Kent State University NSF-IRES Program, Summer 2020

Program Description

Overview

Human evolution is an area of major interest within multiple disciplines, including anthropology and biology, because this line of investigation will reveal the particular processes that gave rise to the human species. This includes identifying the genetic, morphological, and neuroanatomical features that underlie our cognitive and behavioral advances, which will contribute to understanding our unique susceptibility to human-specific disease processes. Identification of the evolutionary changes unique to modern humans requires comparison with our closest living relatives, the nonhuman primates. Given their generally similar bauplan, and the fact that they are long-lived and socially complex animals, nonhuman primates provide not only a solid comparative framework for human studies, they can also be useful analogs for understanding human evolution. This extends from shedding light on the radiation of hominins (humans and our extinct bipedal cousins) to identifying therapeutic targets for diseases that affect humans exclusively or disproportionately, such as Alzheimer’s disease and schizophrenia.

With great interest in such comparative primate studies, the Anthropology Department and the School of Biomedical Sciences at Kent State University began, in 2016, a partnership with the Primate Research Institute (PRI) of Kyoto University, Japan. To date, 11 members of KSU have visited the PRI for research visits, resulting in several collaborative projects and publications. Building on these successes, Anthropology faculty (Drs. Tosi, Raghanti, Meindl, Lovejoy) applied for and were awarded a three-year grant from the National Science Foundation’s International Research Experience for Students (NSF-IRES) program to support several graduate-level internships at the PRI. Selected participants will be paired with Japanese mentors of similar research interest and subsequently conduct nine-week internships as members of their mentor’s laboratory group. One of the goals of this program is for students to use their summer research as a chapter of their thesis or dissertation; thus, students are strongly encouraged to design a project that complements their work at KSU. Participants will receive a stipend of $500 per week in addition to travel, housing, and meal costs. Summer housing is available in the PRI dormitory.

The Research Environment

Kyoto University, Japan, is one of the world’s leading research institutions, counting 10 Nobel Prize laureates among its faculty and alumni. One of its specialized centers, the Primate Research Institute (PRI), was established in 1967 on its own campus in Inuyama, 150km east of Kyoto. Today, the PRI has 39 faculty members across four departments: Evolution and Phylogeny, Behavioral and Brain Sciences, Cellular and Molecular Biology, and Ecology and Social Behavior. Nearly all of the PRI faculty members hold terminal degrees from one of the seven national Japanese universities. The institute houses an extensive biomaterials repository, which preserves various tissues from deceased animals of Japanese zoos and other research institutes. The combined resources in biomaterials, instrumentation, and personnel available at the PRI are without parallel among primate research centers. General descriptions of the four departments are provided below. Other, project-specific information can be found on the PRI website: https://www.pri.kyoto-u.ac.jp

A wide spectrum of morphological, neuroscientific, and genetic studies can be pursued at the Institute. Between the PRI and the Japan Monkey Centre (its neighboring sister-institute), there are skeletal remains from over 10,000 individuals, representing over 130 primate species. The Department of Evolution and Phylogeny is well-equipped with imaging instruments such as a Hitachi AIRIS Vento (0.3 T) for MRI scans, a Toshiba ASTEION Premium 4 Edition (TSX-021B) for CT scans, a Stratec XCT Research SA+ for pQCT scans, a Hitachi mobile C-arm DHF-105CX for X-rays, a Bruker Skyscan 1272 for micro-CT scans, and a number of Microscribe 3D Digitizers and related analysis software. Other notable equipment includes a Kyowa Gait Analysis System (floor reaction force meter), KINECT camera and sensors for gait analysis, and near-infrared spectroscopy (NIRS) system.
The Department of Behavioral and Brain Sciences contains equipment for studying brain tissue sections and facilities for testing the cognitive abilities of living animals. One of the more specialized instruments is a Bruker PharmaScan 4.7T, used for MRI brain scans. Also available are quantitative PCR systems and equipment for immunohistochemistry and Western blots. Animals often included in behavioral studies are marmosets and macaques. Marmoset models are increasingly used in neurodegenerative studies at the PRI, as in the U.S.

The Department of Cellular and Molecular Biology has facilities and instrumentation for cytogenetic examination (e.g. FISH), iPS cell creation, cell culture, DNA extraction and quantitation, standard and quantitative PCR, DNA sequencing and microsatellite analysis, and immunohistochemistry. Areas of investigation include analysis of (i) retroposons and satellite DNA in chimpanzees, gibbons, owl monkeys, and slow lorises, (ii) G-protein coupled receptors (GPCRs), especially evolution of taste receptors as related to diet, (iii) expression of genes involved in spermatogenesis, and (iv) molecular development of primate germ cells.

Members of the Department of Ecology and Social Behavior head field stations in Central Africa, Southeast Asia, and Japan, including long-term bonobo, chimpanzee, and Japanese macaque sites. Major areas of study include primate socio-ecology, conservation, self-medication, and parasitic infections. In addition to studies of wild primates, the PRI maintains populations of 12 different species, and runs a breeding facility for Japanese macaques, which currently holds ~400 animals.

Additional program requirements

In addition to their summer research projects, IRES participants will undertake activities designed to better prepare them for life in Japan and add to their professional development.

Pre-departure. Student cohorts will enroll in Elementary Japanese I in the Spring semester prior to their departure. They will also be required to join a once-weekly series of lectures and discussions, designed specifically for this program that focus on Japanese daily life and customs, the scientific culture of Japan, and the infrastructure of the PRI. As part of this once-weekly preparatory course, students will be required to write a detailed description of their planned research in NSF-DDRIG format. Iterative drafts will be cycled between the student and most relevant PI (genetics, Tosi; neuroscience, Raghanti; morphology, Lovejoy and Meindl) – or the student’s main advisor – for revision. They will also have to apply for approval from the IACUC at Kent State before leaving for Japan.

In Japan. Inuyama City: The PRI hosts several visiting international researchers, especially in the summer. These visitors give presentations on their work, so there are frequent seminars in many fields of primate biology. IRES students will be required to attend at least two talks while at the PRI and submit short summaries to their KSU advisor and PRI mentor. Students will also be required to submit a 2-page concept paper on a collaborative project that could be done with a PRI graduate student. This is intended to make them network with other students, and to encourage them to think about interdisciplinary studies.

Kyoto City: Students will attend two seminars (at the end of the first and fourth weeks) on the Kyoto University main campus to discuss U.S.-Japan cultural differences and how they affect our respective approaches to science. These discussions will help to prevent potential misunderstandings in U.S.-Japan collaborations. Kasugai City: Students will present posters at the annual (July) meeting of Japan Primatological Society – an opportunity to network with more Japanese scientists.

After return to the U.S. There will be three required tasks upon return to the U.S. First, students must produce a final written report of their summer research. These will be reviewed by Tosi, Raghanti, Meindl, and Lovejoy, and returned with comments for revision. The final products will be recorded in an online IRES ‘yearbook,’ and/or submitted for journal review. Second, the students will be asked to compile a “lab startup” list – with costs of instrumentation and chemicals – for materials needed to perform the work they completed over the summer. Third, the students will be required to present their summer research in the Graduate Research Symposium held every Spring at Kent State. These tasks provide practice in manuscript writing, “building” a new laboratory, and giving a professional presentation. Students will also complete a post-experience assessment that includes specific questions about how their visit allowed them to grow as global citizens/scientists and what changes they would recommend for the program.
# APPROXIMATE timeline

<table>
<thead>
<tr>
<th>ACTIVITY</th>
<th>DATES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Application deadline (online submission)</td>
<td>October 31</td>
</tr>
<tr>
<td>Application documents reviewed</td>
<td>November 1 - 10</td>
</tr>
<tr>
<td>Interviews of finalists</td>
<td>November 11 - 17</td>
</tr>
<tr>
<td>Decisions made; offer letters sent via email</td>
<td>November 21</td>
</tr>
<tr>
<td>Accept/decline deadline (email response)</td>
<td>December 1</td>
</tr>
<tr>
<td>Language (Japanese I) and Preparatory Course</td>
<td>January 13 - May 7</td>
</tr>
<tr>
<td>Departure for Japan</td>
<td>May 28</td>
</tr>
<tr>
<td>Nine-week research project</td>
<td>June 1 - July 31</td>
</tr>
<tr>
<td>Annual Meeting, Japan Primatological Society</td>
<td>July 17 - 19</td>
</tr>
<tr>
<td>Return to U.S.</td>
<td>August 3</td>
</tr>
<tr>
<td>Final reports and questionnaires due</td>
<td>August 14</td>
</tr>
<tr>
<td>Graduate Research Symposium</td>
<td>mid-April, next year</td>
</tr>
</tbody>
</table>
Kent State University NSF-IRES Program, Summer 2020

Application

Interested students should arrange to have the following documents sent to Dr. Anthony Tosi (atosi@kent.edu) by October 31, 2019. Interviews with the IRES committee are also required and will be arranged by Dr. Tosi.

1) completed application form (this form)
2) curriculum vitae
3) one-page summary of previous independent research
4) one-page description of a proposed project to be done at the PRI
5) two letters of reference

The project description is a tool for the IRES committee to better understand the student’s interests and ability to think scientifically; however, the student is not necessarily bound to a project proposed at this stage. The committee will ultimately guide project revision and help to compact the various projects to fit into the allotted nine-week schedule. The basic profiles and research interests of the selected students will be forwarded to potential PRI mentors who must give their final approval before a student is officially accepted. A formal invitation letter and an accompanying acceptance contract will then be sent to selected students. Students will be given 10 days to accept or decline the IRES offer.

Please provide the following information and email to Dr. Anthony Tosi (atosi@kent.edu) along with the other documents listed above.

1) Name
2) Contact information (email, phone):
3) Department:
4) Primary advisor:
5) Topic of (intended) KSU thesis/dissertation:
6) Are you a master’s or doctoral student? What year?
7) Why do you want to conduct an IRES internship in Japan? How will this experience fit into your overall research plan, and how will it benefit your future career?
8) Have you ever been abroad? If so, what are some significant differences of that country as compared to the U.S.? What did you like/dislike about that culture?
9) Have you previously visited Japan? If so, please elaborate on that experience.
10) Describe a stressful situation you’ve had in your life and how you dealt with it.
11) Visit the PRI webpage, https://www.pri.kyoto-u.ac.jp and identify three potential researchers with whom you would like to work, explaining why in a sentence or two for each. (Google Chrome can translate the personal/laboratory webpage of a researcher if it appears in Japanese. If a faculty member is listed without a webpage, their publications can be found using this database: http://kyouindb.iime.kyoto-u.ac.jp/view/index_e.html )

Please do NOT contact the PRI faculty. We do not want to inundate our colleagues with emails from multiple sources. Once candidates are selected, the IRES panel will contact the PRI faculty.