate behavioral and systems neuroscience applications.

Having assembled a tremendous multi-disciplinary team across institutions, you are in a great position to implement a Marmoset Coordinating Center facilitating significant advancements to the field of neuroscience. Thank you for inviting me to serve on the SAB, I consider it a privilege to help contribute to this much needed service to our growing marmoset users community. I look forward to working together on this exciting project.

Sincerely,

secondary names and identifiers

secondary names and identifiers

RESOURCE SHARING PLAN

All PIs and Co-Is have worked within large consortia and understand the importance of collaboration and data sharing. We are fully committed to data sharing with other investigators in the marmoset neuroscience world.

Data to be Shared: A primary goal of the marmoset coordinating center (MCC) is to make available data to the neuroscience community that will inform the design of experiments using the marmoset model. We will make available, through the MCC website, individual-level phenotype data and genetic information pertinent to the selection of animals for experiments. The data to be shared will be discussed and agreed upon by MCC participants, and, if interested, relevant NIH program officers.

Any new, non-trivial tools developed as part of this study including software for bioinformatics analysis will be made available to the research community. The [secondary names and identifiers] Conrad lab maintain repositories of open-source software that they have developed, [secondary names and identifiers] available for the research community to use. Data quality control measures will include checking data entries regularly by the Data Manager.

Publications and presentations at scientific meetings will be done collaboratively with all PIs and Co-Is on project.

Access to Data: Phenotype and genetic data will be accessible through the MCC website. Prior to data access of individual-level NHP information all interested parties will be required to register for a password-protected access account. General information on the use of marmosets in neuroscience will be available without restriction through the portal.

Location of Data: The database and webserver for the MCC will be based at OHSU. This environment sits behind OHSU firewalls, and can only be accessed by a two-step process a) [proprietary info] and b) [proprietary info]. Thus, access is effectively two-factor authorization. If applicable, existing databases such as mGaP will be used for data repository. If an individual investigator directly asks for data, no direct electronic mailing will occur.

Contact: The Contact PI, Dr. Conrad, will be the contact person for data sharing and support for this will be provided by the Data Manager.

AUTHENTICATION OF KEY BIOLOGICAL AND/OR CHEMICAL RESOURCES

This is primarily an informatics grant, with no explicit experimental work proposed. We have requested budget for DNA sample collection from participating centers. We will request that each sample be labeled with a unique Marmoset Identifier code generated by the MCC and paired with electronic records in the MCC LabKey database. Upon receipt of samples, we will confirm that the identifier listed on each specimen matches a valid code in the proprietary info. If necessary we will use DNA sequencing to computationally assess the origin of a sample, by comparison to existing data from the donor or potential relatives. The pedigree and genetic data maintained at participating centers make it very straightforward to identify an individual genetically.