March 5, 2014

MEMORANDUM

TO: The Steering Committee of Academic Governance

FROM: Acting Provost June Pierce Youatt

RE: Name Change, Department of Zoology

I am requesting the advice of Academic Governance on the proposed name change of the Department of Zoology to the “Department of Integrative Biology.”

The proposed name change has been carefully considered by the Department and College, and is endorsed by Dean R. James Kirkpatrick. Background and rationale are provided on the attached materials from the Zoology Chairperson, Thomas Getty, and Dean Kirkpatrick.

Your advice is appreciated as I make my recommendation to President Simon.

Attachments
This is a request to change the department name from the Department of Zoology to the Department of Integrative Biology.

The proposed new name is part of our effort to be Bolder by Design. It better reflects who we are, what we do and how we intend to focus our efforts in the future. We can better serve CNS and MSU if prospective undergrad and grad students, faculty and funding agencies have a more accurate picture of our strengths. There are no plans to create a new organization, new accounts or new organizational relationships with other units at MSU. This is an internal departmental reorganization and refocusing. We are following guidelines detailed at [https://ebs.msu.edu/001/index.htm](https://ebs.msu.edu/001/index.htm).

Rationale

The Past

In 1860, the Board of Trustees of the Michigan Agricultural College resolved to appoint Dr. Manly Miles to the Professorship of Zoology and Animal Physiology, "the Salary to be at the rate of $1000 a year." In the 19th century, when MAC and other academic institutions were being created throughout the Midwest, departments were organized along taxonomic lines, according to a scheme developed in the 16th century by Swedish physician Carl Linnaeus. This made sense in the pre-Darwinian, pre-molecular era.

In 1859 Darwin published *On the Origin of Species*. This began a long slow revolution in biology by integrating the processes that generate structural and functional biodiversity across the entire tree of life. Charles Darwin was "the quintessential integrative biologist" ([M.H. Wake 2003. What is "Integrative Biology"? Comp. Biol. 43 (2): 239 -241.]). His publications included *The Formation of Vegetable Mould through the Action of Worms*, *The Various Contrivances by which Orchids are Fertilised by Insects*, *The Structure and Distribution of Coral Reefs* and *The Expression of Emotions in Man and Animals*. 
The Darwinian revolution in biology didn't take off until the modern molecular era was established in the mid-twentieth-century, by Watson, Crick and other pioneers. As with Darwin a century earlier, these revolutionary biologists integrated the processes that generate structural and functional diversity across the entire tree of life. The concepts, questions and empirical tools employed to address fundamental challenges to improving environmental sustainability and human health and wellbeing no longer divide neatly along taxonomic lines. Human wellbeing is tightly coupled with the global environment and we are now such a dominant forcing function that many ecologist and geologists believe we have entered the Anthropocene epoch. In addition, we share homologous genes and fundamental properties with bacteria, protists, plants, fungi, insects, fish, frogs, turtles, birds and mammals like hyena. There is a continuous range of similarities and differences in the patterns and processes across the whole tree of life and at all levels of organization.

The Present

The word zoology is now widely interpreted as the study of things that live in zoos. Incoming undergrads interested in health-related professions do not imagine that zoology is relevant to modern biology, in general, nor to the biology of humans, in particular. Only after several years at MSU do they realize that Zoology faculty teach a large part of the pre-med/vet/professional curriculum. Appendix I lists what we teach and publish on. A large majority of the faculty in the Zoology Department at MSU do not consider themselves zoologists. This is particularly true of the younger faculty. Appendix II lists the taxonomic group indicated in our most recent publications. Appendix III shows the taxonomic range of our recent publications on a modern phylogenetic tree of life. Faculty participation in interdepartmental programs at MSU are color coded.

MSU Zoology has been struggling with its identity for over a decade. The efforts quickened about 8 years ago when new faculty working on molecular evolution, genomics, development and community ecology expressed frustration with the problems they were having recruiting grad students into a department called Zoology. Discussions over the past five years began to converge on the idea that the name Integrative Biology would better serve our students and faculty, as well as CNS and MSU.

What is Integrative Biology?


Why, then, is "integrative biology" becoming a label of choice for research programs in biology and medicine, universities and institutes, units in funding agencies, and programs in nongovernmental organizations (NGOs)? To some people, it is merely a label meant to replace taxon-based names now deemed "old-fashioned," an unfortunate opinion of the value of taxa. In the more progressive units, though, the label has real meaning because it reflects an ongoing change in research and educational paradigms. Integrative biology—integrative science—bridges disciplines, and it works within and across levels of biological organization and across diverse taxa over time, short (ecological or physiological) and long (evolutionary).

Addressing the challenges of 21st century biology requires integrating approaches and results across different subdisciplines of biology, such as genetics, development, physiology, ecology, and evolution, as well as technologies, information, and approaches from other disciplines, such as engineering, computer science, physics, chemistry, mathematics, and the geological and atmospheric sciences (figure 1).

![Figure 1 (from G.E. Robinson et al.)](image)

**Tools for 21st century biology.** To solve grand challenges, biology is becoming increasingly integrated across levels of organization, over different spatial and temporal scales, and it has become allied with other disciplines. Twenty-first century biology requires new tools that involve new technologies; new applications of existing technologies; new adaptations of tools from established model organisms to new models; new software; new model organisms; and new social structures to promote tool building, tool sharing, research collaboration, and interdisciplinary training.

**Internal Deliberations and Voting**

As part of the self-examination underpinning the APR process, Zoology members engaged in intensive discussion about whether to formally propose a name change. Initial discussions included over 20 alternative names. These were winnowed down to three alternatives: Integrative Biology, Zoology and Integrative Biology; Zoology. 95% of the TS faculty voted to change the name; 82% wanted Integrative Biology. This did not change in a 2-way runoff between Integrative Biology vs Zoology and Integrative Biology.

An informal poll of the grad students found near-unanimous support for Integrative Biology. Many of them are anxious for a quick name change so that they won’t have to have Zoology on their diploma and CV.
According to the Academic Analytics database, there are only 8 Zoology Departments left in the US. As indicated in the reference above, Integrative Biology is becoming a label of choice for research programs in biology and medicine, universities and institutes, units in funding agencies, and programs in nongovernmental organizations (M.H. Wake. BioScience (2008) 58 (4): 349-353), including UC Berkeley and UT Austin. We want to be playing in the same league as UCB and UTA.

Practical-Political Concerns

Within the Zoology Department, the concerns fall largely into two areas. First, a few of the senior faculty lament the shift in focus that has already happened as new faculty pursue new challenges in biology. They have legitimate concerns about honoring our traditions and not alienating our alumni and we take these concerns seriously. Second, faculty and staff who are closely engaged with our large undergraduate constituency (~550 students) want to insure that the department continues to serve those students who are focused on animal biology, including some interested in careers working at zoos. We intend to do that by continuing to offer a BS in Zoology, in addition to creating a new BS in Integrative Biology that will attract and better serve at least some of the pre-med med, pre-vet and pre-professional students currently enrolling in the Human Biology degree program.

Across departments at MSU, there are concerns about "stepping on toes." MSU has an unusually diffuse disciplinary structure. This is especially the case in biology, which is spread across many departments and interdepartmental programs in several colleges. This works surprisingly well because of the collegial bridges that are built across departments. The EEBB and ESPP programs and BEACON project are especially effective bridges. We are very sensitive to the need to maintain high levels of collegiality and collaboration across units. Currently, Zoology faculty have good collaborative relationships with colleagues in Entomology, Physiology, Neuroscience, Fisheries and Wildlife and Animal Science, even though the name Zoology would seem to subsume (step on the toes of) all of these other animal-focused departments. We have all grown accustomed to this structure and it does not seem particularly threatening. The name Integrative Biology would lessen the apparent overlap with the other animal-focused departments, but it would appear to step on the toes of different departments.

We have consulted with the Chairs and Directors of Physiology, MMG, Geology, Fisheries & Wildlife, CMB, KBS, Entomology and Plant Biology. Only Plant Biology expressed concerns about the name Integrative Biology, based on the fact that their own APR emphasizes their integrative approaches to plant biology. We will work with colleagues in Plant Biology to maintain our current good working relationships. PLB at MSU is world renowned and growing stronger. We have no intention to challenge them. One point we emphasize in our own APR is our need to identify and strengthen the collaborative synergies that will be essential to tackling the big challenges in biology over the coming decades. Strengthening our department will strengthen PLB and other departments by providing greater collaborative opportunities. We will not encroach on PLB or its mission and plans for growth. We have our own plans for recruiting new faculty, described in our APR, and very little space to set them up.
The Future
Our faculty lead research on important problems across the entire (vertical) range of hierarchical organization (genes, cells, organ systems, organisms, populations, communities, ecosystems, biogeochemistry, coupled human and natural systems) and the entire (horizontal) span of the tree of life (viruses, bacteria, protists, fungi, plants, and animals, including humans). We are a department of Integrative Biology in practice. We want to be Integrative Biology in name, to better represent what we currently do and to facilitate our reorganization and growth moving forward. This will allow us to better serve our students and faculty, CNS and MSU. Plans for our future are detailed in our recently-submitted Academic Program Review (APR).

How will the change affect signage, logos, websites, etc.?
Many departments have changed their name over the past decade. Processes and procedures are well established. We will consult with others and implement these changes systematically over time. The added work will be less than it might have been because our website, recruiting materials etc. are badly out of date and in need of renovation anyway.
Appendix I

The courses we teach are listed below.

Courses that are focused on animals are in *italics*. 40% of our courses are not focused on animals. If you consider student credit hours (SCH) in the Introductory courses, ecology, evolution and genetics, none of which are animal focused, >80% of the SCHs we teach are not focused on animals.

*Preview of Zoology*
*Intro Bio: Organisms and Populations*
*Honors Introductory Organismal Biology*
*Oceanography*
*Invertebrate Biology*
*Developmental Biology*
*Fundamental Genetics*
*Marine Biology*
*Ecology*
*Biology of Birds*
*Biol Amphibians/Reptiles*
*Neurobiology*
*Histology*
*Ecological Aspects Animal Behavior*
*Stream Ecology*
*Evolution*
*Environ Issues & Pub Policy*
*Tropical Biology*
*Seminar in Zoo & Aquarium Science*
*Topics Ethology & Behav Ecology*
*Statistical Methods in Ecology & Evolution*
*Population & Community Ecology*
*Animal Behavior*
*General Parasitology*
*Compar Anat & Bio Vertebr*
*Biology of Mammals*
*Intro to Zoo & Aquarium Sci*
*Neurobiology*
*Cells and Development*
*Cancer Biology*
*Environmental Physiology*
*Stable Isotope Biogeochemistry*
Appendix II

What do we publish?

The list below gives the taxonomic groups in the most recent publications by the Tenure Stream faculty (from the Web of Science). Publications focused on animals or animal physiology are in italics. $14.5/28 = 52\%$ are focused on animals. Approximately half of our most recent publications are not focused on animals.

Boughman, Janette - stickleback evolutionary ecology
Clemens, Lynwood - mammal neuroendocrinology
Dworkin Ian - fruit fly evolutionary genetics
Dyer, Fred - digital organisms
Eisthen, Heather - axolotl neurobiology
Evans, Sarah - soil microbial communities
Foran, David - chemical methods for DNA recovery
Gallant, Jason - Mormyrid fish physiology and evolutionary genetics
Getty, Thomas - inclusive fitness theory
Hamilton, Steve - dissolved organic nitrogen
Hill, Richard - Animal Physiology (text book)
Holekamp, Kay - hyena ecology, evolution and behavior
Kopachik, Will - Naegleria fowleri (a protist)
Lenski, Richard - digital organisms
Lindell, Catherine - Bird ecology and fruit crops (in Crop Protection)
Litchman, Elena - phytoplankton (protists and bacteria)
Lundrigan, Barbara - mammal ecology and evolution
Miller, Kyle - drosophila neurobiology
Mittelbach, Gary - Community Ecology (text book)
Muzzall, Patrick - fish parasites on the Great Lakes
Ostrom, Margaret - dolphin ecology
Ostrom, Nathaniel - Oxygen consumption in aquatic systems
Rowe, Ashlee - mouse neurobiology and evolution
Schribner, Kim - turtle ecology and demographics
Snider, Richard - Trichobilharzia stagnicola (Schistosomatidae)
Stevenson, R Jan - diatom (protists) ecology
Williams, Barry - eQTL mapping
Zipkin, Elise - structured decision models for management

Phytoplankton and diatoms are protists. Yeasts are fungi. E. coli and cyanobacteria ("bluegreen algae") are bacteria. Digital organisms are clearly not animals. Communities and ecosystems encompass the tree of life.
Appendix III

What taxonomic groups are in our most recent publications and what interdepartmental programs do we participate in?

Zoology Faculty: Taxonomy of Most Recent Pubs and Program Participation

The Program Participation color codes indicate the intellectual foci of the faculty. Many of the faculty whose most recent publication included an animal do not consider themselves “animal biologists.” All but one voted to change the department name.

How did we get here?
The Department of Zoology has not posted a faculty position in Zoology in living memory. We hire the most promising young scientists in areas that address MSU and national needs, including quantitative ecology, the evolution and genetics of development, including neural development, the evolutionary ecology of communities in changing environments, etc.

Our website describes us accurately:
... We are unified by an emphasis on integration across levels of biological organization, and by our recognition of the explanatory power of evolutionary theory in understanding biological complexity. This integrative perspective helps unify researchers in modern biological subdisciplines, including cellular and developmental biology, neurobiology, animal behavior, ecology, evolution, and environmental science.
Appendix IV

The Parable of Gary Mittelbach

When MSU hired Gary Mittelbach in the mid-1980s he was a rising start in the field of animal ecology. His 1983 paper on fish community ecology became a standard textbook example and has been cited over 1200 times.

Gary Mittelbach
Michigan State University, Kellogg Biological Station
community ecology
Verified email at kbs.msu.edu
Homepage

As the field of community ecology matured, Mittlebach stayed at the forefront by disregarding the taxonomic constraint of animal ecology and pursuing the most pressing problems in community ecology. His more recent papers on global patterns in the biodiversity of animals, plants and other living things have received thousands of citations. His 2012 textbook Community Ecology "is great if you’re looking for an up-to-date overview of the latest developments in the field" (http://www.goodreads.com/book/show/15999021-community-ecology)

It would not make sense to tell Gary Mittelbach that he is stepping out of bounds and needs to go back to doing what he was doing in the 1980s. The same can be said for the Department of Zoology.
Appendix V

The Parable of Elena Litchman

In the early 1980s, MSU lost Zoology Professor Robert Wetzel, a world leader in the field of limnology, the study of lake and river ecosystems. George Lauff, on the left in the photo, led the search for a replacement. We hired Alan Tessier, 2nd from the left, who went on to become a leader in the evolutionary ecology of daphnia, also known as “water fleas.” Tessier’s graduate student Megan Duffy (far right) led his lab’s research into the field of disease ecology, focused on fungal and other pathogens as much as on the daphnia. Duffy is now on the faculty at the University of Michigan. When Tessier left MSU for NSF, we searched for a new faculty member in the area of aquatic ecology. The most promising young scientist in the applicant pool was Elena Litchman (in the center of the photo). Litchman’s research focused on “phytoplankton,” which are neither animals nor plants, but mostly bacteria and protists. We did not shy away from hiring her because she wasn’t focused on animals. Elena has been a spectacularly successful colleague. In 2010 she received a very prestigious Presidential Early Career Award for Scientists and Engineers (PECASE).

It would not have made sense for us to have hired the 2nd best aquatic ecologist because they worked on daphnia. It would not make sense to ask the Department of Zoology to keep searching for faculty who are doing what Robert Wetzel was doing in the 1970s.

A footnote: The photo above was taken in 2013 at the celebration of 50 years of aquatic ecology at the Kellogg Biological Station. To the left of Elena Litchman (her right) is Lars Hedin, who was on the faculty of MSU Zoology 1990-94. His research on the ecosystem ecology and water biogeochemistry in forests and streams was extremely influential. He moved to the Department of Ecology and Evolutionary Biology at Cornell and is now a professor at Princeton. To the right of Litchman (her left) is Zoology Professor Steve Hamilton, who replaced Hedin. Hamilton’s research on ecosystem ecology and biogeochemistry is fundamental to MSU’s LTER and GLBRC projects and he is a leader of both of those projects. All of these people have been very successful and continue to be very influential because they pursued the big challenges of their day without regard to taxonomic turf boundaries.