Draft Memo

Date: July 11, 2011
To: Jim Cogdell
   Co-Chair, Council on Academic Affairs
From: Jay Hobgood
   Chair, ad hoc Committee on Aviation
Subject: College of Engineering proposal to abolish the Department of Aviation and delegate
        the authority for the academic programs to a Center for Aviation Studies

Summary of the Process

The College of Engineering submitted a proposal to the Council on Academic Affairs in March
2010 to abolish the Department of Aviation, to create Center for Aviation Studies (CAS) and to
delegate the responsibility for the Department of Aviation’s academic programs to CAS. The
proposal was produced in accordance with Faculty Rule 3335-3-37 on the “Alteration or
Abolition of Units”. The proposal was reviewed by the College of Engineering Committee on
Academic Affairs (CCAA) and it was approved by CCAA with the contingency that a
satisfactory tenure home be found for Dr. Seth Young. This contingency was met when Dr,
Young and the Department of Civil and Environmental Engineering and Geodetic Sciences
signed a Memorandum of Understanding in April 2011. The College of Engineering created the
CAS in June of 2011 as a college center.

A planning committee consisting of Jim Cogdell (co-Chair), Jay Hobgood (co-Chair) and Randy
Smith (Vice Chair) reads proposals submitted to CAA and assigns them to subcommittees based
on their content, complexity and the existing workloads. The planning committee decided to
create an ad hoc committee to review the proposal based on the heavy workload of the CAA
subcommittees related to the conversion to semesters. The ad hoc committee met with
representatives of the College of Engineering and Dr. Young. It also examined a relatively
recent proposal from the legacy College of Biological Sciences that created the Center of Life
Sciences Education and delegated the authority for the Biology major to the center. A revised
proposal was received by the ad hoc committee in May of 2011. The Chair of the ad hoc
committee presented its preliminary findings to the Steering Committee of the University Senate
in late spring of 2011. The Chair of the ad hoc committee drafted an initial version of this report
and circulated it to the members of that committee. The comments of the members were
incorporated into this report and the ad hoc committee voted unanimously (6 yes, 0 no) to
endorse the report.

The ad hoc committee

Members of the ad hoc committee were chosen with the goals of strong representation from
CAA, incorporation of additional expertise in curricular and procedural aspects of engineering
and strong student participation. The members of the ad hoc committee were:

Jay Hobgood (Geography and co-Chair CAA)
Barb Polivka (Nursing and CAA)
Jim Rathman (Chemical and Biomolecular Engineering)
Bob Gustafson (Food, Agricultural and Biological Engineering)
Sara Lang (Education and Human Ecology, CAA and Council of Graduate Students)
Jennifer Flis (Undergraduate Student Government)

The proposed membership and the draft charge to the ad hoc committee were presented to the Steering Committee of the University Senate in autumn of 2010, which endorsed both. The charges to the ad hoc committee were:

1) to evaluate the proposal from the College of Engineering to reconfigure the Department of Aviation in the Center for Aviation Studies (CAS): A College Center within The Ohio State University College of Engineering;
2) to present its recommendation regarding the proposal to the Council on Academic Affairs (CAA).

Review of the Proposal

A copy of the original proposal was circulated to the members of the ad hoc committee after it was constituted. The ad hoc committee met to discuss the proposal for the first time on December 6, 2010. The committee identified two key elements to the proposal. The first important item, which was outstanding at the time, was the satisfactory transfer of the tenure line for Dr. Young to another Tenure Initiating Unit (TIU) prior to the abolition of the Department of Aviation. Dr. Nawal Taneja’s tenure line, who was the only other tenure line faculty member left in Aviation, had already been transferred to the Department of Mechanical and Aerospace Engineering. All other instructional, advising and support staff were to be transferred to the CAS upon its creation.

The second key aspect of the proposal was the plan for the College of Engineering to create the CAS and to delegate the responsibility for the B.S. in Aviation and the Aviation minor to the college center. Since the CAS was to be a college center, CAA did not have to approve its creation. However, CAA does have to approve any proposal by a college to delegate the authority for academic degree programs to a center. Thus, the members of the committee had a number of questions about the proposed delegation of such an authority to CAS. These questions focused on the appropriateness of the transfer of the academic programs to CAS, College of Engineering’s commitment to the resources for CAS to maintain the academic degree programs, the oversight of the academic programs once they were to be transferred to CAS, and a concern that only a single tenure line faculty member would be directly involved in the instruction within CAS.

Members of the ad hoc committee met with Dr. David Tomasko who is the Associate Dean for Undergraduate Education and Services in the College of Engineering on March 15, 2011. Most of the discussion at that meeting focused on the nature of the B.S. in Aviation and the Aviation minor and the college’s commitment of resources to CAS to maintain the academic degree programs. (Note: CAA approved the semester conversion proposals for the B.S. in Aviation and the Aviation minor at its meeting on April 20, 2011.) The committee was told that Aviation will have space in the renovated Baker Systems Engineering building in addition to its existing facilities at the Ohio State University Airport at Don Scott Field. It was also informed that the
College of Engineering had amended its rules to allow centers such as CAS to have a representative on the college’s curriculum committee. Associate Dean Tomasko reiterated the college’s commitment to the academic programs and that all advising and support staff would be transferred to CAS.

Members of the ad hoc committee met with Stu Zweben who is the Associate Dean for Administration and Planning in the College of Engineering on April 27, 2011. The initial discussion centered on the process that resulted in the transfer of the tenure line of Dr. Taneja to the Department of Mechanical Engineering and the tenure line of Dr. Young to the Department of Civil and Environmental Engineering and Geodetic Sciences. Although the transfer of Dr. Young’s tenure line took longer than originally anticipated, the additional time produced a satisfactory outcome for all of those involved. The committee also learned that Dr. Taneja had subsequently retired after his tenure line was transferred to Mechanical Engineering. The second portion of the meeting reconfirmed Associate Dean Tomasko’s previous statements about the college’s commitment of resources to CAS for the support of the academic degree programs. Several members of the committee asked more specific questions about the oversight of those academic programs once they were to be transferred to CAS.

The members of the ad hoc committee met with Dr. Young on May 11, 2011. Dr. Young confirmed that he was quite satisfied with the movement of his tenure line to the Department of Civil and Environmental Engineering and Geodetic Sciences. He also talked about the current status of the B.S. in Aviation and the Aviation minor and his goals for the future of those academic programs. He provided the committee with a list of names of tenure line faculty for a Faculty Oversight Committee for the CAS that includes individuals from several colleges outside of the College of Engineering. He also provided a list of names of tenure line faculty who were willing to serve on an Academic Program Committee to oversee the academic programs once they were transferred to CAS. Dr. Young was quite enthusiastic about the potential benefits of transferring the academic programs to CAS. The ad hoc committee asked Dr. Young to submit a revised proposal that incorporated a number of the discussion items. He submitted the revised proposal which the chair circulated to the other members for their comments.

Summary of the Key Issues

The College of Engineering’s proposal to abolish the Department of Aviation is predicated on the delegation of the authority for the B.S. in Aviation and the minor in Aviation to the newly created Center for Aviation Studies. The College of Engineering created the CAS in June of 2011 as a college center. Rule 3335-3-36 (B) (2) which discusses the establishment of college centers states “No review/action by CAA is required. The dean(s) will inform OAA of the establishment of such a center. OAA will inform CAA, resulting in the official institutional notification.” Rule 3335-3-36 (A) defines academic centers and states “An academic center is a non-degree granting educational unit of the university engaged in research; instruction; or clinical, outreach or related service.” The rule defines a center as a non-degree granting educational unit, but it also permits centers to be engaged in instruction. However, Rule 3335-3-36 (B) (3) which discusses the curricula and faculty associated with centers also states in its second sentence that “With the approval of the council on academic affairs, the faculty of a school or college may delegate to an academic center the authority to offer courses or degree
programs established under the auspices of that school or college.” This section of the rule seems to permit the College of Engineering to delegate the authority for the B.S. in Aviation and the minor in Aviation to CAS subject to the approval of CAA.

The most recent instance where CAA was asked to permit a college to delegate the authority for a degree program to a center appears to have occurred in 2008. At that time the legacy College of Biological Sciences submitted a proposal to CAA to change the requirements for the Biology major and to delegate the authority for that major to the Center for Life Sciences Education. The proposal specifically stated that “The Biology major will be housed in this new unit.” CAA discussed this proposal at a meeting on February 6, 2008 and approved the proposal at that meeting. The minutes from that meeting contain no mention any discussion of the principle of delegating the authority for the major to the center or of any concerns about setting a precedent for the delegation of other academic programs to centers. Thus, it appears that the College of Engineering’s request to delegate the B.S. in Aviation and the Aviation minor to CAS is permissible under the rules and is consistent with the precedent set in CAA’s review of the Biology major.

If CAA permits the College of Engineering to delegate the authority for the B.S. in Aviation and the Aviation minor to CAS, then the proposal to abolish the Department of Aviation will conform to Rule 3335-3-37. The tenure lines for all affected faculty have been transferred to satisfactory new units. All instructional, advising and support staff will be transferred to CAS. The interests of students will be protected because they will be able to complete their degree programs without interruption. In truth the resolution of the home for their degree programs may actually provide a greater level of confidence in the continued availability of the courses and other resources needed by the students.

The members of the ad hoc committee remain concerned about the limited number of tenure line faculty involved in the instructional components of the CAS. These concerns were expressed to Dr. Young and the representatives of the College of Engineering. It was agreed during the discussions that subject to the approval of CAA, representatives of CAS and the college will report to CAA in three years on the status of the academic programs.

Specific Recommendations to CAA

The ad hoc committee makes the following specific recommendations to CAA for its consideration and action:

1. That CAA approve the College of Engineering’s request to delegate the authority for the B.S. in Aviation and the Aviation minor to the Center for Aviation Studies;

2. That CAA approve the College of Engineering’s request to abolish the Department of Aviation; and

3. That CAA request the Center for Aviation Studies and the College of Engineering to report on the status of the B.S. in Aviation and the Aviation minor in three years.
PROPOSAL

Reconfiguration of the Department of Aviation (AVN) into the Center for Aviation Studies (CAS): A College Center within The Ohio State University College of Engineering

Department of Aviation
College of Engineering
The Ohio State University

MARCH 2010 (rev. May 2011)
The following is a proposal describing a plan to reconfigure the Department of Aviation, which manages undergraduate degree programs focusing on aviation management and aircraft systems, into a proposed Center for Aviation Studies.

This proposal is delivered in three volumes:

- Volume 1 describes the alteration of the Department of Aviation (AVN) in accordance with the requirements set forth in Faculty handbook Section 3335-3-37- “Alteration or Abolition of Units”.

- Volume 2 describes the creation of The Center for Aviation Studies (CAS), to which the current aviation undergraduate program will be transferred.

- Volume 3 responds to questions and comments from previous reviews from the College of Engineering Committee on Academic Affairs (CCAA).

This proposal has been prepared by the faculty of the Department of Aviation and reviewed by the College of Engineering Administration, and is presented for further approval by the CCAA.

Any questions regarding the information within this proposal may be directed to Dr. Nawal Taneja, Aviation Department Chairman, or Dr. Seth Young, Associate Professor, Department of Aviation.
Volume 1

Proposal

Reconfiguration of the Department of Aviation into the Center for Aviation Studies: A College Center within The Ohio State University College of Engineering.

March 2010

Revised May 2011
I. Introduction

This document proposes the elimination of the Department of Aviation (AVN), and the reassignment of the Aviation academic programs and resources into the Center for Aviation Studies (CAS). The creation of the Center for Aviation Studies is outlined in the “Proposal: Creation of a Center for Aviation Studies, College of Engineering, The Ohio State University, March 2010,” provided under separate cover.

This proposal describes the alteration of the Department of Aviation (AVN), in accordance with the requirements set forth in Faculty handbook Section 3335-3-37 “Alteration or Abolition of Units”.

It is expected that this reconfiguration will serve the immediate requirements of the College of Engineering mission of consolidation of departments while providing an infrastructure to strengthen The Ohio State University as an international leader in Aviation education and research.

This proposal addresses this process and associated analytical requirements. It is understood that this proposal will be evaluated by a number of University entities including the College Council on Academic Affairs (CCAA), the university senate, the university administration, and the Board of Trustees.

It is hoped that this proposal is found by all of these entities as beneficial for the College of Engineering, including their faculty, staff, and students, as well as to the wider university community.

II. Reconfiguration of the AVN Department

Faculty Handbook Section 3335-3-37 defines the abolition of a unit as the “complete elimination of a unit and the academic programs it provided”. Based on this definition, this proposal does NOT propose abolition, as the CAS is proposed to maintain the operation of the university’s aviation program. Rather, this proposal describes the reconfiguration of AVN into CAS, as Section 3335-3-37 defines “reconfiguration” as the breaking apart of existing units and their academic programs and recombining the faculty and programs into new units.

In this case, AVN will be reconfigured by placing current AVN tenured faculty into other existing units within the College of Engineering and placing full and part time lecturers and staff, academic programs, and associated facilities, in the CAS. It is proposed that tenured faculty, lecturers, and staff will continue their aviation related professional activities within the CAS.

It is to be understood, that the College is in the process of establishing the CAS, and that establishment of the CAS will precede the approval of this proposal by the OSU Board of Trustees. Upon approval of this proposal by the OSU Board of Trustees, the College of Engineering will effect a transfer of resources and programs currently operated by AVN, into the CAS. Upon this transfer, the AVN department will be eliminated. This transfer of degree programs from the AVN department to the CAS will be in full compliance with all university rules and regulations.

Reconfigurations of units may be proposed by any number of university entities, including the Dean of the College within which the units are located, the executive Vice President and Provost, the Council on Academic Affairs (CAA), or any faculty from the affected units. In this case, the
reconfiguration of AVN was recommended by the Dean of the College of Engineering based on recommendations from the Performance Plan Acceleration Taskforce (PPAT) Committee (reviewing the performance of College of Engineering Departments) and following discussions with evaluation subcommittees and the faculty of AVN itself. Through this process, the Dean recommended that a proposal be developed for the reconfiguration of AVN into a separate center. This proposal is formally initiated and submitted by AVN, with support from their respective faculty and constituents.

Proposed alterations of units must include an analysis with a number of elements. This analysis is provided below:

A. Rationale for Alteration, including history of the formation, activities, and evaluation of the performance of the unit.

History

This proposal comes at a time when the College of Engineering (COE), as well as the University in general, is seeking opportunities to consolidate academic units, for, among other reasons, to establish units that have a critical mass of faculty and other resources to efficiently pursue the goals of higher education through research, teaching, and public outreach.

Interestingly, this strategy is not a new one. For example, reorganization of departments within the COE occurred as recently as 1994. The purpose of the reorganization was to streamline the administration of the College, which, at the time had 14 separate departments, including the School of Architecture. Smaller departments, such as Aeronautical and Astronautical Engineering (AER), Aviation, Welding Engineering, and Engineering Mechanics were consolidated, reducing the number of departments in the College to eight. One of these consolidated departments was Aerospace Engineering, Applied Mechanics, and Aviation (AAA). The three units became known as sections and attempted to form a coherent faculty. However, due to several reasons, notably the widely varied philosophies of each section’s existing faculty, the consolidation was unharmonious. By 1998, the Applied Mechanics section left the AAA department and became consolidated into the Mechanical Engineering (MEC) Department. In 2003, the Aviation Section petitioned to leave the AAA department. In 2005, Aviation (AVN) became an independent department within the College.

As an independent department within the College, AVN has continued to carry on its education and service missions. Specifically, AVN:

- Assumes the responsibilities of providing academic instruction and offering undergraduate majors in the technical, business, and policy topics associated with aviation for three university colleges: The College of Social and Behavioral Sciences (Aviation Major), The Fisher College of Business: (BSBA with specialization in Aviation), and The College of Engineering: (BS in Aviation) each with specializations in Aircraft Systems and Aviation Management, as well as a minor in Aviation, available to undergraduate students University-wide.

- Operates and manages the University’s flight education programs: “Aviation Flight Lab”, an integral component of the undergraduate major curriculum in Aviation, specialization in Aircraft Systems, and “Flight Training Clinic”, a flight education program designed for non-degree seeking students. Both flight education programs are fully certified by the Federal Aviation Administration under Federal Aviation Regulations Part 61 and 141.
• Operates and manages The Ohio State University Airport, an active general aviation reliever airport, and a comprehensive aviation teaching and research field laboratory used by undergraduate and graduate students throughout the University for aviation-related and other applicable research.

In addition to fulfilling its current mission, AVN has looked to transform its identity towards a more technical and analytical mission, geared towards graduate level research and study in issues of concern to air transportation. The department has sought out new faculty in this area, has begun to engage in internationally recognized, funded research, and has increased its presence in the greater academic community through publications, presentations, and the hosting and sponsoring of internationally attended conferences and symposia. AVN has also begun to revise its undergraduate curriculum and develop graduate-level courses with emphasis on Air Transport Operations, a program that is to serve the need for highly educated professionals in the air transportation industry.

While the mission and academic programs within AVN continue to be enriched, the department has seen a recent reduction in full time faculty. Since 2005, four of the department’s full time faculty have retired or left prior to the tenure process. As of March 2010, the AVN academic staff consisted of two full-time tenured faculty, two full-time non-tenure track lecturers, and one adjunct faculty, in addition to its flight education staff of approximately 20 full and part-time flight instructors. This level of staffing is sufficient to meet the department’s teaching needs but unfortunately, would not provide adequate staffing to achieve its goals of growth in undergraduate education, graduate degree programs and research.

Given the economic climate faced by the university, it had been made clear that only a limited number of additional faculty may be hired into AVN, as long as it continues to maintain its status quo as an academic program. From the College perspective, it may be considered cost prohibitive to open up additional faculty lines for a small, undergraduate only program. Such a program is also very difficult to recruit graduate-level faculty. This became evident in 2007 when two potential faculty candidates declined to join the department upon being offered junior faculty positions. It was clear from both perspectives that growing the size of AVN to the level where it can justify its status as an independent department would be prohibitively difficult, at least for the foreseeable future.

In 2007, AVN entered into discussions with the Dean of COE regarding the future of the department. During these discussions, the Dean suggested that AVN should consider an option to consolidate with another department within the College. In December 2008, after a series of discussions with various departments within the COE, as well as with students, alumni, and industry constituents, a formal proposal to re-merge AVN and AER was developed.

In February 2009, shortly after this proposal was submitted, it was revealed by a task force appointed by the Dean of the COE that the viability of AER itself as a stand-alone department was in question. Subsequently, it was recommended by the Dean’s task force that AER be merged with the department of Mechanical Engineering (MEC). Under such a recommendation the consolidation of AVN into an “MEC/AER” department seemed far less feasible. Furthermore, subsequent discussions found that consolidating AVN into another department would similarly be less viable. Ultimately, the Dean’s Task Force recommended that AVN cease to be an independent department, or “Tenure Initiating Unit (TIU), and either be absorbed into an existing “center” or be reorganized into an independent center.
In April 2009, after a review by a Dean’s appointed subcommittee, and discussions with the department faculty, the idea of reorganizing AVN into a separate center, to be known as The Ohio State University Center for Aviation Studies (CAS) was accepted and this proposal was drafted. The CAS is proposed to be a “College Center” operating within the College of Engineering.

Justification

Reorganizing AVN into the CAS, operating within the COE with support from the airport provides a number of potential benefits for students and faculty throughout the COE, as well as for members of the wider University community, Columbus and Central Ohio.

The primary motivation for reorganizing AVN into CAS is to provide opportunities for growth in the degree program and growth in Aviation-related graduate research and education, while maintaining a realistic operating cost. Reorganizing AVN into CAS will result in at best modest cost savings; this will mainly be in the form of slightly reduced staff to carry out the business operations. On the other hand, by reorganizing into CAS, the current AVN faculty members, as well as faculty from other units, are able to collaborate on aviation-related research and graduate student training. Aviation currently does not have a graduate program, and in order to offer a graduate program in Aviation would require hiring at least 8 tenure-track faculty members; the resources for such faculty hiring are not available in the College now nor will they be in the foreseeable future. On the other hand, graduate students from allied departments that currently do have graduate degree programs (such as Civil and Environmental Engineering; Integrated Systems Engineering; City and Regional Planning) can pursue aviation-related research through the CAS. In addition, the CAS provides the opportunity for research collaborations involving existing faculty from other allied units, effectively creating a critical mass of researchers in aviation without the need to hire several additional faculty. We see this approach as the best alternative to maintain and grow an undergraduate degree program in aviation and to develop and grow research and graduate education in aviation.

Evaluation of Performance

Despite its reduced faculty, AVN has performed very well in enrollments, graduation rates, and external research opportunities. As of winter quarter 2010, AVN has 200 enrolled undergraduates, including nearly 100 students actively engaged in flight education, through the Colleges of Engineering, Business, and Social and Behavioral Sciences. In addition, AVN supports a growing Minor in Aviation, available to all undergraduates at The Ohio State University.

AVN has also recently increased its research and external revenue productivity, having received more than $250,000 in external revenue in academic year 2008-2009 alone. Research articles are being accepted in highly-regarded aviation management and engineering journals, and faculty are presenting work to international audiences.

AVN is clearly in a revitalization and growth mode, and CAS is proposed to allow this productivity to further prosper.

B. Enumeration of Faculty and Assessment of Proposed Reassignments

Figure 1.1 illustrates the current organizational structure of AVN within the College of Engineering.
Currently, AVN is staffed with the following roster:

**Faculty & Staff**

<table>
<thead>
<tr>
<th>Name</th>
<th>Rank/Title</th>
<th>FTE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Taneja, Nawal</td>
<td>Professor, Dept. Chair</td>
<td>1.0 (retired October 2010)</td>
</tr>
<tr>
<td>Young, Seth</td>
<td>Associate Professor</td>
<td>1.0</td>
</tr>
<tr>
<td>Oppermann, James</td>
<td>Lecturer, Full Time</td>
<td>1.0</td>
</tr>
<tr>
<td>Litvay, Robyn</td>
<td>Lecturer, Full Time</td>
<td>1.0 (left dept. March 2011)</td>
</tr>
<tr>
<td>Pruchnicki, Shawn</td>
<td>Lecturer, Part Time</td>
<td>0.2</td>
</tr>
<tr>
<td>Mulchaey, Mark</td>
<td>Lecturer, Part Time</td>
<td>0.2</td>
</tr>
<tr>
<td>Gregorek, Gerald</td>
<td>Lecturer, Part Time</td>
<td>0.2</td>
</tr>
<tr>
<td>Henderson, Kenneth</td>
<td>Office Associate</td>
<td>1.0</td>
</tr>
<tr>
<td>Patterson, Charles</td>
<td>Academic Advisor</td>
<td>1.0 (Cecilia Lammers, eff. 2011)</td>
</tr>
<tr>
<td>Scarlett, David</td>
<td>Admin Associate</td>
<td>0.75 (left dept. July 2010)</td>
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</table>

Department faculty, instructional, and administrative staff are currently funded under the AVN Cost Center (Organization #14070).

**Flight Education Staff**

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<tr>
<th>Name</th>
<th>Rank/Title</th>
<th>FTE</th>
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<tbody>
<tr>
<td>Hammon, Doug</td>
<td>Airport Director</td>
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</tr>
<tr>
<td>Overly, Cynthia</td>
<td>Recruiter</td>
<td>1.0</td>
</tr>
<tr>
<td>Roby, Candi</td>
<td>Chief Flight Instructor</td>
<td>1.0</td>
</tr>
<tr>
<td>Mann, Brandon</td>
<td>Asst. Chief Flight Instructor, APL</td>
<td>1.0</td>
</tr>
<tr>
<td>Farley, Michael</td>
<td>Asst. Chief Flight Instructor, FTC</td>
<td>1.0</td>
</tr>
<tr>
<td>Webb, Ashley</td>
<td>Flight Instructor</td>
<td>0.75</td>
</tr>
<tr>
<td>Bates, Joshua</td>
<td>Flight Instructor</td>
<td>0.50</td>
</tr>
<tr>
<td>Early, Bradley</td>
<td>Flight Instructor</td>
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</tr>
</tbody>
</table>

**Part-Time Flight Instructors** (All possess FAA Flight Instructor Certification)

<table>
<thead>
<tr>
<th>Name</th>
<th>Rank/Title</th>
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<tbody>
<tr>
<td>Rosekelly, John</td>
<td>Strzempkowski, Brian</td>
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<td>Roberge, Patrick</td>
<td>Rust, Derek</td>
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<tr>
<td>Petrasek, Adam</td>
<td>Peplow, Hunter</td>
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<tr>
<td>Garner, Joseph</td>
<td>Birth, Nathanial</td>
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<tr>
<td>Skakun, Kristin</td>
<td>Buzogany, Thomas</td>
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<td>Ward, Richard</td>
<td>Watts, Greg</td>
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<tr>
<td>Maienza, Steven</td>
<td>Hardick, Edward</td>
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<td>Wiens, Michael</td>
<td>Heron, Timothy</td>
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<td>Stouffer, Luke</td>
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Figure 1.1: Current organizational structure of AVN within the College of Engineering

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Flight education staff operates under The Ohio State University Airport budget (organization #14080) and report to Doug Hammon, Airport Director, who in turn reports to the AVN Department Chair. Flight education staff is funded in-part by revenues generated by the airport, as well as from flight laboratory fees. Part time flight education staff is compensated on an hourly basis at an approximate level of 0.25 FTE.

In addition to the above roster, the OSU airport employs a staff of approximately 60 administrative, operations, maintenance, and customer service positions, all of which function under the airport’s operating budget, and are funded by airport generated revenues.

The effects of a reorganization of AVN into the CAS are as follows:

The CAS will oversee the AVN program in the organizational chart illustrated in Figure 1.2:

Figure 1.2: Proposed Airport / CAS organizational Structure

Under this scenario:

- The Airport serves as the home-base, integrating the educational, research, and outreach functions of the center with existing airport operations and facilities, while utilizing the Airport’s existing administrative activities to cover various needs of the Center.

- The CAS is expected to operate effectively with four full-time faculty members and lecturers, one student services staff member (i.e. Recruiter/Advisor), and one administrative assistant. This is the current level of instructional staff in the AVN department.

- A faculty member oversees all academic functions of the Center, including course curricula, flight education, faculty and staff, student advising, research, and outreach.
programs, and coordination with the Colleges of Engineering, Social and Behavioral Sciences, and the Fisher College of Business on the Center’s academic and research missions.

- The AVN Department Chair position would be eliminated and Dr. Nawal Taneja would assume the position of Full Professor within another department (TIU) within COE (proposed: the merged Mechanical / Aerospace Engineering). (Dr. Taneja retired in October 2010)

- Dr. Seth Young, Associate Professor in AVN, would assume the position of Associate Professor, with tenure, within another department (TIU) within the COE (proposed: Civil and Environmental Engineering and Geodetic Science).

- The full-time academic staff (Oppermann and Litvay) would become full-time faculty of CAS and may have the opportunity to become Clinical-track faculty as set forth in Faculty Handbook Section 3335-7, Guidelines for Regular Clinical Track Faculty. (Litvay left the university in March 2011, a replacement for her position is in process)

- The full- and part-time flight education staff will continue to fulfill their mission of providing flight education to for-credit and not-for-credit enrollees. The senior instructional staff (chief and assistant chief flight instructors) may have the opportunity to become full-time faculty of the CAS, possibly as a Clinical-track faculty member as set forth in Faculty Handbook Section 3335-7, Guidelines for Regular Clinical Track Faculty.

- Much of the AVN Department’s administrative and student services duties will be incorporated into the administrative and academic support functions of the Airport and the College of Engineering.

- Funding for these positions will be supported based on enrollments in courses offered by the CAS (i.e. the current AVN undergraduate program courses, as well as continuing education and not-for-credit short courses and certificate programs). The budget for the CAS is discussed in more detail in Section E of this proposal.

C. Analysis of Academic Courses

Undergraduate Programs

Currently, there are three degree options for undergraduate students in AVN. They are:

- **The B.S. in Aviation through the College of Engineering**, designed for students interested in a program containing a strong engineering science and analysis component. Approximately 15% of aviation majors are enrolled in this program.

- **The B.A./B.S. in Aviation through the College of Social and Behavioral Sciences**: for those students who prefer a liberal arts background, with an aviation core content. Approximately 75% of aviation majors are enrolled in this program.
• A Special Major in Aviation Management offered through the Fisher College of Business: for those students who desire a background in business. Approximately, 10% of aviation majors are enrolled in this program.

As of Autumn 2009, 200 students were enrolled in these AVN major programs. Within these programs AVN offers two areas of concentration. They are:

Aircraft Systems: A concentration in flight education that allows students to earn FAA pilot ratings through commercial pilot, with the option of attaining a certified flight instructor certificate. In Autumn 2009, 100 students were enrolled in this area of concentration.

Aviation Management: A concentration that prepares students to work in management and engineering functions within the aviation system, including airlines, aircraft manufacturers, airport, corporate aviation departments, and various levels of local, state, and federal government. In Autumn 2009, 100 students were enrolled in this area of concentration.

AVN currently offers a variety of core and elective courses to support these concentrations. Those courses are:

Aviation Core Courses

AVN 300 – The National Aviation System
AVN 310 – Private Pilot Fundamentals
AVN 530 – Aviation Regulations
AVN 540 – Aviation Human Factors
AVN 550 – Aviation Management
AVN 560 – Aviation Safety
AVN 650 – Air Transportation Analysis I

Aircraft Systems Concentration Courses

AVN 341 – Private Pilot Flight Lab I
AVN 342 – Private Pilot Flight Lab II
AVN 410 – Aviation Weather
AVN 413 – Commercial Pilot Fundamentals
AVN 415 – Instrument Pilot Fundamentals
AVN 417 – Advanced Multiengine Operations
AVN 421 – Flight Instruction Methodology
AVN 422 – Instrument Instruction Methodology
AVN 441 – Commercial Pilot Flight Lab I
AVN 442 – Commercial Pilot Flight Lab II
AVN 443 – Commercial Pilot Flight Lab III
AVN 444 – Commercial Pilot Flight Lab IV
AVN 445 – Commercial Pilot Flight Lab V
AVN 446 – Commercial Pilot Flight Lab VI
AVN 447 – Commercial Pilot MEL Lab V
AVN 461 – Flight Instructor ASEL Lab
AVN 462 – Flight Instructor Instrument Airplane Lab
AVN 463 – Flight Instructor AMEL Flight Lab

Aviation Mgmt Concentration Courses

AVN 552 – Airport Management
AVN 591 – Airline Network Analysis
AVN 652 – The International Aviation System
AVN 654 – Airline Marketing
AVN 674 – Airport Planning, & Design
AVN 493 – Individual Studies in Aviation

Minor

Vol. 1. Proposal: Reconfiguration of the Department of Aviation into the Center for Aviation Studies
- rev. 5/2011
AVN also offers a minor in aviation to students throughout the University that wish to apply their course of study within the Aviation industry. Although concrete numbers are not available, this portion of the program is growing rapidly. Students currently pursuing minors in Aviation are enrolled in such disciplines as Archeology and Aero Engineering.

Reorganized under CAS, these courses will continue to be offered, and identified with the AVN designator. The College of Engineering would be the academic “home” for these courses. The Director – CAS will have the authority of proposing changes to individual courses and to the curricula as a whole, with the review and approval by the appropriate academic committees and the Dean of the College of Engineering.

AVN is currently in the process of revising its curriculum, in part to accommodate the pending change in the university academic calendar to semesters. The CAS would continue this effort. In addition, the CAS will seek to expand undergraduate major opportunities for students at OSU. The offering of additional courses would continue to grow as student demand warrants.

As part of this proposal, the administration of the degree programs is delegated to the CAS.

This process has been discussed with the College of Social and Behavioral Sciences (SBS) and the Fisher College of Business. To date, SBS and Business have given support for this administrative change.

Graduate Programs

AVN does not currently offer any graduate level courses. However, the CAS envisions developing graduate programs through an evolving strategy of graduate research growth. CAS faculty will pursue research and graduate education, leading to graduate degrees in departments with existing graduate programs, by entering into partnerships with existing units within and outside the College of Engineering. A proposed masters program will focus on interdisciplinary research and building relationships with industry.

Professional Development

As the aviation industry faces new security and environmental concerns, changing revenue models, and a need for more efficient training practices, on-going discussions are taking place with various trade organizations and companies to bring professional courses to campus. AVN is already in discussions with the American Association of Airport Executives, the airport industry’s primary trade organization, regarding airport specific topics.

Academic Partnerships

As stated previously, the CAS would break down existing perceived barriers between AVN and other academic departments in the COE, the wider University, and other educational institutions. This would then facilitate partnerships that strengthen AVN education and research within the State of Ohio. Specific partnerships already under discussion include those between AVN and Civil Engineering, and AVN and City & Regional Planning. Potential future partners include the John Glenn School of Public Affairs and the Columbus State University Aviation Technology program to name a few.

D. Analysis of Students Affected by the proposal, including majors, non-majors, professional and graduate students, and Specific proposals regarding support for currently enrolled students
Discussions regarding administrative changes to AVN over the past two years have been met with a significant amount of tension and concern from constituent groups, including active students, alumni, and former faculty. While the bulk of the tension had been found to be primarily the result of a lack of communication between university decision makers and these groups, leaving these groups to feel out-of-the-loop in deciding the future of a program to which they have deep passions and loyalties, there were some legitimate issues of concern.

To alleviate these concerns, it has and will continue to be communicated to students and alumni that:

- All AVN courses and curricula will continue to be offered in their current program format
- All AVN courses will be taught by existing faculty and staff, as well as additional faculty and staff to be hired by CAS as needed.
- Faculty and staff office space will be concentrated at the airport, and sufficient transportation (Campus-Airport Shuttle) and communication infrastructure (Wireless access at the Airport) will be in place to facilitate access to all students, faculty, and staff of the University.
- Course classroom assignments will remain under the current classroom assignment policies
- Student admission policies will remain consistent with existing requirements for students in their respective colleges. Acceptance into an AVN major will be conducted in coordination with university colleges.
- Student advising will continue to be offered by a CAS academic advisor and the CAS Faculty.
- Both current students and alumni will be included in any future CAS Advisory Committees.

In addition, it has been communicated to students and alumni that the university aviation education programs in the form of a CAS will come with renewed possibilities for industry interaction with the wider aviation industry.

Discussions with a number of constituent groups with respect to this proposal are continuing. Specific groups engaged in these discussions including the Dept. of Aviation Alumni Society, the OSU Flight Team, the AHP aviation fraternity, and the student chapters of the American Association of Airport Executives, and Women in Aviation.

E. Budgetary Consequences

From a budgetary perspective, this reorganization proposes the elimination of the AVN cost center (organization #14150) and the establishment of a CAS cost center. The CAS cost center budget is estimated to be nominally less than the current AVN budget, primarily as the result of the reduction in one administrative position and the transfer of some administrative functions of the CAS to the OSU airport and the College of Engineering.
The Center will continue to receive annual budget for instructional and student services staff, based in part on the OSU tuition and the State share of instructional support associated with enrollment in Aviation classes that flow to the College of Engineering in accordance with the University budget model.

**Development Program**

One benefit of a stronger, more integrated Aviation program is the opportunity for the COE to undertake an extensive development initiative to enhance all aspects of the CAS. AVN already benefits from strong alumni support of its many student organizations, while the Airport has recently received a substantial donation towards upgrades to the Flight Simulation Laboratory. Future initiatives include aircraft training fleet upgrades, a new aviation academic center, and enhanced student services, including regularly scheduled bus transportation between the OSU airport and central campus, and wireless Internet service at the OSU airport.

**F. Analysis of services lost to the rest of the University**

Despite the elimination of an academic unit, no services currently available to the university will be lost as a result of this reorganization. Specifically:

- All academic programs associated with AVN will continue to be offered by CAS to the OSU community.
- Flight Education programs will continue to be offered to both OSU enrolled students for academic credit and to the general public, through the CAS.
- The CAS will continue to provide community outreach via academic seminars, research programs, public school events, and other community events on campus as well as at the airport.

**G. Analysis of Impact to Constituencies external to the university**

The AVN program has a wide variety of constituents in the community, including major Columbus-based aviation industry corporations (NetJets, Flight Safety International), corporations with business aviation departments (Limited Brands, Worthington Industries, Cardinal Health Care, etc.), and the wider local aviation community (The Ohio State University Airport accommodates more than 100,000 flight operations annually and is home to more than 200 based aircraft, most owned by local members of the Columbus community).

Many of these constituents have expressed concern over any reorganization of AVN, for reasons similar to the concerns of students and alumni. Aviation education is seen as an invaluable asset to industry in greater Columbus and the State of Ohio in general. The Ohio Board of Regents itself has publicly expressed the need for institutions of higher education in Ohio to provide education that promotes aviation in Ohio via its Ohio Aerospace Initiative. Past discussions on changes or elimination of Aviation as a department has raised significant concern from its constituencies, largely due to a perception or concern that the academic aviation mission would be eliminated.

As a result of these constituency reactions, there has been a strong recent effort to inform the constituent groups that the reorganization of AVN in to the CAS will represent a rebirth of
aviation education and research at The Ohio State University. To make evident this commitment the CAS will:

- Work towards becoming a strong research institution in the area of aviation and air transportation systems.

- Create strategic partnerships with constituency groups, including the creation of an Industry Consortium, comprised of leaders from local and national companies with interest in aviation at OSU.

- Expand upon AVN’s already extensive P-12 outreach program to attract more youth to the industry. Current efforts include, but are not limited to, the following:
  - Airport tours
  - ProjectSIM
  - Black Pilots Association Aviation Career Education (ACE) Camp
  - Youth Aviation Adventure
  - Airport Job Shadow
  - Aviation Career Exploration
  - Aviation Explorer Post
  - Higher Education

In addition, it has been assured to the constituency that a top quality flight education program will remain a priority at The Ohio State University, which the current university administration also supports.

H. Governance

The CAS will be led by a Center Director, a tenure-track faculty member within the College of Engineering. The Center Director will work closely with the Director of the OSU Airport to coordinate on academic and research program uses and needs of the airport. This position will be funded by the College of Engineering as part of the Center’s base budget. Upon elimination of the AVN department, the College will re-allocate resources of AVN needed to operate the Aviation academic programs, including funds to support the requisite full- and part-time lecturers, support staff, and operating costs, to the Center.

The CAS will have two oversight committees to assist in directing the center. A Faculty Oversight Committee (FOC) and an Academic Program Committee (APC):

**Faculty Oversight Committee (FOC):** Oversight of the CAS is provided by a Faculty Oversight Committee (FOC). The purpose of this committee is to assist in providing strategic direction to the CAS, including aiding in the identification of appropriate and viable areas of research. The FOC will support the relationship among academic departments within the University and help in engaging other academic institutions.

The FOC will consist of 5 members of the OSU College of Engineering faculty, one of which will be appointed committee chair. In addition, up to one emeritus member may sit on the FOC. The Director of the FOC will be on the committee but not the committee
chair. The FOC committee will be appointed by the Dean of the College of Engineering. FOC members will serve three year terms.

The FOC may also consist of up to 1 Faculty member each from other Colleges within the University as deemed appropriate by the Dean of the College of Engineering. It is recommended that at least 1 faculty member from the Fisher College of Business and 1 faculty member from the John Glenn School of Public Affairs sit on the FOC.

The following faculty have been identified and approached, and have expressed interest in participating in the FOC:

<table>
<thead>
<tr>
<th>Name</th>
<th>Dept.</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phil Smith*</td>
<td>ISE</td>
<td>Full Professor</td>
</tr>
<tr>
<td>Mark McCord</td>
<td>CEG</td>
<td>Full Professor</td>
</tr>
<tr>
<td>Seth Young</td>
<td>AVN/CEG</td>
<td>Associate Professor</td>
</tr>
<tr>
<td>James Gregory</td>
<td>ME/AE</td>
<td>Assistant Professor</td>
</tr>
<tr>
<td>Gulsah Akar</td>
<td>KSA</td>
<td>Assistant Professor</td>
</tr>
<tr>
<td>Stacy Weislogal</td>
<td>AVN</td>
<td>Emeritus Professor</td>
</tr>
</tbody>
</table>

*Considered for FOC Chair

**Academic Program Committee (APC):** Oversight of the academic degree curricula offered by the CAS will be the responsibility of an Academic Program Committee (APC). The purpose of this committee is to provide academic oversight of the course offerings provided by the CAS, course offerings offered by other academic units that comprise CAS academic degree programs, and the overall academic integrity of the CAS academic programs. This committee will become active upon the CAS’ inheriting the undergraduate academic programs in Aviation, currently housed within the AVN dept.

The APC will consist of up to 5 members. At least 2/3 of the APC will be comprised of tenure track faculty within the College of Engineering in accordance with university regulations. In addition to these 5 members, 1 faculty member from the College of Arts & Sciences and 1 faculty member from the Fisher College of Business may participate in committee activities as liaisons to their respective colleges. The Director of the CAS will be on the committee but not the committee chair. The APC will be appointed by the Dean of the College of Engineering. APC members will serve three year terms. Members of the CAS Faculty Oversight Committee (FOC) may also be on the APC.
The following faculty and staff have been initially identified to be on the CAS APC:

<table>
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<tr>
<th>Name</th>
<th>Dept.</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clark Mount Campbell*</td>
<td>ISE</td>
<td>Full Professor</td>
</tr>
<tr>
<td>Mark McCord</td>
<td>CEG</td>
<td>Full Professor</td>
</tr>
<tr>
<td>Rabi Mishalani</td>
<td>CEG</td>
<td>Associate Professor</td>
</tr>
<tr>
<td>Seth Young</td>
<td>CEG/AVN</td>
<td>Associate Professor</td>
</tr>
<tr>
<td>James Oppermann</td>
<td>AVN/CAS</td>
<td>Lecturer</td>
</tr>
<tr>
<td>Candy Roby</td>
<td>AVN/OSU Airport</td>
<td>Chief Flight Instructor</td>
</tr>
</tbody>
</table>

* Considered for APC Chair.

To maintain its relevance and importance in a rapidly changing industry, the CAS will look to its industry advisors to help direct its focus and expand post-graduate opportunities for its students.

I. Impact upon Diversity

This reorganization does not have any significant positive or negative impact on the diversity of faculty, staff, or students at the university. The combined resources of AVN and the Airport will help enhance existing minority outreach programs and scholarship opportunities.

J. Academic Freedom and Responsibility of Faculty

This reorganization has no intention of creating any significant impact on the academic freedom of the faculty within the current AVN department. The two current AVN faculty will move to other TIU departments. However, their administrative and academic responsibilities may lie, in part, within the CAS; thus, operating under the CAS Pattern of Administration.

New faculty hires will also be hired into other TIUs departments and have academic and responsibilities for certain agreed percentages of their time with the CAS. Under these circumstances, while academic freedom is maintained, responsibilities to the CAS will be as such to meet the mission of the CAS.

This proposal has been vetted by the faculty and staff of the Department of Aviation, including formal discussions among tenure track faculty, full-time and part-time instructors, administrative staff, and flight education staff. With the understanding that the creation of the CAS is in the best interests of the aviation academic program at The Ohio State University, and that the College of Engineering will support aviation under this Center model, the faculty and staff expressed full support and approval to move forward for further evaluation, as described in Faculty guidelines section 3335-3-37. The two tenure track faculty of AVN unanimously voted in favor of this proposal.
Volume 2

Proposal

Creation of a Center for Aviation Studies

College of Engineering, The Ohio State University

March 2010 (rev. May 2011)
I. Introduction

This document proposes the creation of the Center for Aviation Studies (CAS), a college-level academic and research center within the College of Engineering at The Ohio State University. This proposal describes the creation of the Center for Aviation Studies (CAS), in accordance with the requirements set forth in Faculty Handbook Section 3335-3-36, Guidelines for the Establishment and Review of Academic Centers, and procedures set forth by the College of Engineering. A draft Charter and Pattern of Administration (POA) of the CAS are included as Attachment 1 of this proposal.

II. Vision and Mission of the CAS

As described in the attached charter and Pattern of Administration, the vision of the proposed Center for Aviation studies is to be a leading center for aviation related research, education, and scholarship. The mission of the proposed Center for Aviation studies is to incorporate engineering, business, and behavioral philosophies into a multi-disciplinary approach to the study of the many components of the aviation industry, supporting world class flight education programs, academic degree programs, research initiatives, and outreach activities on local, regional, national, and international levels.

III. CAS Activities

The activities of the Center are envisioned to promote interdisciplinary aviation related research and education, both internally and in partnership with other academic units within and outside the College Of Engineering, other universities, and industry. Such activities include: offering courses on both the undergraduate and graduate levels; administering an undergraduate major and minor; supporting the research of affiliated faculty and graduate students; providing graduate administrative and teaching associate-ships; and coordinating professional development opportunities for aviation industry employees.

Interdisciplinary Research and Education

The academic disciplines that play an important role in aviation are far reaching. As such, a strategic initiative of the CAS will be to support participation from the wide variety of academic departments at The Ohio State University and beyond, whose teaching and research may have aviation applications. Potential future partners include Civil Engineering, City & Regional Planning, the John Glenn School of Public Affairs, and the Columbus State University Aviation Technology program to name a few. As such, the CAS will have partnership agreements with these other departments to include a number of their courses in aviation degree programs. The CAS will also have a roster of “Associated CAS faculty” who will participate in CAS associated teaching and research programs and other academic activities.
Undergraduate Academic Programs

Reorganized within the CAS, the current Aviation undergraduate program will continue to be offered and all aviation courses will continue to be identified with the AVN designator. The College of Engineering will continue to be the academic “home” for these courses.

AVN is currently in the process of revising its curriculum, in part to accommodate the pending change in the university academic calendar to semesters. The CAS would continue this effort. In addition, the CAS will seek to expand undergraduate major opportunities for students at OSU. The offering of additional courses would continue to grow as student demand warrants.

The CAS Director will have the responsibility of managing an outstanding undergraduate academic program, and will be responsible of proposing changes to individual courses and the curricula as a whole. Course and curricular changes will be reviewed and approved following the same structure and process as for any other undergraduate academic program within the College, as per the College Pattern of Administration.

Minor in Aviation

The minor in aviation, currently offered through AVN, will continue to be offered to students throughout the University that wish to apply their course of study within the Aviation industry.

Graduate Academic Programs

The CAS envisions developing interdisciplinary graduate programs through an evolving strategy of graduate research growth. CAS faculty will pursue research and graduate education, leading to graduate degrees in departments with existing graduate programs, by entering into partnerships with existing units within and outside the College of Engineering.

Certificate and Adult Education Programs/Affiliation with Professional Organizations

As the aviation industry faces new challenges, such as security and environmental concerns, changing revenue models, and a need for more efficient training practices, on-going discussions are taking place with various trade organizations and companies to bring professional courses to campus.

IV. Organizational Structure

As described in the attached Charter and Pattern of Administration, the CAS will be led by a Center Director, a tenure-track faculty member within the College of Engineering. The Director of the Center for Aviation Studies will report directly to the Dean of the College. Upon elimination of the AVN department, the College will re-allocate resources of AVN needed to operate the Aviation academic programs, including funds to support full- and part-time lecturers, support staff, and operating costs, to the Center (the budget for operating the Center is shown in Section V below).

The OSU Flight Education program will continue to operate under the OSU Airport business unit, and coordinate all course content and curricular matters with the CAS.
Figure 2.1 illustrates the future integration of current activities that lie within the AVN Department (specifically coursework and student support services) into the Center.

**Center for Aviation Studies: Organizational Chart**

![Org Chart]

An MOU between the CAS and the Airport, clarifying the roles the Airport will serve in support the Center will be drafted.

**V. Staffing**

The CAS is expected to initially operate effectively with four full-time faculty and lecturers, one of which will serve as the Center Director, one student services staff (i.e. Recruiter/Advisor), affiliated faculty and instructional staff operating under memoranda of understanding with other university departments and the OSU Airport, and one Administrative Assistant. A tenure-track faculty member oversees all academic functions of the Center, including course curricula, faculty and staff hiring and assignments, student advising, research, outreach programs, and coordination with the Colleges of Engineering (including OSU Airport), Social and Behavioral Sciences, and the Fisher College of Business. It is proposed that the Center Director will dedicate 50% of time during Summer Quarter 2010 and 25% time during academic year 2010-2011 to initiate the Center, develop an industry advisory board, and recruit faculty members and external research support into the Center. If/when the academic program from the Aviation Department is transferred into CAS, the Director will assume additional administrative duties associated with managing the academic program, and the percent time devoted to the Director position will increase accordingly. It is expected that the Director’s research-related administrative duties may change as the Center becomes established, and a ‘steady-state’ administrative level of effort may be different from these initial levels of effort.
The CAS will be staffed with current faculty and staff of the AVN department and draw upon staff resources at the OSU Airport and within the College of Engineering for certain administrative functions.

The Airport will continue to manage the staff and facilities of the University’s Flight Education program, consistent with the University’s mission, policies, and requirements. The full- and part-time flight education staff of the Airport will continue to fulfill their mission of providing flight education to for-credit and not-for-credit enrollees. The senior flight instructional staff, specifically the Chief and Assistant Chief Flight Instructors, may qualify to become full-time clinical faculty, as set forth in Faculty Handbook Section 3335-7, Guidelines for Regular Clinical Track Faculty.

It is proposed that the Airport Director, who currently reports to the chair of AVN, will report directly to the Dean of the College of Engineering, or the Dean’s designee once AVN is eliminated as a department. In addition to managing the Airport, the Airport Director will continue to support the mission of AVN/CAS through classroom instruction, participation in research, and leading professional seminars.

The CAS staff will work closely with a proposed Aviation Oversight Committee (AOC) to ensure that instructional, research, and outreach programs are aligned with the needs of the College, University, and wider aviation industry. The members of the AOC are appointed by the Dean of the College of Engineering, and generally are appointed for three-year terms such that term end dates are staggered across the members of the Committee.

VI. Facilities

Pending the demolition of the Aviation Building (#036) in June 2011, it is proposed that the CAS faculty and staff offices will occupy space both on main campus and at the Airport.

To maintain a permanent presence on campus, the CAS will occupy a suite in a location to be determined. This suite should consist of, at minimum, a reception area, an advising office, four faculty offices, a small conference room, and a supply/copy room.

The campus suite will allow faculty and staff to interact with students for instruction, advising, and recruitment purposes. It will also support faculty as they pursue interdisciplinary research activities with other faculty members in other departments/colleges.

The majority of the Aviation Management courses will continue to be taught on main campus, at locations as determined by university facilities management.

As one of only 25 University owned and/or operated airports nationwide in support of an academic aviation program, the OSU Airport is an integral part of AVN’s academic, research, and recruiting functions. For that reason, it is imperative that the Airport continue to be fully integrated within the activities of the CAS.

Academics

The Ohio State University Airport serves as an important tool in the educational experience of the University’s students and the community. The facility serves as a learning laboratory for all
aviation students, especially those looking to enter the Airport Management and/or Airport Planning fields.

**Aviation Management**

Currently, two Aviation courses, AVN552 “Aviation Management” and AVN674 “Airport Planning & Design” are taught at the Airport at least once annually and integrate the facility into the course material.

**Flight Laboratory**

In addition to serving as the home of the University’s Flight Laboratory, the Airport Administration has the responsibility of overseeing the management and daily operations of the University’s FAA Part 141 Flight Education Program. Each quarter, roughly 100 students enroll in the University’s Academic Flight Laboratory (AFL) to pursue a professional pilot’s license, while earning a college degree.

**Non-Aviation Courses**

The Airport’s role in fulfilling the academic mission of the University does not end with aviation education; rather, the facility serves as a learning laboratory for all of the University’s faculty and students. Courses from other disciplines throughout the University that utilize their Airport include:

- AER612 “Aircraft Flight Test Engineering” – Aerospace Engineering students perform takeoff distance flight tests in the University’s training fleet aircraft.
- AER614 “Aircraft Flight Testing Engineering” – Aerospace Engineering students perform flight tests in the University’s training fleet aircraft.
- CE796 “Interdepartmental Seminar Urban Transportation” – Civil Engineering students learn about the role planners & engineers play in the management, operations & development of airports.
- CRP750 “Resolving Social Conflict” – City & Regional Planning students utilized the proposed improvements to the University Airport as its subject for understanding social conflict between the proponents and opponents of the proposal.
- DESIGN693 “Independent Study in Industrial, Interior & Visual Communications Design” – Design students tested the redesign of the emergency landing gear release system of the Cirrus VK-30 experimental aircraft.

**Internships**

Students enrolled in the University’s Aviation Management program have the opportunity to gain real-world experience in all aspects of airport management and operations through internships within all of the Airport’s Divisions. Roughly one-third of the Airport’s nearly 80 employees are student interns. The Airport Administration also maintains contacts throughout the aviation industry, and assists students with lining up internships and/or full-time positions with other entities.

**Research**

The Airport serves as one of the College of Engineering’s 24+ state-of-the-art research laboratories and centers.

Three aviation research projects were recently completed, with the Airport being the focus of the studies, as follows:
• **FAA Pilot Program for the development of Airport Safety Management System (SMS)** – To establish requirements for Safety Management Systems at airports based on International Civil Aviation Organization (ICAO) guidance, over and above FAA certification standards.

• **Airport Cooperative Research Program 03-13: “Understanding Airspace, Objects, and their effects on Airports”** – To study the interaction of urban development in the vicinity of airports with the need to preserve navigable airspace. The project addressed federal regulatory policies and local case examples of interest to the wider industry.

• **FAA Design Competition for Universities** – National competition to encourage university students to address design issues associated with improving the safety and efficiency of the nation’s airports. Areas include airport safety, wildlife mitigation, environmental remediation, and airport planning. The Airport was used as a field research and testing environment.

**Outreach & Engagement/Recruiting**

For years, the Airport has sponsored, managed, and/or hosted a majority of AVN’s outreach & engagement, and recruiting programs. As such, a number of outreach programs are available for individuals of all ages, as follows:

• **Flight Training Clinic (FTC)** – The Airport provides flight and ground instruction to those not interested in enrolling in the University for academic credit. A complete range of pilot certification courses is available through the clinic.

• **Airport tours** – Youth & adults take an interactive tour of The Ohio State University Airport (Don Scott Field). This behind-the-scenes experience introduces them to airport operations, flight training, and aircraft maintenance, while highlighting the Airport’s importance in the community.

• **Project SIM** – The Ohio State University Airport’s real Cessna 172 cockpit simulator is available for checkout to schools and other educational facilities.

• **Black Pilots Association Aviation Career Education (ACE) Camp** – A collaborative program between The Ohio State University Airport and the Black Pilots Association allows intercity middle school youths to experience Aviation through a first-hand introduction to flight. Free plane rides are included.

• **Youth Aviation Adventure** – This half-day program located at The Ohio State University Airport introduces youths to the exciting world of aviation in a hands-on adventure. Through the use of real aircraft to unravel the wonder and mystery of flight, youths learn about airport operations, instruments in a cockpit, aerodynamics, pre-flight an actual airplane and also have the opportunity to take a free flight in an airplane through the Young Eagles program.

• **Airport Job Shadow** – The staff of The Ohio State University Airport works closely with youths (grades 6-8) to provide them with a one-day, up-close experience with various careers in Aviation. Areas of interest include Airport Management, Airport Operations, Flight Training, and Air Traffic Control.

• **Aviation Career Exploration** – The Ohio State University Airport staff and its partners provide students (grades 9-12) with an in-depth shadow and career exploration program. Student with an interest in aviation as a career can work at the University Airport and other local aviation-related businesses. A free introductory flight is included, if desired.
• Aviation Explorer Post – The Ohio State University Department of Aviation sponsors the only central Ohio Explorer post dedicated to Aviation. This organization helps youth (ages 14-20) gain insight into a variety of programs that offer hands-on career activities. For young men and women who are interested in careers in the field of aviation, exploring offers experimental learning with lots of fun-filled, hands-on activities that promote the growth and development of adolescent youth. Aviation Explorer posts also help youths to attain their Career Achievement Award.

• Higher Education – The Ohio State University Aviation faculty, staff, and students visit high school science classes with an interactive presentation of basic aerodynamics and an overview of aviation. The highlight of the class is a working wind tunnel, used to demonstrate airflow over a variety of basic objects that are part of our daily lives.

• Introductory Flight Lessons – The Ohio State University Airport Flight Education Division provides introductory flight lessons to individuals that wish to experience the thrill of flight. This is an excellent opportunity for those considering flight lessons.

In short, the Airport is where the theory of the classroom meets the practice of the industry. For the CAS to continue to benefit from the Airport’s presence and involvement in its academic, research, and recruiting activities, the faculty and staff of the Center need to re-establish a greater presence at the facility. To that end, the Airport retains enough vacant space for the Center Director, four clinical faculty/lecturers (excluding flight instructors), an academic advisor, two emeritus professors, and a student organization office; a student computer lab; and a research lab. This space is available at no additional cost to the COE.

VIII. Budget

From a budgetary perspective, this reorganization proposes the elimination of the AVN cost center (organization #14150), and the integration of the AVN resources into the CAS. Resources from the current AVN budget, which funds the undergraduate Aviation Program, will be transferred to the CAS and annual CAS’ instructional activities, including salaries for regular faculty, clinical faculty, lecturers, and flight instructors, will be funded by the instructional support funds from tuition and fees that result from teaching AVN courses.

Administrative support functions for the CAS will be coordinated between the OSU Airport resources and the College of Engineering’s Business Operations Center (BOC).

Funds to support the research mission of CAS will be provided to CAS by the College similarly to the way in which other college research centers are funded.
This document describes the charter and pattern of administration for The Ohio State University Center for Aviation Studies, a College Center administered under The Ohio State University College of Engineering.

I. Vision

The vision of The Ohio State University Center for Aviation Studies (CAS) is to be a leading center for aviation related research, education, and scholarship.

II. Mission

The mission of the CAS is to incorporate engineering, business, and behavioral philosophies into a multi-disciplinary approach to the many components of the aviation industry, supporting world class flight education programs, academic degree programs, research initiatives, and outreach activities on local, regional, national, and international levels.

III. Statement of Purpose

In order to achieve its mission the CAS will perform two key functions: (1) Serve as a multi-disciplinary research venue for conducting aviation research and (2) Offer and continuously improve the courses and curricula associated with the University’s aviation academic degree programs.

Aviation functions as a system of interdependent elements, aircraft operations, airport operations, air traffic control systems, airlines, business aviation, meteorology, urban planning, and several disciplines within engineering, business, and public policy. The proposed center is an interdisciplinary, mechanism to research the relationship between advanced technology and applied decision making for issues arising in the complex aviation system.

The proposed research touches disciplines from aviation, operations research, aeronautical and aerospace engineering, logistics, computer simulation, communications, human factors, and psychological crisis response. It will not only serve to address real problems in the travel industry, but will provide a classroom for undergraduate students at Ohio State and a functional laboratory for graduate and post-graduate research.

The Center will bring together academic researchers and industry professionals to collaborate in the examination of the challenges of operating complex networks within
significant infrastructure constraints and uncontrollable events. This collaboration will foster better research and develop genuine solutions while inspiring students and producing new, well-trained professionals for the transportation industry.

IV. Organizational Structure

The Center will be comprised as a group of academic faculty, researchers, instructors, and support staff, working in partnership with other university entities, including the Ohio State University Airport, other academic departments within and outside the College of Engineering, and industry, to meet its mission. This organizational structure is illustrated in Figure A1.

**FIGURE A1: CAS Organization**

Figure A1 illustrates the Center’s primary responsibilities of managing research and instructional programs, as well as student support services such as advising, career counseling, and student employment as they directly related to the mission of the CAS. The Center reports directly to the College of Engineering, has memoranda of understanding and works in close collaboration with the OSU Airport for the use of facilities and staff, and with other university departments for the participation of affiliated faculty and staff performing activities associated with the CAS. The CAS is responsible for the academic integrity of its research and educational programs, including flight education.
V. Leadership and Staff

The CAS will be led by a Director, as appointed by the Dean of the College of Engineering or his/her designee. The Director will be responsible for the overall management of the CAS, including:

1. Oversight of CAS affiliated research projects and programs
2. Management of the university’s academic aviation degree programs and courses
3. Promotion of the CAS on local, regional, national, and international levels
4. Coordination of academic programs and facilities with the Ohio State University Airport
5. Coordination between University entities, including academic department within and outside the College of Engineering, as well as with departments from other institutions of higher education throughout Ohio, The United States, and internationally.
6. Responsibility for all Center administrative and financial matters
7. Representing the Center on official correspondence, meetings, and other events.
8. Managing center resources and responding to issues affecting affiliated faculty, staff, students, alumni, and oversight committee members.

The Director will report to the Dean of the College of Engineering or his/her designee. Staff positions associated with the center include:

- **Affiliated Research and Clinical Faculty**: Through memoranda of understanding with university tenure initiating units (TIUs), the CAS employs a cadre of research and clinical faculty to lead and participate on internally and externally funded research projects and to develop and teach courses affiliated with the aviation academic program.

- **Professional & Student Research Staff**: The CAS supports a staff of full and part time professional research staff to lead and participate in internally and externally funded research projects associated with the CAS. These include graduate and undergraduate research assistants as appropriate.

- **Full and Part Time Lecturers**: The CAS supports a team of full time lectures to teach a variety of the courses affiliated with the aviation academic program.

- **Instructional Staff**: Through a memorandum of understanding with the OSU Airport, the CAS utilizes an instructional staff, including certified flight instructors, to conduct the flight education portion of the academic curriculum, as required by FAA certification.

- **Student Support Staff**: The CAS employs a staff of qualified advisors to guide students in their pursuit of an aviation related education.

- **Administrative Staff**: The CAS employs a small staff of administrative assistants, including student assistants to assist with day-to-day operations. The CAS also coordinates with the OSU Airport and the College of Engineering Business Operations Center (BOC) for administrative resources.
VI. Oversight

Oversight of the CAS will be the responsibility of the Dean of the College of Engineering or his/her designee. To assist in supporting the mission of the Center, the CAS will have two oversight/advisory committees, a faculty oversight committee (FOC), and an academic program committee (APC).

Faculty Oversight Committee (FOC):

Oversight of the CAS is provided by a Faculty Oversight Committee (FOC). The purpose of this committee is to assist in providing strategic direction to the CAS, including aiding in the identification of appropriate and viable areas of research. The FOC will support the relationship among academic departments within the University and help in engaging other academic institutions.

The FOC will consist of 5 members of the OSU College of Engineering faculty, one of which will be appointed committee chair. In addition, up to one emeritus member may sit on the FOC. The Director of the FOC will be on the committee but not the committee chair. The FOC committee will be appointed by the Dean of the College of Engineering. FOC members will serve three year terms.

The FOC may also consist of up to 1 Faculty member each from other Colleges within the University as deemed appropriate by the Dean of the College of Engineering. It is recommended that at least 1 faculty member from the Fisher College of Business and 1 faculty member from the John Glenn School of Public Affairs sit on the FOC.

Academic Program Committee (APC):

Oversight of the academic degree curricula offered by the CAS will be the responsibility of an Academic Program Committee (APC). The purpose of this committee is to provide academic oversight of the course offerings provided by the CAS, course offerings offered by other academic units that comprise CAS academic degree programs, and the overall academic integrity of the CAS academic programs. This committee will become active upon the CAS’ inheriting the undergraduate academic programs in Aviation, currently housed within the AVN dept.

The APC will consist of up to 5 members. At least \( \frac{2}{3} \) of the APC will be comprised of tenure track faculty within the College of Engineering. In addition to these 5 members, 1 faculty member from the College of Arts & Sciences and 1 faculty member from the Fisher College of Business may participate in committee activities as liaisons to their respective colleges. The Director of the CAS will be on the committee but not the committee chair. The APC will be appointed by the Dean of the College of Engineering. APC members will serve three year terms. Members of the CAS Faculty Oversight Committee (FOC) may also be on the APC.
Industry Membership Consortium

The CAS supports a consortium of industry, professional organizations, and other organizations with interests aligned with the center’s mission and vision. The purpose of this consortium is to maintain an active partnership between the CAS and the aviation industry to align the activities of the CAS with the needs of industry.

Members of the consortium will assist in developing and managing a consortium operating charter which shall include membership eligibility, terms of membership, and dues structure.
Volume 3

Proposal to reconfigure AVN

RESPONSE TO CCAA COMMENTS

(Responses in BOLD)

March 2010
Questions and Recommendations from Subcommittee B of CCAA

The recommendations on this page were excerpted from an email dated May 27, 2009 from the chair of Subcommittee B to the chair of CCAA. The opening paragraph of the email was omitted as it did not provide questions or recommendations on the proposal, and the formatting was fixed after the cut and paste operation made it difficult to read, but it is otherwise unaltered.

1. The main purpose of the document is to propose the abolition of the AVN department, and with that goal in mind the proposal was in pretty good shape with a couple of exceptions. Budget implications were not spelled out clearly. It said that all AVN resources would be passed to the new center CAS. But the faculty transfer to TIU, therefore some of the AVN resources need to transfer to the TIU taking the faculty. I think the proposal should also spell out how these budget transfers result in faculty duties get assigned to the CAS in support of the AVN programs. At least some clarification is necessary.

RESPONSE: There will be MOU’s in place that describe the assignment of these faculty to CAS activities. Therefore the faculty resources are for all intents and purposes allocated to the CAS.

a. The discussion of the Institute for Propulsion is irrelevant.

RESPONSE: All references to any such institute has been removed

b. As I read the rules faculty can be transferred to another TIU only if that TIU accepts the transfer. I don’t think this issue should hold up the proposal from going to the college faculty for vote, but I believe it should be settled before the proposal goes to CAA.

RESPONSE: Discussions are being held with the Chairs of the affected TIUs to formalize this issue.

2. Any proposal to abolish a unit must say what will happen to the degree granting programs. This proposal says they will be transferred to the CAS. The problems with this are as follows:

a. The CAS does not exist – if it is a college center this will not require CAA approval to create the center. I think the college should create CAS before the abolition proposal goes to CAA. A question is what is CCAA’s role in establishing the CAS? Under college rules from long ago it would be up to CCAA to review all organizational changes in the college. The proposal included a charter for the CAS as an appendix. I was not sure if we (committee B) should be reviewing that as a proposal to establish the center or not, but the charter has several issues and is not ready for prime time.
b. **RESPONSE:** The Charter and POA for the Center are being formalized and it is proposed that the CAS does get established shortly before the transfer of the AVN academic program from the dept to the CAS. The College already has reviewed the POA for the Center.

c. I believe a specific action is required by the faculty of the college to delegate the administration of degree programs to the CAS and it must be approved by CAA. Either the proposal should specifically state that faculty approval of the proposal to abolish is also an approval to delegate the administration of the programs to CAS or at a college meeting a separate motion could be made to that effect and carried forward with the proposal to abolish the department.

**RESPONSE:** The proposal attempts to be explicit in stating that the AVN program is not being eliminated, just transferred under the authority of the College of Engineering and to be administered by the staff of the CAS. As noted in the revised proposal, the faculty have approved the proposal to delegate the administration of the aviation academic programs to CAS.

d. Since two of the degree programs are offered through other colleges, they may need to do a delegation approval as well, or at a minimum they would provide a letter of support for the ENG college proposal to delegate. It would also be appropriate for them to write a letter of support for the proposal to abolish AVN.

**RESPONSE:** These letters of support are being developed at this time:

At this point you can see that we have a bit of a chick and egg problem. I suggest that the CAS be created immediately, at least on paper. Then the whole issues of abolition and delegation are more easily handled. Also, the faculty could be transferred to other TIU units even before the proposal goes forward. In fact we could move staff (**and designate the resources of the current AVN faculty**) to the CAS and delegate the degree programs to CAS. At that point an abolition proposal should sail right through since there is nothing left of AVN except organizational numbers.

**RESPONSE:** AGREED.

Under the proposed plan, the AVN department will exist until the proposal is fully approved at the Trustees level, and all of the AVN programs will be in the AVN department until the department goes away. Creating the CAS sooner than the department goes away allows CAS to begin other activities, but not the educational activities, and has a place for the programs to seamlessly transfer once the proposal approval process is complete.
Questions and Recommendations from CCAA
Developed from discussion at the CCAA Meeting of June 1, 2009

1) The proposal should clearly state if the Center for Aviation Studies (CAS) will be a College Center or a University Center. During its deliberations the College Committee on Academic Affairs (CCAA) assumed CAS would be a College Center, but the proposal should be unambiguous on this.

RESPONSE: The CAS is a College Center as stated in the first paragraph of the introduction to the Proposal.

2) Regarding College Centers, Guidelines for the Establishment and Review of Academic Centers from the Office of Academic Affairs (OAA) state that “a template for the establishment and review of centers … will be included in the college pattern of administration.” The current College of Engineering Pattern of Administration (POA) does not include such a template.
   a. CCAA suggests that the college update the POA to include the template for creation of college centers.
   b. CCAA would find it helpful to have the template during further review of this proposal. Even if the template does not generally stipulate review by CCAA prior to creation of college centers, this proposal couples an academic curriculum to the CAS, and academic programs in the College of Engineering (CoE) are under the purview of CCAA.

RESPONSE: The College has drafted a template for the creation of a center and the center creation proposal follows this template.

3) CCAA has concerns over anticipated tension between the responsibilities of the current faculty in AVN to the proposed CAS and to their new Tenure Initiating Units (TIUs). CCAA requests that any Memoranda of Understanding (MOU) between the Dean, the affected faculty, and/or the chairs of the TIU departments to which these faculty are relocating be included in the appendices of the proposal, with references to their existence incorporated at appropriate point(s) in the proposal (i.e. section L of the proposal). If such Memoranda of Understanding do not currently exist CCAA suggests that it would be beneficial to arrive at them now to avoid misunderstanding in the future.

RESPONSE: Agreed. MOUs will be established between the CAS and TIUs as well as with the CAS and the OSU Airport.

4) On a related note, will graduate students in the TIUs of the faculty affiliated with CAS be able to earn degrees in those units while doing thesis or dissertation work in Aviation? Graduate students are crucial if the center is to become a true research center.

RESPONSE: YES, graduate students shall be able to apply CAS related research towards graduate degrees, as applicable. Faculty affiliated with the CAS shall be able to act as primary advisors for students studying CAS related issues within their department and other CAS faculty shall be able to act as secondary advisors to
students outside their TIU studying research under the CAS.

5) CCAA reinforces Subcommittee B’s concerns about the lack of detail on the budgetary consequences of the proposed changes (Section G of the proposal). We heard that the Department of Aviation has been operating at a significant deficit and that even with the decrease of faculty size a deficit has persisted. However, those we heard from were not able to provide details or explanations, and we were not provided solid data to confirm or refute that. In addition, how dependent will the budget of CAS be on the good will of the chairs of the TIUs of the faculty associated with CAS? How do funds associated with grants get split between the center and the TIUs? The budget section should discuss what will change with delegation of the degree programs to the proposed CAS that will preserve the viability of those programs.

RESPONSE: To be clear, AVN has not operated at an operating budget deficit. Student enrollments with respect to faculty and staff resources are among the highest in the College. On paper deficits are a result of relatively large capital investments (specifically the recent purchase of 2 airplanes totaling $800,000). These investments have been paid off by absorbing existing faculty lines, thereby reducing the teaching resources of the department. At the current time, the operating budget of the department is minimal, covering only the expenses of the existing faculty and staff.

The department has made arrangements to pay off the remaining debt on these investments to the College using one faculty position from the Flight Education division over the next six years. This issue has been resolved with the college for more than two years.

As with any center, expenditure credit for IDCs on joint grants is split with the units of the other partners at the time a PA-005 is created. The basis of this split is the degree to which the facilities and administrative resources for the project are housed in the center vs in the departments.

6) CCAA has serious concerns about the idea of the transfer of academic programs from a degree granting department into a center. The concern is not limited to this specific case, but is general to the concept. Academic programs need ongoing review and updating, and faculty and other staff assigned to teach courses. Students need to be recruited and advised and student organizations advised. How will all these functions be sustained in a center having only faculty associates from other TIU’s? How will faculty oversight of degree programs in all three colleges be managed? Will there be an undergraduate studies committee? How will it be organized? The proposal to delegate administration to the CAS should spell all this out. Such details should perhaps also be reflected in the MOUs mentioned earlier. As the number of tenure-track faculty in the Department of Aviation has decreased, most of the teaching responsibility for courses in the Aviation programs has shifted from tenure-track to non-tenure-track faculty. The proposal should address the question of why, if a degree program is not considered important enough that tenure-track faculty should teach it, it should instead become a degree program under the
control of a center with courses taught largely by non-tenure-track faculty. CCAA is concerned that the same fate could be in store for other undergraduate programs unless there is a clear statement indicating that this is a unique situation and explaining how it was unavoidable rather than planned.

7) RESPONSE: Much of these concerns are larger than this proposal. It is has always been the preference of the AVN Department to “replenish” the faculty to historical levels of 8 or more tenure track lines. It has also been the desire of the department to create a graduate program in aviation. It is clear that the College has decided not to pursue these initiatives, but rather consolidate departments in general and strive for more inter-disciplinary methods of providing academic programs. The CAS meets this goal.

As mentioned in the proposal, the Center Director, who will have a TIU in an existing COE department as a tenured faculty member, will have the authority over the AVN curriculum, similar to how the Department chair of AVN currently does. There will be at least one other current faculty member associated with the AVN participating in course evaluation, instruction, etc., as well as the leading of research initiatives. These positions will be agreed upon with the TIU’s through an MOU. The existing AVN non-tenure lecturers will be under the CAS organization.

Whether or not this may be considered a “unique” situation or was “planned” is up for debate. This proposal is addressing what may be considered the best way to move forward, maintain, and grow our existing Aviation undergraduate program.

8) Two of the degree programs are in other colleges. Will they also need to delegate to the center the administration of their Aviation degree programs? While CCAA has seen an email from Prof. Deborah Moore Haddad, Assistant Dean - Undergraduate Programs, in Social and Behavioral Sciences stating they have no objections to the restructuring of Aviation, that seems to fall short of agreeing to delegate the degree program to CAS.

RESPONSE: The degree programs in SBS and Business are still their programs. The CAS will administer the AVN courses that are part of those programs, just as the AVN department does today.

9) CCAA’s understanding of the OAA Guidelines for the Establishment and Review of Academic Centers is that centers may not establish independent course offerings or degree programs. Some sections of the proposal seem to imply that CAS would (e.g. the fourth bullet near the top of page 6).

RESPONSE: There has been precedent to the contrary. (See the Center for Renaissance Studies). In any event, the CAS will simply be inheriting an existing program. These will be College of Engineering courses.
10) The makeup of the boards advising the operation of CAS needs to be clarified.

   RESPONSE: These boards will consist of faculty members from the COE, COB, and SBS, Industry leaders, and student representatives.

11) The CAS Pattern of Administration identifies that one criterion for OSU faculty becoming CAS Fellows is participation in the center continuing education program. It should be clarified if they will be required to do more than that. For example, will they be required to participate in the degree granting programs?

   RESPONSE: This portion of the POA has been removed.
PRESENT:

Professors: Marcia E. Farr, E. Kay Halasek (Chair), Michael Ibba, Daniel A. Mendelsohn, John M. Robinson, W. Randy Smith (Vice-Chair), Brian L. Winer.

Student Members: Rose M. Babington (Undergraduate Student Government); Robert Calhoun (Council of Graduate Students)

Guests: Jed Dickhaut, Associate Registrar, Office of the University Registrar; David Roy, Senior Assistant Director, Enrollment Services; Dr. John Wanzer, Senior Vice Provost, Enrollment Management; Edward H. Adelson, Associate Executive Dean, Colleges of the Arts and Sciences; Professors Joan Herbers, Dean, Caroline Breitenberger, Associate Dean, College of Biological Sciences, and Dave Stetson, Department of Evolution, Ecology, and Organismal Biology.

APPROVAL OF THE MINUTES OF THE MEETING ON JANUARY 23, 2008

• Halasek moved approval of the corrected Minutes of the meeting of January 23, 2008. It was seconded by Babington and passed with two abstentions.

COMMENTS FROM THE CHAIR – PROFESSOR E. KAY HALASEK

• Two proposals for minors, an Interdisciplinary Minor in Evolutionary Studies and a Minor in Survey Research, and a Transitional Doctor of Physical Therapy proposal, will be on the agenda for the next meeting

• Three proposals, the Doctor of Nursing Practice, and the new degrees in Environmental Engineering and Biomedical Engineering, are on the agenda for the University Senate on February 7, 2008.

• Winer will present the summary of Council activities at the next Faculty Cabinet meeting.
COMMENTS FROM THE VICE-CHAIR – PROFESSOR W. RANDY SMITH

- At the University Senate meeting, Executive Vice President and Provost Alutto will be giving his first annual address.

- The three colleges outside the health sciences, with Regular Clinical Track Faculty – Business, Engineering, and law - will be asked to give a status report to Council in May, 2008.

- The College of Social and Behavioral Sciences has yet to submit a revised Clinical Track Faculty proposal from the Departments of Psychology and Speech and Hearing Sciences.

- Meetings have been scheduled with the Colleges of Mathematical and Physical Sciences, Humanities, and Biological Sciences to discuss course redesign. Based on the success of the recent redesign of Statistics 135, funding was provided by then-Provost Barbara R. Snyder, mainly in the STEM areas, to redesign large enrollment GEC courses. Mathematics, Physics, Molecular Genetics, Philosophy, and the languages have been chosen in the first round, and are asked to rethink teaching these courses. Funding is provided for release time to develop these courses. Professor Alexis Collier, Associate Provost, and Smith are spearheading this initiative.

PROPOSAL TO REVISE THE UNDERGRADUATE BIOLOGY MAJOR,
COLLEGE OF BIOLOGICAL SCIENCES – PROFESSOR E. KAY HALASEK,
FOR SUBCOMMITTEE A –

Halasek noted that Collins, based on time constraints, had indicated that he needed to step down as Chair of Subcommittee A, but will remain a Council member. Mendelsohn will assume the Chair role, but today she will present this proposal.

We do not have details about the Arts and Sciences-level review of this proposal that occurred, except for a short cover letter of transmittal indicating changes to the Core Requirements of the Biology major, and a series of questions from Subcommittee A of this Council, answered by Associate Dean Caroline Breitenberger. The three courses in the revised Core Requirements would be Biological Sciences 320 (Sophomore Colloquium: Biological Inquiry), Biological Sciences 401 (Integrated Biology I), and Biological Sciences 402 (Integrated Biology II). The rationale for these changes is to present biology as a single, integrated body of knowledge. The current major could be viewed as a series of compartmentalized topics that are not necessarily closely linked with each other. The current approach requires that certain basic topics be taught in each group, because students may take the courses in any order. The integrated approach clearly links aspects of biology together and has the added advantage of reducing duplication of materials in multiple courses.
The revised major requires 12 credit hours of core courses, 15 hours of specialization courses, and electives, to make up 45 hours required in the major. Students choose a specialization area in consultation with their advisors. Each specialization area will consist of a series of courses or course options that have been approved by the College of Biological Sciences Curriculum Committee. The rationale for this proposed change is to encourage and guide students toward a cohesive, complete, and rigorous major. These changes do not change the number of credit hours required to complete the major.

Farr noted that the proposal uses the term College of Human Ecology, probably because the proposal was written before the College merged with the College of Education to become the College of Education and Human Ecology. This terminology should be corrected in the proposal.

Halasek had a question about the anticipated decimalization of Biology 320 instead of a single course. Will it be broken down to accommodate various specializations? It was not clear. Winer questioned whether the core courses would be prerequisites to specialization courses?

**DISCUSSION WITH PROFESSORS JOAN HERBERS, DEAN, CAROLINE BREITENBERGER, ASSOCIATE DEAN, COLLEGE OF BIOLOGICAL SCIENCES, AND DAVID STETSON, DEPARTMENT OF EVOLUTION, ECOLOGY, AND ORGANISMAL BIOLOGY.**

Winer asked if the revised Core Requirements serve as prerequisites for the courses in the Specialization Areas? No. The new core courses will not be prerequisites to specialization courses.

Winer noted that the argument for adding the revised core requirement is to reduce multiple course offerings because students were taking courses at different times. If the prerequisite is not enforced how is the multiple offering of courses handled? Stetson indicated that specialization courses will come from other departments and they can establish the prerequisites. It will be up to the departments to decide whether to require students to take Biological Sciences 320, 401, and 402.

Herbers added that Biology is one of eight departments in the College of Biological Sciences. The specializations come from other departments. It will be up to the departments to decide prerequisites. This will be a transitional problem until other departments review the specialization.

How do the revised Core Requirements reduce the duplication of material in multiple courses? Currently students can take courses in any order, the faculty teaching those courses are obliged to assume that the students in the course they are teaching have not had any of the other core courses, and deliver the course content accordingly. Students often selected courses and the specialization within the biology major based on expediency, especially convenience in scheduling, rather than disciplinary depth or
integrity. In the revised major duplication of materials will be reduced because the core requirements will present a two-quarter sequence that covers the broad range of biology in a single unit, and incorporates concepts from mathematics, chemistry, and other relevant scientific disciplines as appropriate.

Halasek had a question about the decimalization of Biological Sciences 320 at a future date. Breitenberger responded that 320 exposes biology majors to the methods of biological inquiry as related by active research scientists. Other departments are also encouraged to create similar courses and allow biology majors to take those departmental sophomore seminars. Students do not have to pick a 320 in a specialization. They should be free to take any 320 versions they choose.

Will you be offering a general 320 initially? If they receive proposals from various departments or faculty, they would like to offer different versions of 320. All the 320s will have something in common - the logic of inquiry.

Can students take 320 as many times as they want? They can take it only once but can take any version of it.

Will there be sufficient sections of the courses in the revised Core Requirements to meet the anticipated demand? 401 and 402 are offered only once on trial basis but may be offered twice in autumn and winter or winter and spring. If demand increases, they may be offered three times a year. It is difficult to predict.

There are currently only three specializations. More specialization areas are listed in the revised Appendix 3 distributed.

What are the procedures for the approval of additional Specialization Areas? Specializations come from the departments or faculty and are vetted through the Center for Life Science Education, Advisors, Breitenberger, and Stetson and approved by the College of Biological Sciences’ Curriculum Committee.

Halasek indicated that Collins (absent at this meeting) recommended that Part C include an explicit statement that electives are required beyond the 15 or more credits hours in specialization areas to bring the total number of credit hours to a minimum of 45. The specialization hours can go as high as 30 and a student may exceed 45 hours. Breitenberger added that this is clarified in the revised Appendix 3 – as distributed at this meeting. Under Part C, it is clearly stated that some specializations may require more than 15 credit hours. Note that most students will need additional electives to complete the 45 credit hours.

Mendelsohn noted that electives in the program have a very loose structure. Where does it specify from where they choose their specialization? This is outlined on page 3 of the revised document. The advisors will advise students on courses based on their interests.
Can you explain the statement “very few students in Autumn 2007 will be ready to take 401 and 402.” Students coming in Autumn 2008 will not have chemistry to start 401. Students coming with AP credit may be ready to start 401.

Halasek had a question about advising. Two advisors advise over 1000 students. There are three honors advisors. There are 1800 majors and 600 of them are honors, so two professional advisors advise 1200 students. Are they able to advise such a large student population effectively? Will there be additional staff? Currently they are not planning to add an advisor.

Farr noted that the proposal predates the merger of Human Ecology and Education. The proposal needs to be updated with the new name College of Education and Human Ecology.

Smith asked for predictions on how large this major will get? Applications are up by 13%. More applications are received and there is better yield. They are also retaining at much higher rate.

What happens to the graduates? More than half of them go into health professions broadly defined; 25 to 30 percent go to graduate school in the life sciences and the remaining students go to a variety of different areas. More and more students are in demand in business and law school. Many with the BS degree become technicians or sales representatives in pharmaceutical companies. Significant numbers go in to science education teaching at high school level.

The revised handout will be substituted in the proposal. Smith suggested that the Council should receive a progress report in Spring 2009.

Smith requested from Adelson that future transmittal materials from the Colleges of the Arts and Sciences include detailed materials on its Subcommittee activities.

Winer was not satisfied with the response to the questions about core courses being prerequisites to specialization. They had not clearly thought through this step. Others expressed concern about two professional advisors advising so many majors. Ibba was concerned about who will teach the core courses.

Subcommittee A moved approval of the proposal. It was seconded by Robinson. The motion passed unanimously.

Smith added that the revision can be implemented in Autumn 2008. No additional level of review/approval is necessary.
Continued Discussion on the Revised Center Guidelines

Smith distributed a revised Center/Institute Guidelines edited by him and Halasek and asked for feedback. He also distributed a draft list of approximately 60 approved centers/institutes.

Winer had some changes to item B and C under “Procedure” on page 4.

Mendelsohn moved approval of the revised center/Institute guidelines, as corrected. It was seconded by Farr and passed unanimously.

Halasek and Smith will make final changes and a final copy will be distributed at the next meeting, along with a proposed rule change.

Smith noted that lately we have been having difficulty securing a quorum at most Council meetings. Faculty have other commitments. To date, the Inter-professional Council has yet to provide a representative. Smith will be meeting with the Senate leadership this Spring, when new appointments are being made, with the hope of clearly conveying the workload expectations of this Council so that those asked to serve will be better aware of the commitment being made.

Winer suggested that we have alternates for those Senate members who cannot attend for a whole quarter.

The meeting adjourned at 4:40pm

Respectfully Submitted by

W. Randy Smith
Lakshmi Dutta
Subcommittee A has reviewed the proposed revisions to the Biology Major. After a thorough discussion of the proposal, the subcommittee indicated that it was disposed to recommend it to the Council for approval. However, it requested the following preliminary clarifications from Dean Caroline Breitenberger:

1. Is Biology 320 (the sophomore colloquium-style seminar) sequenced with the introductory sequence (Biology 401 and 402)?
   
   Dean Breitenberger's response: While 320 was assigned a lower number to encourage students to take it earlier than 401–402, it is not mandatory that they do so. The program is planning to propose decimalized versions of 320 tied to specific specializations in the major; the fact that 320 is outside the required sequence will give majors flexibility to take the version of 320 that is in their area of interest at the time it is offered, rather than forcing them all into the same version of the course before they can take 401–402.

   Dean Breitenberger stressed that, given that the one version of 320 has been approved, the redesigned major can be implemented without waiting for the decimalized versions, which will be a future refinement. The program plans to issue a call for proposals for versions of 320 to all the associated faculty.

2. Was the rationale for 320 to recruit new students or to build on a core? If the latter, should it be numbered higher?

   Dean Breitenberger's response: the rationale is not so much recruitment as retention. In the sophomore year, students are mostly taking courses in other sciences (e.g., Chemistry); thus 320 will keep them steadily thinking about biological questions during this time. In addition, the course will help students refine their goals; some students, after taking it, may discover that their main interest lies in one of the other 7 majors in Biological Sciences (e.g., Microbiology, Zoology).

   On the rationale for not having the course at a higher level, see #1. 300 is an appropriate level for a second-year course.

3. What is the approval status of 320?

   Dean Breitenberger's response: the course has passed successfully through the college and ASC review process. (The decimalized versions will be submitted for review when ready.) If CAA approves the major revision proposal, 320 will get its final approval as one component in the package.

4. On p. 5 of the proposal, it is noted that "Electives within the major are also chosen from all of the courses taught by the departments in the college and from several other courses offered by units such as the College of Medicine and Public Health, the College of Human Ecology, the College of Social and Behavioral Sciences, and the College of Mathematical and Physical Sciences." Do all these units support the proposal, i.e., are concurrences needed?

   Dean Breitenberger's response: it did not seem necessary to ask for concurrences in the present instance because the courses offered by the other units are included in the existing major, with the concurrence of those units. Given that the status of those courses will not change in the new major, the existing concurrences will presumably still be valid.
5. On p. 14–15 of the proposal, we recommend that Part C include an explicit statement that electives are required beyond the 15 or more credit hours in specialization areas to bring the total number of credit hours to a minimum of 45.

Dean Breitenberger's response: she agreed to make the requested addition.

Upon the receipt of Dean Breitenberger's responses, Subcommittee A voted unanimously (with one member unavailable) to recommend approval of the revised major to the Council.
Date: June 6, 2007
Subject: Proposed Revisions to the Biology Major
From: Jay Hobgood (Subcommittee C Chair)

Subcommittee C considered the proposed revisions to the Biology major on May 22, 2007. After a discussion of the key aspects of the proposed revisions, the Subcommittee voted unanimously to approve the revised major.

The principal revisions to the major are:

1. To replace the current Core Requirements, which currently consist of choose one course from each five groups (Molecular, Genetic, Cellular, Organismal, Ecology/Evolution) with three courses taken for 10 hours of credit. The three courses in the revised Core Requirements would be Biological Sciences 320 (Sophomore Colloquium: Biological Inquiry), Biological Sciences 401 (Integrated Biology I), and Biological Sciences 402 (Integrated Biology II). The rationale for these changes is to present biology as a single, integrated body of knowledge. The current major could be viewed as a series of compartmentalized topics that are not necessarily closely linked with each other. The current approach requires that certain basic topics be taught in each group, because students may take the courses in any order. The integrated approach clearly links aspects of biology together and has the added advantage of reducing duplication of material in multiple courses.

2. To replace the current Electives within the Major, which consists of at least three additional courses at the 300 level or above from one biological science department with a Specialization Area totaling at least 15 hours. Student choose the specialization area in consultation with their advisors. Each specialization area will consist of a series of courses or course options that have been approved by the College of Biological Sciences Curriculum Committee. The rationale for this proposed change is to encourage and guide students toward a cohesive, complete, and rigorous major.

These changes do not change the number of credit hours required to complete the major.
If approved, the revised Biology Major would consist of:

**Part A. Required Prerequisites or Supplements to the Major.** (These do not count toward the 45 hours required for the major.)

<table>
<thead>
<tr>
<th>Courses</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biology 113 or H115, 114 or H116</td>
<td>10</td>
</tr>
<tr>
<td>Mathematic 148, 150, 151, 152 or 161 (or Honors versions)</td>
<td>5-19</td>
</tr>
<tr>
<td>Chemistry 121 or H201, 122 or H202, 123 or H203</td>
<td>15</td>
</tr>
<tr>
<td>Chemistry 251, 252, 254 or 245, 255 or 246 (or Honors versions)</td>
<td>10-12</td>
</tr>
<tr>
<td>Physics 111 or 131, 112 or 132, 113 or 133 (or Honors versions)</td>
<td>15</td>
</tr>
</tbody>
</table>

**Part B. Core Requirements.** (10 credit hours)

- Biological Sciences 401 -- Integrated Biology I: 5
- Biological Sciences 402 -- Integrated Biology II: 5
- Sophomore Colloquium: Biological Sciences 320 -- Biological Inquiry: 2

**Part C. Specialization Areas** (Individually designed areas of further study totaling at least 15 hours)

**Part D. General Requirements for the Biology Major**

1. 45 or more credit hours beyond the prerequisites for the major
2. Three courses in the major must have a laboratory or data analysis component.
3. Independent Study can be included to a maximum of 5 hours and may be counted toward the laboratory/data analysis component.
4. A minimum of C- in each course in the major.
5. An overall GPA of at least 2.0 in the major.
6. Courses in the major must be approved by a Biology adviser.

The principal foci for questions and discussion during the Subcommittee’s meeting were:

1. How do the revised *Core Requirements* reduce the duplication of material in multiple courses?

2. Will the courses in the revised *Core Requirements* serve as prerequisites for the courses in the *Specialization Areas*?

3. Will there be sufficient sections of the courses in the revised *Core Requirements* to meet the anticipated demand?

4. What are the procedures for the approval of additional *Specialization Areas*? There are currently only three (Life Sciences Education, Forensic Biology, and Pre-Health Professions).

Note: The Subcommittee was very favorably impressed by the plan for the assessment of the learning outcomes for students completing the major.
Changes in the October, 2007 Revisions to the Biology Major document, compared with April, 2007 document are indicated in bold type face below.

**Text in 042007 document:**

p. 1 (List of Appendices), and p. 37  
*BioSci* or *BiolSci* 320

**Changed to in 102007 document:**

→ *Biology* 320  
(inconsistency in course designation)

p. 3 (Last sentence, last paragraph of Rationale): 
that *would not* eliminate …  
→ that *would* eliminate …

p. 5 (Under Relationship to Other Programs): 
new *Biological Sciences* courses … → new *Biology* courses…

p. 5 (First line under Administration): 
major *is currently* housed …  
→ major *was* housed …

p. 14 (Appendix 3):  
Part B Core Requirements. (10 credit hours) → (12 credit hours)  
*Biological Sciences* 401 and 402 → *Biology* 401 and 402  
401 and 402 credit hours 4 → 401 and 402 credit hours 5  
*Biological Sciences* 320 → *Biology* 320

p. 46 (Appendix 7):  
No changes are needed in the 4-year sample curriculum because the increase in credit hours in Biology 401 and 402 does not change the total hours in the major, still 45 credits.
A Proposal to Revise the Biology Major

College of Biological Sciences

Original proposal: November 2, 2005

Approved by College of Biological Sciences Curriculum Committee,
pending approval of Integrated Biology courses: April 3, 2006
Integrated Biology courses (Biology 401 and 402) approved by College of
Biological Sciences Curriculum Committee: April 19, 2007

Appendices
1. Current biology major program
2. Student enrollments in the College of Biological Sciences
3. The proposed biology major
4. New course requests for Biology 401 and 402
5. Proposed Biology 320 syllabus
6. Approved specialization areas
7. 4-Year sample curriculum for the new major
Name of the Major: Biology

Degrees: Bachelor of Science in Biology, Bachelor of Arts in Biology

Target Implementation Date: New freshmen declaring their interest in the biology major in Autumn 2008 will be subject to the revised major requirements. Existing students are eligible to choose to graduate under the current biology major requirements or the requirements of the revised major.

Administrative Unit: Center for Life Sciences Education, College of Biological Sciences

Rationale
Over the past quarter century, biology has experienced dramatic change. Because of the introduction of new technologies, such as relatively inexpensive computers, site-directed mutagenesis, and the polymerase chain reaction, we can examine biology from molecules to communities in far greater detail and volume than ever before. At Ohio State and around the world, monikers like “bioinformatics,” “mathematical biosciences,” and “biological engineering” indicate the increasingly interdisciplinary nature of biology, building on the older affiliations inherent in biophysics, geology, chemistry, and anthropology. The very nature of performing biological research has changed dramatically, often requiring more interdisciplinary collaboration and broader experience and expertise on the part of investigators, and the use to which that research can be applied has shattered boundaries of possibility and ethics. As a result, the National Research Council, in “BIO 2010: Transforming Undergraduate Education for Future Research Biologists” (2003, National Academies Press, Washington, DC), recommended a reevaluation of what we teach future biomedical researchers, and, most importantly, how we teach them. While all this has been occurring, the curricular structure of the biology major at Ohio State has changed little (though the courses themselves have changed dramatically to incorporate new information). On February 16, 2005, Dean Joan Herbers convened a committee of faculty, staff, and students, and charged that committee to examine the current biology major thoroughly and to determine whether and how the biology major should be restructured. The 2005 committee was chaired by Prof. Dave Stetson, EEOB and Honors Biology advisor, and its members were: Caroline Breitenberger, Associate Dean; Joe Conroy, graduate student, EEOB; Charles Daniels, Microbiology; Margaret Strow, Biology Advisor; Desh Pal Verma, Molecular Genetics; John Wenzel, Entomology.

The biology major at Ohio State is unusual in that it is not housed in a single department, but is a college-wide major, overseen by the College Curriculum Committee and currently administered by staff within the college office. The core
curriculum comprises courses from all of the six departments within the college (Appendix 1). Therefore, it is a broad-based, comprehensive, and demanding major.

The current biology major serves a large and diverse body of students. It is the largest of the eight majors in the college; indeed, as of autumn quarter, 2004, it is the largest single major in the university. In winter quarter 2005, 1266 of the college’s 2446 majors were biology majors (Appendix 2), and 13.5% of the students enrolled in the biology major were under-represented minorities (compared with 11.4% for the college as a whole, and 12.2% for all of the Colleges of the Arts and Sciences).

A large proportion of the students who complete the biology major go to professional school, not just in medicine, but also in business, law, dentistry, optometry, pharmacy, and other disciplines. Other students go to graduate school in biological sciences or education. Students are well prepared to follow a number of career paths because the biology major is flexible and can be tailored to the individual student’s needs and aspirations. Its flexibility also allows students to schedule their curriculum quite flexibly and conveniently, permitting them to complete their degree in a timely manner.

To evaluate the biology major, the review committee undertook a review of course syllabi and student curricula, and solicited feedback from faculty, advising staff and current biology majors. The curricular review indicated duplication of some material across the biology major core curriculum, as well as inadequate integration of prerequisites and fundamental biological concepts in major courses. Faculty feedback indicated that students across the college often seemed unprepared for upper-level courses, despite having taken the stated prerequisites. Faculty also expressed concern about the lack of structure in the biology major core courses. Since these courses can be taken in any order, the faculty teaching those courses are obliged to assume that the students in the course they are teaching have not had any of the other core courses, and deliver the course content accordingly. Advisor feedback indicated that students often selected elective courses and the specialization within the biology major based on expediency, especially convenience in scheduling, rather than disciplinary depth or integrity. Students generally agreed with the faculty and advisor feedback regarding the major. Interestingly, students provided numerous examples of duplication of concepts and topics in different core courses (such as cellular division, Mendelian genetics, the lac operon, or mitochondrial respiration), and urged the committee to develop a core curriculum that would eliminate this redundancy.

The Revised Biology Major
To build upon the strengths of the current biology major while ameliorating its shortcomings, the committee designed the proposed major (Appendix 3) to emphasize that biology is a single, broad, and complex body of knowledge. We believe that presenting the discipline in this way will enable students to understand more clearly the integrated, relational nature of each facet of the discipline. The biology major review committee proposed three significant changes in the structure of the biology major curriculum:

- a novel introductory sequence of courses (Biology 401 and 402, Appendix 4) to replace the current core of the biology major. We expect that these courses will support student achievement of biology major learning outcomes and that they will promote retention in the biology major. Furthermore, we expect that these courses will support student integration of the physical science and mathematics prerequisites with the biological sciences as well as help students see the real world application of biological concepts.

- a sophomore colloquium-style seminar (Biology 320, Appendix 5). The seminar is designed to encourage students to learn to participate more fully in the process of discovery and to synthesize their learning more completely.

- to encourage and guide students toward a cohesive, complete, and rigorous major, we developed the Specialization Areas (Appendix 6). These sets of courses allow individual students to focus their upper-level courses on an area of their choosing, while emphasizing the interdisciplinary nature of biology.

After the College of Biological Sciences Curriculum Committee approved the concept of the biology major revisions, they recommended that a second committee be appointed to flesh out the details of the integrated sequence of courses. This second committee was convened in autumn, 2006. The core course committee was chaired by Prof. Charles Daniels, Microbiology, and its members were: Caroline Breitenberger, Associate Dean; Erich Grotewold, Plant Cellular and Molecular Biology; Norm Johnson, Entomology; Eric Juterbock, EEOB, Lima campus; W. Mitch Masters, EEOB; Judith Ridgway, Assistant Director of the Center for Life Sciences Education; and Mark Seeger, Molecular Genetics.

The revisions proposed here for the biology major are in line with the recommendations of the NRC "BIO 2010: Transforming Undergraduate Education for Future Research Biologists" report. Specifically, the BIO 2010 report included recommendations that universities reexamine their curricula with an eye toward preparing students for an area that is increasingly interdisciplinary; that concepts from math and the physical sciences be included in biology courses; that cross-departmental teaching collaborations be encouraged; and that students have access to seminar-style courses that
communicate the excitement of biological research.

**Relationship to Other Programs**

The proposed major will directly replace the existing biology major, one of eight majors offered by the College of Biological Sciences. The other seven majors are: biochemistry, entomology, evolution and ecology, microbiology, molecular genetics, plant cellular and molecular biology, and zoology. The current biology major depends on the course offerings of the departments within the College of Biological Sciences. The core of the major consists of five courses chosen from an assortment of courses offered by all six departments in the college. The new 400 sequence proposed for the new major will replace this core and will slightly reduce enrollments in the courses designated by the current core. The teaching staff that will offer the new Biology courses (320, 401, 402) will be drawn from the staff within the college, thus any reduction in the teaching loads for the departments created by reduced enrollments in the current core courses will be absorbed by the requirements of the new major. Electives within the major are also chosen from all of the courses taught by the departments in the college and from several other courses offered by units such as the College of Medicine and Public Health, the College of Human Ecology, the College of Social and Behavioral Sciences, and the College of Mathematical and Physical Sciences. The electives for the proposed major will be chosen from the current array of courses and will be enlarged by allowing and designating courses from additional colleges. These electives will comprise what we call the “Specialization Area” in the new major.

**Student Enrollment**

At present (Sp07), approximately 1400 of the college’s 2800 undergraduates are biology majors. If this proposed major is successful, we expect that that number may grow somewhat by attracting students to Ohio State who might otherwise enroll at other universities. We expect that attraction to the new biology major will be based on the strength and relevance of the new 400-level courses and the clear path to the degree defined by the specializations within the major. We also expect that retention of students in the biology major will be improved through the increased attention to their coursework on the part of the college, the increased interaction with faculty specifically interested in the biology major, and the focus on student-directed learning. Finally, it is also reasonable to expect that the integrated biology core courses will help students define their interest in the biological sciences, and may encourage many biology majors to transition into one of the other majors in the College of Biological Sciences. We view the integrated biology core courses as being a gateway, not only to the biology major, but also to the other majors in the college.
Administration

The biology major was housed in the college office, under the oversight of the Dean, an Associate Dean, and the College Curriculum Committee. A modified administrative structure has been implemented in the College of Biological Sciences to facilitate collaboration of faculty across the college in life sciences education and to implement the review committee’s proposals. The new Center for Life Sciences Education (Caroline Breitenberger, Director) brings together in one administrative unit the existing Introductory Biology Program, the assessment and scholarship of teaching and learning expertise in the college, and the biology major advising group. The biology major will be housed in this new unit, and the College of Biological Sciences Curriculum Committee (with its college-wide representation) will remain the curriculum committee responsible for the biology major. The College Curriculum Committee will approve any and all changes to the curriculum, including new and altered specializations.

Advising

The advising of majors will continue as it is now. Two professional advisors in the College office (Peggy Strow and David Wells) are the primary contacts for students; these staff advisors will be housed in the Center for Life Sciences Education, and will report to the Director of the CLSE or her designee. Honors students will be advised by one of three designated faculty members; currently, those three faculty are Neil Baker (Microbiology), David Stetson (EEOB), and Tom Wilson (Entomology).

The Core Curriculum

As the committee began the discussion to revise the biology major, we reached consensus very quickly concerning the principal goal of any revision: to present biology as a single, integrated body of knowledge. The current major tends to present biology as a series of compartmented topics because of the five categories of courses within the core (biochemistry, genetics, cellular biology, organismal biology, and evolution and ecology; Appendix 1) and because of the rather discrete partitioning of the knowledge among the six departments in the college. We have developed the core 400-level courses as a two-quarter sequence that covers the broad range of biology in a single unit, and incorporates concepts from mathematics, chemistry, and other relevant scientific disciplines as appropriate. The new course requests and syllabi for Biology 401 and 402 are presented in Appendix 4. (We do not recommend that the core include a laboratory component for three reasons: First, the laboratories in the required 100-level Biology courses are being revised and updated and should provide an adequate general exposure to the breadth of laboratory techniques used in biological research. Second, the sophomore seminar, Biology 320, exposes biology majors to the methods of biological inquiry as related by active research scientists. Third, there is a requirement for three laboratory or data analysis
courses within the specialization area and electives in the major, thus providing students with hands-on experience with more advanced techniques.)

A staff member will coordinate the Biology 401 and 402 courses (Appendix 4). Two or three faculty members drawn from various departments and with complementary expertise will participate with the coordinator as a team in teaching each of the courses. We do not intend that the instructors simply deliver their assigned lectures, but that they participate in the planning of the curriculum for the complete sequence and that they remain connected with the students and faculty throughout the progress of the course. Several members of the core course development committee have agreed to be largely responsible for teaching the Wi08 and Sp08 offerings of Biology 401 and 402.

A new course designed to address the GTA training needs of the 401 and 402 courses has been proposed by Dr. Judy Ridgway. The course has been vetted by the core course design committee, approved by the College of Biological Sciences Curriculum Committee, and approved for the Graduate Interdisciplinary Specialization in College Teaching by FTAD. A Graduate Teaching Fellow has been appointed who will work during Su07 and Au07 to develop learning activities for the 401 and 402 students, and will serve as head GTA for the first offerings of Biology 401 and 402.

As far as we know, no one is offering this kind of sequence in the life sciences at Ohio State or at any other university of comparable size. (There are institutions that offer courses entitled “Integrated Biology,” but in the cases we have examined, the topics are not truly integrated in the way we envision.) The lack of such courses can present a problem for students transferring to Ohio State; there may be no equivalent core to accept in transfer and it will not be possible to give students credit for any individual component of this sequence because of its unitary structure. Each transferring student will be expected to complete the entire sequence to gain the full benefit of the offering. It is likely that any intermediate or advanced courses that a transferring student brings with him/her can be included in the major specializations.

The proposed core also includes a required second-year seminar. We believe students must be encouraged to become involved in discussion and be presented with original research early in the process because these experiences are so fundamental to the process of learning and creating information in biology. We propose the creation of a new course, Biology 320 (Appendix 5), to accomplish this, but we also encourage other departments within the college to create similar courses if they do not already have such courses, and to allow biology majors to take those departmental sophomore seminars. (Biochemistry and Molecular Genetics already offer such courses.)
Specialization Area

In consultation with his or her advisor, each student should decide on an area of specialization within the broader field of biology. Each specialization area will consist of a series of courses or course options that have been approved by the College Curriculum Committee. Some possible specialization areas are listed below, and three detailed examples (approved by the College of Biological Sciences Curriculum Committee) are provided in Appendix 6. If these do not meet a student’s needs, he/she may work with College of Biological Sciences faculty and advisors to choose a series of at least three advanced courses (300 and above, excluding 591 and 597) in the biological sciences with a coherent theme, and present a proposed specialization to the College of Biological Sciences Curriculum Committee for approval.

Possible Specializations for the Biology Major (details to be planned and approved by the College of Biological Sciences Curriculum Committee):
Aquatic Biology
Biophysics
Computational Biology
Education in Life Sciences
Forensic Biology
Molecular and Cellular Ecology
Molecular and Cellular Evolution
Organismal Biology
Pre-health Professions
Psychobiology
Quantitative Biology
Systematics

Bachelor of Arts Degree

Currently, the BA in Biology follows the BS program, except for Math 152, which is not required. Very few biology majors currently pursue the BA degree. This distinction will be retained in the new major; i.e. the BA in Biology has the same curricular requirements as the BS, save for Math 152, which is not required.

Assessment Plan

Dr. Judith S. Ridgway, Assistant Director Center for Life Science Education, has a degree from the College of Biological Sciences and extensive experience in science education reform and outcomes assessment. She will oversee the assessment efforts for the biology major. The assessment of this program will include a suite of outcome monitoring methods to develop a rich understanding of the impact of the program components. The assessment of the program will follow principles of good practice because this program has been
planned around values that support deep and complex student understanding of the biological sciences, the assessments will be multidimensional and ongoing, and data-driven decision making will be used to refine the program leading to the graduation of biology majors who are better prepared for graduate studies and to make contributions to society. We have in place or will soon implement most of the assessment methods described below, so we will be able to compare students in the revised major with students currently in our major programs.

We will track the students who complete the Biology 401 and 402 sequence, as an indicator of the influence that the sequence has had. We are interested in their retention in the biology major, retention in the College of Biological Sciences, and time to graduation.

The Major Field Test for Biology (http://www.ets.org/Media/Tests/MFT/pdf/ContBio2.pdf) will be administered as the final exam for Biology 402 in the first two complete cycles of the Integrated Biology Core, and student scores and subscores compared to national norms as well as to the scores of biology majors from an earlier cohort (before the implementation of the Integrated Biology Core). The Biology Major Field Test data will allow the faculty teaching the Integrated Biology Core to make quick adjustments in the course content if student understanding is shown to be deficient in specific areas. We will measure enhanced student learning and achievement by asking biology students to self-report on their learning and achievement both after they complete the sequence and upon their graduation. We will also monitor the biology major scores on the Medical College Admission Test (MCAT) and the Graduate Record Examination (GRE) biology subject test. The results of these tests will be used to compare cohorts of biology majors before and after the implementation of the integrated biology major. Taken together, these test score data will give the curriculum developers an indication of the impact of the integrated biology program on graduates’ successful admission to graduate school in biological fields (GRE) and medical school (MCAT), and their learning of core concepts and biological principles.

We will develop a portfolio that will guide future implementation of the courses and assessment leading to continuous improvement. The course portfolio will be developed following the template provided by Bernstein, Burnett, Goodburn, and Savory (2006). Fellow faculty in the College of Biological Sciences and biological sciences faculty at peer institutions will complete the portfolio evaluation.

Another component of our assessment plan is to support the adoption of student-centered pedagogies that encourage integration of biological concepts by faculty, staff and GTAs. Since the activities regarding this goal are the faculty
and staff training and the GTA training, we will measure our success by counting the number of participants, gathering participant self-assessment of their preparedness and use of student-centered pedagogies, and performing document analysis to identify the use of those pedagogies.

Students who take any of several upper level biological science courses write analyses of biological research as part of their course requirements. Samples of student papers will be collected from several of these courses and analyzed by a panel of faculty using a simple rubric based on the student outcomes for biology and writing. The faculty panel will receive training on the use of the rubric prior to the actual analysis of student papers. The goal of this analysis is to directly measure student levels of understanding and abilities as they complete the integrated biology major curriculum, and one prominent feature of the rubric will be the emphasis on integration of biological concepts.

To ensure continuous improvement of the program, an assessment report will be distributed to the CLSE Director and the College of Biological Sciences Curriculum Committee on an annual basis. Additional or different methods will be added to the assessment suite as special needs emerge during the evolution of the revised major.
Appendix 1: Current biology major program

The biology major provides a structured program that includes the major areas of importance to modern biology, as well as an in-depth concentration of study in one of the six departments in the College of Biological Sciences.

Part A. Required Prerequisites or Supplements to the Major (Do not count toward the 45 hour major)

- Biology 113 or H115, 114 or H116
- Mathematics 148, 150, 151, 152 or 161
- Chemistry 121 or H201, 122 or H202, 123 or H203
- Chemistry 251, 252, 254 or 245, 255 or 246
- Physics 111 or 131, 112 or 132, 113 or 133

Part B. Core Requirements
Choose one course from each of the five groups below.

1. Molecular (choose one):
   - Biochemistry 511, or 613 and 614

2. Genetic (choose one):
   - Microbiology 581
   - Molecular Genetics 500, or 605 and 606

3. Cellular (choose one):
   - EEOB 415 or 630
   - Microbiology 509, or 520 and 521
   - Molecular Genetics 602 or 607
   - Plant Biology 648

4. Organismal (choose one):
   - EEOB 410, or 405.01 and 405.02
   - Entomology 500 or 611F
   - Microbiology 661
   - Plant Biology 436, or 630 and 631

5. Ecology/Evolution (choose one):
   - EEOB 370 or 400 or 413.01 or 413.03
   - Entomology H444 or 641
   - Microbiology 664 or 665
   - Molecular Genetics 640

Part C. Electives within the Major

- At least three additional courses at the 300 level or above from one biological science department.
- At least two of the three courses must be lecture-based courses
- When courses are taken as a sequence to satisfy a Core requirement (part B), all but one of the courses in the sequence may also be used to satisfy the three additional courses requirement.
• Independent study is strongly recommended (693 or H783), with up to five credit hours counting towards the 45 hour major.

Requirements - Parts B and C together
• A minimum grade of "C-" in each course and a 2.0 overall GPA in the major.
• At least three courses must have a laboratory.
• Total: 45 or more hours at the 300 level or above.
• COURSES IN THE MAJOR MUST BE APPROVED BY YOUR BIOLOGY ADVISER.
Appendix 2: Student enrollments in the College of Biological Sciences

<table>
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<tr>
<th></th>
<th>Biochem</th>
<th>Biology</th>
<th>Entomol</th>
<th>Evol &amp; Ecol</th>
<th>Microbiol</th>
<th>Mol Genetics</th>
<th>Plant CMB*</th>
<th>Zoology</th>
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<th>Mol Genetics</th>
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<td>13</td>
<td>57</td>
<td>120</td>
<td>2</td>
<td>52</td>
<td>651</td>
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* Formerly Plant Biology

** Includes BIO-Undecided students; students with double majors within the College are counted just once in the headcount
Appendix 3 -- revised 2-6-2008: The proposed biology major

Biology Major Program

The biology major provides a survey of the essential areas of study in modern biology, an individually-tailored focus of study, and an emphasis on methods of communication in the discipline.

Part A. Required Prerequisites or Supplements to the Major. (Do not count toward the 45 hour major)

Courses
Biology 113 or H115, 114 or H116
Mathematics 148, 150, 151, 152 or 161 (or Honors versions)
Chemistry 121 or H201, 122 or H202, 123 or H203
Chemistry 251, 252, 254 or 245, 255 or 246 (or Honors versions)
Physics 111 or 131, 112 or 132, 113 or 133 (or Honors versions)

Credit Hours
10
5-19
15
10-12
15

Part B. Core Requirements. (12 credit hours)

Biology 401 – Integrated Biology I
Biology 402 – Integrated Biology II
Sophomore Colloquium: Biology 320 – Biological Inquiry

5
5
2

Part C. Specialization Areas (Individually-designed areas of further study totaling at least 15 hours; some specializations may require more than 15 credit hours. Note that most students will need additional electives to complete the 45 credit hour major – see Part D.)

In consultation with his or her advisor, each student must decide on an area of specialization within the broader field of biology. Certain series of courses have already been approved for specialization and are listed below. If these do not meet a student’s needs, he or she may work with College of Biological Sciences faculty and advisors to choose a series of at least three advanced courses (300 and above, not including 591 and 597) in the biological sciences with a coherent theme, and present the proposed specialization to the College of Biological Sciences Curriculum Committee for approval.

Specialization Areas for the Biology Major
Aquatic Biology
Biophysics
Computational Biology
Education in Life Sciences
Forensic Biology
Molecular and Cellular Ecology
Molecular and Cellular Evolution
Organismal Biology
Pre-health Professions
Psychobiology
Quantitative Biology
Systematics

[This list of specializations includes topics that are not included in Appendix 6, “Specialization Areas.” Those listed in Appendix 6 represent the pattern that we expect to see. The additional areas listed above are being developed for approval by the College of Biological Sciences Curriculum Committee. We anticipate that an increasingly broad range of specializations will become available over time.]

Part D. General Requirements for the Biology Major

- 45 or more credit hours beyond the prerequisites to the major (some students may need additional courses at the 300-level or above after completing the Core for Part B and Specialization Area for Part C)
- Three courses in the major must have a laboratory or data analysis component
- Independent Study, e.g. Biol 699 or H783, can be included to a maximum of 5 hours, and may be counted towards the laboratory/data analysis component
- A minimum of C- in each course in the major
- An overall GPA of at least 2.0 in the major
- Courses in the major must be approved by a biology advisor
Electives in the biology major – College of Biological Sciences
Any course at the 300 level above in the College of Biological Sciences, not including 591 and 597.

Up to 5 credit hours of independent study or undergraduate research (693, H783, or 699) in the College of Biological Sciences.

Electives in the biology major – other Colleges at the Ohio State University
Up to 10 credit hours of courses in units outside the College of Biological Sciences may be counted on the biology major, upon approval by a biology advisor. Examples of courses that are regularly approved include:

Up to 5 credit hours of independent study or undergraduate research (693, H783, or 699) in an approved area of the life sciences.

Anatomy 200: Introductory Anatomy

Animal Science 310: Principles of Animal Systems Physiology
Animal Sciences 610: Physiology of Reproduction

Anthropology 300: Human Origins
Anthropology 302: Modern Human Physical Variation
Anthropology 409: Primate Evolution
Anthropology 411: Human Ecological Adaptations
Anthropology 610: Ethnobotany

Environment and Natural Resources 618: Ecological Engineering and Science
Environment and Natural Resources 725: Wetland Ecology and Management

Human Nutrition 310: Fundamentals of Human Nutrition

Molecular Virology, Immunology, and Medical Genetics 600: Evolution of Emerging Viruses

Neuroscience 300: Introduction to Neuroscience

Pharmacology 600: General Pharmacology

Physiology and Cell Biology 311 and 312: Principles of Human Physiology I and II
Physiology and Cell Biology 601 and 602: Organ System Physiology I and II

Plant Pathology 401: General Plant Pathology
Plant Pathology 600: Introduction to Bacterial and Viral Pathogens of Plants

Psychology 313: Behavioral Neuroscience
Psychology 513: Introduction to Cognitive Neuroscience
Appendix 4: Biology 401 and 402

The Ohio State University
Colleges of the Arts and Sciences New Course Request

College of Biological Sciences
Academic Unit
Biology

Book 3 Listing (e.g., Portuguese)
401 Integrated Biology I

Number Title

Integrated Biology I

18-Character Title Abbreviation Level Credit Hours

Summer Autumn Winter x Spring Year 2008

Proposed effective date, choose one quarter and put an "X" after it; and fill in the year. See the OAA curriculum manual for deadlines.

A. Course Offerings Bulletin Information

Follow the instructions in the OAA curriculum manual. If this is a course with decimal subdivisions, then use one New Course Request form for the generic information that will apply to all subdivisions; and use separate forms for each new decimal subdivision, including on each form the information that is unique to that subdivision. If the course offered is less than a quarter or a term, please complete the Flexibly Scheduled/Off Campus/Workshop Request form.

Description (not to exceed 25 words): A case studies approach is used to to gain a better understanding of biological concepts and principles. This course is designed for biology majors.

Quarter offered: Wi, Au

Distribution of class time/contact hours: 2 1.5 hr cl, 1 hr rec

Quarter and contact/class time hours information should be omitted from Book 3 publication (yes or no): yes

Prerequisite(s): Biology 113 and 114 or HS AP Biology; and Chem 123 and Math 150; or permission of instructor

Exclusion or limiting clause:

Repeatable to a maximum of _____ credit hours.

Cross-listed with:

Grade Option (Please check): Letter ☑ x S/U ☐ Progress ☐ What course is last in the series? 402

Honors Statement: Yes ☐ No ☑ GEC: Yes ☐ No ☐ Admission Condition

Off-Campus: Yes ☐ No ☑ EM: Yes ☐ No ☐ Course: Yes ☐ No ☐

Embedded Honors Statement: Yes ☐ No ☑

Other General Course Information:
(e.g. "Taught in English." "Credit does not count toward BSBA degree.")

B. General Information
Subject Code 260101 Subsidy Level (V, G, T, B, M, D, or P) B
If you have questions, please email Jed Dickeaut at dickhaut.1@osu.edu.

1. Provide the rationale for proposing this course:
Revisions to the biology major

2. Please list Majors/Minors affected by the creation of this new course. Attach revisions of all affected programs. This course is (check one): x Required on major(s)/minor(s) □ A choice on major(s)/minor(s) □ An elective within major(s)/minor(s) □ A general elective:

3. Indicate the nature of the program adjustments, new funding, and/or withdrawals that make possible the implementation of this new course.

4. Is the approval of this request contingent upon the approval of other course requests or curricular requests?
   Yes x No □ List: Biology 402

5. If this course is part of a sequence, list the number of the other course(s) in the sequence: 402

6. Expected section size: 250 (lecture), 25 (rec) Proposed number of sections per year: 2

7. Do you want prerequisites enforced electronically (see OAA manual for what can be enforced)? Yes x No □

8. This course has been discussed with and has the concurrence of the following academic units needing this course or with academic units having directly related interests (List units and attach letters and/or forms):
   Not Applicable □
   Departments in the College of Biological Sciences: Biochemistry, Entomology, EEO Biology, Microbiology,
   Molecular Genetics, Plant Cellular and Molecular Biology

9. Attach a course syllabus that includes a topical outline of the course, student learning outcomes and/or course objectives, off-campus field experience, methods of evaluation, and other items as stated in the OAA curriculum manual and e-mail to asccurofo@osu.edu.

Approval Process The signatures on the lines in ALL CAPS (e.g. ACADEMIC UNIT) are required.

1. Academic Unit Undergraduate Studies Committee Chair Printed Name Date

2. Academic Unit Graduate Studies Committee Chair Printed Name Date

3. ACADEMIC UNIT CHAIR/DIRECTOR Printed Name Date

After the Academic Unit Chair/Director signs the request, forward the form to the ASC Curriculum Office, 105 Brown Hall, 190 West 17th Ave. or fax it to 688-5678. Attach the syllabus and any supporting documentation in an e-mail to asccurofo@osu.edu. The ASC Curriculum Office will forward the request to the appropriate committee.
5. COLLEGE CURRICULUM COMMITTEE

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<td>David Horn</td>
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6. ARTS AND SCIENCES EXECUTIVE DEAN

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7. Graduate School (if appropriate)

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8. University Honors Center (if appropriate)

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9. Office of International Education (if appropriate)

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10. ACADEMIC AFFAIRS

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Colleges of the Arts and Sciences Curriculum Office. 10/02/06
Biology 401: Integrated Biology I  U  5 credit hours
Winter quarter, 2008

Course description: Biology 401 is the first course of a two-quarter sequence that uses case studies to illustrate and explore fundamental concepts of the biological sciences. The two-course sequence provides a solid foundation and preparation for any major in the biological sciences. This syllabus is one possible adaptation of the first course in the series; in future iterations, modules may be exchanged, but the goals and objectives of substituted modules should align with the goals and objectives of the modules they replace.

Prerequisites: Biology 113 and 114, or AP Biology in high school; and Chem 123; and Math 150; or permission of instructor

Lecture time: 2 x 1.5 hours
The first year clientele for this course will consist of current biology majors who are opting into the redesigned major – very few Au07 freshmen will be ready for this course. We plan to cap the initial enrollment at 100 students. In 2008-09, we plan to limit course enrollment to appr. 250 students per offering. At that class size, offering this course twice a year should be adequate to accommodate all new biology majors.

Faculty instructors:
Contact information:
Office hours:

Recitations: 1 x 1 hour
The recitations incorporate learning activities that are designed to be applicable to any module substituted in the course and will be capped at 20 students per recitation. One GTA should be able to handle 4 recitation sections.

GTAs:
Contact information:
Office hours:

Course Coordinator:
Staff member, coordinates lecturing assignments, lecturer training workshops, recitation activities and GTA training, and coordinates student assessment activities.
Contact information:
Office hours:

Course objectives: Students will apply and explore in greater depth facts and concepts introduced in introductory biology courses. They will begin to develop the ability to integrate biological information and ideas, to apply foundational unifying theories to new problems or situations and to demonstrate quantitative skills that are central to study and research in the biological sciences.
Learning goals:
1. Students will apply facts and concepts related to the following overarching themes to analyze biological phenomena:
   - The cell
   - Heredity
   - Emergent properties
   - Regulation
   - Interaction with the environment
   - Diversity
   - Evolution
   - Structure and function
   - Scientific inquiry
   - Science/technology and society
   - Fundamental interconnectedness of chemistry, physics, mathematics
   - Metabolic unity
2. Students will use quantitative skills, concepts from the physical sciences, and overarching biological themes (listed under #1 above) to analyze biological phenomena.
3. Students will integrate at least two overarching themes (listed under #1) to explain a complex biological system.
4. Students will increase their scientific literacy as they demonstrate critical thinking and scientific logic in the analysis of natural phenomena and the ethics behind the human involvement in these phenomena.

Readings: A course packet will be available at CopEZ and additional materials will be available on the course web site. In addition, every student will be expected to have available a rigorous introductory biology textbook targeted to science majors to use as a reference book. Campbell's Biology, 7th edition, is an appropriate reference work.

Grading:
Recitation activities and on-line assignments 30 points
A series of graded activities with varying deadlines will be placed on the course web site. You will be expected to check this web site on a daily basis and to complete those assignments by the indicated deadlines. Many of these assignments will involve answering questions that will be similar to questions on the midterm and final examinations.
Midterm or in-class quizzes 20 points
Paper 10 points
Write a 2-page summary article, as if for the science pages of the New York Times, describing the topic presented by the guest lecturer (lecture 17 in the syllabus). Your paper should summarize the experimental methods and results, including an analysis of variables that were considered (or not) and limits in interpretation of the data presented.
Attendance and participation 10 points
Attendance will be taken during recitation, and in lecture. Participation will be evaluated based on participation in the recitation activities. Every
absence must be excused by the Course Coordinator. Absences due to official university-sanctioned events or (documented) illness of the student generally will be automatically excused; other excuses will be reviewed on a case-by-case basis.

Final exam 30 points

>90% A
81-90% B
71-80% C
61-70% D
<61% E

**Academic Misconduct:**
It is the responsibility of the Committee on Academic Misconduct to investigate or establish procedures for the investigation of all reported cases of student academic misconduct. The term “academic misconduct” includes all forms of student academic misconduct wherever committed; illustrated by, but not limited to, cases of plagiarism and dishonest practices in connection with examinations. Instructors shall report all instances of alleged academic misconduct to the Committee on Academic Misconduct (Faculty Rule 335-5-487). For additional information, see the University's Code of Student Conduct (http://studentaffairs.osu.edu/resource_csc.asp).

**Disability Services:**
Students with disabilities that have been certified by the Office for Disability Services will be appropriately accommodated, and should inform the Course Coordinator as soon as possible of their needs. The Office for Disability Services is located in room 150 Pomerene Hall, 1760 Neil Avenue; telephone 614-292-3307, TDD 292-0901; http://www.ods.ohio-state.edu/.
Weekly schedule of lectures and assignments:

Lecture 1  Introduction to Biology 401/402
General description of case studies approach
Review all of introductory biology
Use of the reference book and other course materials
Progression across the two courses (increasing depth, complexity, emphasis on integration)
Student milestones in achieving fluency in the language of biology
Research lecture in Biology 401; research seminar of student’s choice in Biology 402
Read literature for general scientific audience in Biology 401; read research literature in the discipline in Biology 402

Expectations in these courses:
The student:
Will participate in classroom and recitation discussions and activities
Will visit the course web site on a regular basis to find out the background material that must be reviewed before class and to complete the on-line activities
Will review material in reference textbook as needed before class
Will attend lecture
Will be an active learner
Will progress from (a) simply understanding background material to (b) understanding how many different biological disciplines are integrated by researchers in the field to (c) being able to succinctly explain to others how several different areas of the biological sciences are relevant to contemporary issues in the biological sciences

Faculty:
Will engage students in active learning
Will model the integration of biological principles across different disciplines with their underlying physical and mathematical concepts

GTAs:
Will engage students in active learning
Will model the integration of biological principles across different disciplines with their underlying physical and mathematical concepts

Use of the reference book and other course materials
Module 1: The nature and origin(s) of life

This module is designed to reinforce the importance of the study of physics, chemistry and mathematics in the expansion of the student's knowledge of the biological sciences. Mathematical concepts are reinforced with examples of time, size and probability. The physical sciences are integrated throughout the descriptions of living organisms and their environments.

Lecture 2
What is science; scientific inquiry
  Alternative hypotheses
  How do we define life?
The fundamental interconnectedness among mathematics, physical sciences, and biology
  Earth science and what we know or surmise about early life
  Early evolution
    Fossil evidence
    The RNA world hypothesis

Recitation 1
Define "environment" in a biological context
  How do living organisms obtain energy from the environment?
  On-line activity: energy flows and/or the thermodynamics of life

Lecture 3
Continue to examine interconnectedness among mathematics, physics, chemistry and biology
  Time:
    Age of the earth
    Age of Homo sapiens
      How many generations?
  Size and number of organisms:
    Significance

Module 2: Life in extreme environments

This module is designed to reinforce fundamental biological themes having to do with the cell and its contents by introducing students to organisms growing in novel environments.

Lecture 4
Single-celled organisms
  Classification
Extreme environments
  Example: deep-sea thermal vents
  What are the environments that support life
  Cell structure and how it is maintained in extreme environments

Recitation 2  Metabolism – general review of universal aspects
  On-line activity: simulation of a living organism (build a cell)
Lecture 5
Universality of metabolism
   Anaerobic pathways

Lecture 6
Genomes and evolution
   Central dogma (DNA to RNA to protein)
   Genomic information

Recitation 3
Molecular evolution
   Definition
   Methods for study
   On-line activity: simulation of evolution

Lecture 7
Adaptation
   Adaptation at the organismal level
      How do organisms change in response to their environment
      How do organisms change their environment
   Adaptation at the genomic level
      Evolutionary clues in genes
      Effect of mutation and gene flow on evolution
      Humans as another example of an extreme environment

Lecture 8
The evolution of organismal classification systems
   Systematics
   Woese

Recitation 4  Review for midterm
   On-line activity: develop a map of the topics and concepts integrated in Module 2

Lecture 9  Midterm exam

Module 3: Malaria
Malaria is chosen as the system to be studied in this module because understanding host-vector-parasite interactions and disease control can integrate fundamental biological concepts from molecules to ecosystems. The material in this module is presented at a higher level of complexity than the previous modules.

Lecture 10
Epidemiology of a human disease: malaria as a model

Recitation 5
Dynamics of host-pathogen interactions
Co-evolution
  On-line activity: Mortality vs morbidity

Lecture 11
The pathogen and its vector

Lecture 12
The human immune system
Control of disease: Vaccine development

Recitation 6
The immune system
  On-line activity: Recombination of IgG genes – how many different molecules?

Lecture 13
Molecular aspects of the disease
  How does the parasite evade its host?
    Erythrocyte structure
    Hemoglobin structure and function

Lecture 14
Selection based on disease resistance
Sickle cell anemia and other thalassemias
Human ecology: selection and human evolution

Recitation 7
Other examples of human disease as evolutionary selective pressure
  On-line activity: Think like a pathogen

Lecture 15
Mosquito control
Vector ecology
Ecological approaches to disease control
Ecological implications of disease control

Lecture 16
Treatments for malaria
  Most existing treatments come from plant sources
    Why do plants make these compounds?
The search for drugs – chemistry, mathematics
Types of drugs, their mechanism of action
Drug testing and approval
Ethics

Recitation 8
Background materials for guest lecture
Discuss scientific paper(s) that represent topic to be covered by guest lecturer

**Lecture 17**  
Guest lecturer will present his or her research on a topic relevant to modules 1-3, at a level appropriate for students in this course.

**Module 4: Sex and death**  
*This module introduces topics that encourage the student to understand the complexity of living organisms, and to think of them as more than assemblages of single cells.*

**Lecture 18**  
Evolution relies on genomic diversity  
    - How is genetic diversity created and maintained?  
    - Why engage in sex?  
    - Consequences of in-breeding

**Recitation 9**  
Meiosis  
    - Exchange of genetic material  
    - Why is it important?  
On-line activity: access and report on data about life-span studies

**Lecture 19**  
Death  
    - Evolutionary benefits of death  
    - What life-span means; what determines life-span  
    - Extension of life span: role of diet, oxidative stress  
    - Apoptosis

**Lecture 20**  
Selection and domestication  
    - Genetic engineering  
    - Ethics and social issues

**Recitation 10**  
Review for final exam

Final exam: Students will be provided, at least one week in advance of the final exam, with a set of essay questions which require an integrated approach to biology. Students will be directed toward resources to develop complete answers to the essay questions, and then will have to answer 1-2 of these questions in class for the final exam.
The Ohio State University
Colleges of the Arts and Sciences New Course Request

College of Biological Sciences
Academic Unit
Biology

Book 3 Listing (e.g., Portuguese)
402 Integrated Biology II

Number Title
IntegratedBiologyII U 5

18-Character Title Abbreviation Level Credit Hours

Summer Autumn Winter Spring X Year 2008

Proposed effective date, choose one quarter and put an "X" after it; and fill in the year. See the OAA curriculum manual for deadlines.

A. Course Offerings Bulletin Information

Follow the instructions in the OAA curriculum manual. If this is a course with decimal subdivisions, then use one New Course Request form for the generic information that will apply to all subdivisions; and use separate forms for each new decimal subdivision, including on each form the information that is unique to that subdivision. If the course offered is less than a quarter or a term, please complete the Flexibly Scheduled/Off Campus/Workshop Request form.

Description (not to exceed 25 words): A case studies approach is used to to gain a better understanding of biological concepts and principles. This course is designed for biology majors.

Quarter offered: Sp, Wi Distribution of class time/contact hours: 2 1.5 hr cl, 1 hr rec
Quarter and contact/class time hours information should be omitted from Book 3 publication (yes or no): yes

Prerequisite(s): 401; and Chem 123; and Math 150; or permission of instructor

Exclusion or limiting clause:

Repeatable to a maximum of _____ credit hours.

Cross-listed with:

Grade Option (Please check): Letter X S/U Progress □ What course is last in the series?

Honors Statement: Yes □ No x GEC: Yes □ No x Admission Condition
Off-Campus: Yes □ No x EM: Yes □ No x Course: Yes □ No x
Embedded Honors Statement: Yes □ No x

Other General Course Information:
(e.g. “Taught in English.” “Credit does not count toward BSBA degree.”)

B. General Information

Subject Code __260101___ Subsidy Level (V, G, T, B, M, D, or P) __B__

If you have questions, please email Jed Dickhaut at dickhaut.1@osu.edu.
1. Provide the rationale for proposing this course:
Revisions to the biology major

2. Please list Majors/Minors affected by the creation of this new course. Attach revisions of all affected programs. This course is (check one): x Required on major(s)/minor(s) □ A choice on major(s)/minor(s)
□ An elective within major(s)/minor(s) □ A general elective:

3. Indicate the nature of the program adjustments, new funding, and/or withdrawals that make possible the implementation of this new course.

4. Is the approval of this request contingent upon the approval of other course requests or curricular requests?
Yes x No □ List: Biology 401

5. If this course is part of a sequence, list the number of the other course(s) in the sequence: 401

6. Expected section size: 250 (lecture), 25 (rec) Proposed number of sections per year: 2

7. Do you want prerequisites enforced electronically (see OAA manual for what can be enforced)? Yes x No □

8. This course has been discussed with and has the concurrence of the following academic units needing this course or with academic units having directly related interests (List units and attach letters and/or forms):
Not Applicable □
Departments in the College of Biological Sciences: Biochemistry, Entomology, EEO Biology, Microbiology,
Molecular Genetics, Plant Cellular and Molecular Biology

9. Attach a course syllabus that includes a topical outline of the course, student learning outcomes and/or course objectives, off-campus field experience, methods of evaluation, and other items as stated in the OAA curriculum manual and e-mail to asccurofc@osu.edu.

Approval Process The signatures on the lines in ALL CAPS (e.g. ACADEMIC UNIT) are required.

1. Academic Unit Undergraduate Studies Committee Chair Printed Name Date

2. Academic Unit Graduate Studies Committee Chair Printed Name Date

3. ACADEMIC UNIT CHAIR/DIRECTOR
   Caroline Breitenberger Printed Name Date

After the Academic Unit Chair/Director signs the request, forward the form to the ASC Curriculum Office, 105 Brown Hall, 190 West 17th Ave. or fax it to 688-5678. Attach the syllabus and any supporting documentation in an e-mail to asccurofc@osu.edu. The ASC Curriculum Office will forward the request to the appropriate committee.
5. COLLEGE CURRICULUM COMMITTEE

6. ARTS AND SCIENCES EXECUTIVE DEAN

7. Graduate School (if appropriate)

8. University Honors Center (if appropriate)

9. Office of International Education (if appropriate)

10. ACADEMIC AFFAIRS

Colleges of the Arts and Sciences Curriculum Office. 10/02/08
Biology 402: Integrated Biology II  U  5 credit hours
Spring quarter, 2008

Course description: Biology 402 is the second course of a two-quarter sequence that uses case studies to illustrate and explore fundamental concepts of the biological sciences. The two-course sequence provides a solid foundation and preparation for any major in the biological sciences. This syllabus is one possible adaptation of the second course in the series; in future iterations, modules may be exchanged, but the goals and objectives of substituted modules should align with the goals and objectives of the modules they replace.

Prerequisites: Biology 401; and Chem 123; and Math 150; or permission of instructor

Lecture time: 2 x 1.5 hours
The first year clientele for this course will consist of current biology majors who are opting into the redesigned major — very few Au07 freshmen will be ready for this course. We plan to cap the initial enrollment at 100 students. In 2008-09, we plan to limit course enrollment to aprr. 250 students per offering. At that class size, offering this course twice a year should be adequate to accommodate all new biology majors.

Faculty instructors:
Contact information:
Office hours:

Recitations: 1 x 1 hour
The recitations incorporate learning activities that are designed to be applicable to any module substituted in the course and will be capped at 15-20 students per recitation. One GTA should be able to handle 4 recitation sections.

GTAs:
Contact information:
Office hours:

Course Coordinator:
Staff member, coordinates lecturing assignments, lecturer training workshops, recitation activities and GTA training, maintains list of seminar options, and coordinates student assessment activities.
Contact information:
Office hours:

Course objectives: Students will continue to apply and explore in greater depth facts and concepts already learned in introductory biology courses. They will continue to develop the ability to integrate biological information and ideas, to apply foundational unifying theories to new problems or situations and to demonstrate quantitative skills that are central to study and research in the biological sciences.
Learning goals:
1. Students will apply facts and concepts related to the following overarching themes to analyze biological phenomena:
   - The cell
   - Heredity
   - Emergent properties
   - Regulation
   - Interaction with the environment
   - Diversity
   - Evolution
   - Structure and function
   - Scientific inquiry
   - Science/technology and society
   - Fundamental interconnectedness of chemistry, physics, mathematics
   - Metabolic unity
2. Students will use quantitative skills, concepts from the physical sciences, and overarching biological themes (listed under #1 above) to analyze biological phenomena.
3. Students will integrate at least two overarching themes (listed under #1) to explain a complex biological system.
4. Students will increase their scientific literacy as they demonstrate critical thinking and scientific logic in the analysis of natural phenomena and the ethics behind the human involvement in these phenomena.
5. Students will gain the ability to identify the components of a scientific study and analyze the validity of the methods and results.
6. Students will increasingly value the study of biology and begin to see their role as a biologist in society, business, industry, and health fields.
7. Students will analyze application of their own learning style to best study biological content and procedures.

Readings: Reading materials for this course will be varied. A course packet will be available at CopEZ and additional materials will be available on the course web site. In addition, every student will be expected to have available a rigorous introductory biology textbook targeted to science majors to use as a reference book. Campbell’s *Biology, 7th* edition, is recommended for the reference work.

Grading:

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<th>Component</th>
<th>Points</th>
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<td>On-line assignments and recitation activities</td>
<td>30 points</td>
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<tr>
<td>A series of graded activities with varying deadlines will be placed on the course web site. You will be expected to check this web site on a daily basis and to complete those assignments by the indicated deadlines. Some of these assignments will involve answering questions that will be similar to questions on the midterm and final examinations.</td>
<td></td>
</tr>
<tr>
<td>Midterm</td>
<td>20 points</td>
</tr>
<tr>
<td>Paper</td>
<td>10 points</td>
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Write a summary article, as if for the summary articles in Science or Nature, describing the topic presented by one of the approved seminar speakers (list of approved seminars is attached, and will be updated over the course of the quarter). Your paper should summarize the experimental methods and results, including a discussion of model system(s), if appropriate, and an analysis of variables that were considered (or not) and limits in interpretation of the data presented. You should compare the guest lecturer’s presentation with related work by other biological scientists.

Attendance and participation 10 points
Attendance will be taken during recitation and in lecture. Participation will be evaluated in recitation. Every absence must be excused by the Course Coordinator. Absences due to official university-sanctioned events or (documented) illness of the student generally will be automatically excused; other excuses will be reviewed on a case-by-case basis.

Final exam 30 points

>90% A
81-90% B
71-80% C
61-70% D
<61% E

Academic Misconduct:
It is the responsibility of the Committee on Academic Misconduct to investigate or establish procedures for the investigation of all reported cases of student academic misconduct. The term “academic misconduct” includes all forms of student academic misconduct wherever committed; illustrated by, but not limited to, cases of plagiarism and dishonest practices in connection with examinations. Instructors shall report all instances of alleged academic misconduct to the Committee on Academic Misconduct (Faculty Rule 335-5-487). For additional information, see the University's Code of Student Conduct (http://studentaffairs.osu.edu/resource_csc.asp).

Disability Services:
Students with disabilities that have been certified by the Office for Disability Services will be appropriately accommodated, and should inform the Course Coordinator as soon as possible of their needs. The Office for Disability Services is located in room 150 Pomerene Hall, 1760 Neil Avenue; telephone 614-292-3307, TDD 292-0901; http://www.ods.ohio-state.edu/.
Weekly schedule of lectures and assignments:

Module 1: Model systems as a tool in biology
This module is designed to introduce students to common model systems used in genetics, cellular and molecular biology, and ecology. Students will gain an understanding of how biologists use model systems and how information from one model system can (or cannot) be extrapolated to other organisms.

Lecture 1
Why scientists use models.
How do biologists dissect complex processes?
Why don’t people work on elephants and fleas?
Why do we choose the models that we do?

Recitation 1:
Examine specimens of model systems: Zebrafish, Arabidopsis, C. elegans
What do we want in the “ideal” model system?
Suppose the problem is an ecological problem, how do you establish system – model communities
Recitation assignment: Position paper: Explain why research on a particular model organism should be funded (i.e. what are the strengths of this model organism).

Lecture 2
Brief description of standard (genetic) model systems
Historical perspective + tools available in systems chosen + complexity
Strengths of different systems… disadvantages of certain model systems
Escherichia coli
Saccharomyces cerevisiae (yeast cell cycle – insights about cancer)
(Neurospora crassa)
Chlamydomonas reinhardii
Zea mays
Arabidopsis thaliana
D. Dictyostelium
C. elegans
D. melanogaster
Zebrafish
Mouse
Mathematical models
Systems biology

Module 2: Development of multicellular organisms: are we really like a fly?
This module will reinforce basic concepts of the cell cycle and genetics as students explore related examples of development in different model systems. The focus will shift from the roles of hox genes and segmentation in Drosophila to the roles of hox genes in mouse, and will conclude with a discussion of the entirely different mechanisms of plant
development and organ formation. The module will conclude with a discussion of the genetic basis of behavior.

Lecture 3
How do multicellular organisms organize themselves?
Discuss regulation of the cell cycle (tie in to *S. cerevisiae* discussion from Module 1). Present *Dictyostelium discoideum* development and the mechanisms by which single cells aggregate and form a multicellular organism. Discuss the central themes of development: patterning, cell fate specification, differentiation, cell-cell interactions, gastrulation and organized cell movements.

Recitation 2:
Turn in position paper supporting funding of a model organism.
Who funds science, what is “responsible” science?
Discuss the weaknesses of the model system you proposed in your paper – why is it important to fund research using more than one model organism?

Lecture 4
How do we understand how this complex process of development works?
Describe the approaches of classical embryology. What was learned and what are the limitations? Discuss the limitations of biochemical approaches in ‘reconstituting’ development. Focus on genetic approaches to dissecting development. Describe loss-of-function and gain-of-function mutations, forward genetic screens, and genomic-based approaches to development.

Lecture 5
Why do wings normally form on the thorax and antennae on the head of a fly?
Describe the pathways that pattern the Drosophila embryo. Discuss maternal versus zygotic regulation. Present the cascade of segmentation genes that define the appropriate number of segments. Describe homeotic (Hox) genes and their role in specifying segmental identity.

Recitation 3:
Examine Burgess shale fossils – speculate about development of some of the more unusual organisms; what is similar to extant living organisms? Propose mechanisms for the development of the body plan exhibited by these unusual organisms.
Examine how diverse forms can result from single mutations
Morphological structures – diversity of forms – molecular diversity—classification of organisms
Classical classification systems based on morphology; now can be more closely defined based on molecular changes

Lecture 6
Are Hox genes conserved in other animals?
Discuss the conservation of developmental pathways focusing on Hox genes.
Present Hox gene complexes and Hox gene function in mouse. Are Hox genes found in
unsegmented animals like Hydra? Discuss the role these developmental regulatory genes play in specifying the diversity of body plans using arthropods as an example.

**Lecture 7**
How do cells interact with each other during development?
When and why do cells need to interact with each other during development?
Present a cell signaling pathway that is important in development (the Hedgehog or Wnt signaling pathways could be used as examples). What are the components of a signaling pathway (ligands, receptors, cytoplasmic signaling proteins). Discuss how these signaling pathways are used multiple times in development and disease.

**Recitations 4 and 5:**
Choose one disease from the suggested list of human genetic diseases. Work in small groups to find background information and prepare a 10 min presentation about that disease. What are the symptoms; what gene (or genes) is affected; what is the most common mutation(s) giving rise to the disease; how can you explain the symptoms in terms of the mutation; how can the disease be treated; how is the disease being studied (model organisms)? Recitations 4 and 5 are reserved for the groups to present their results.

**Lecture 8**
What are the similarities and differences in plant and animal development?
Discuss the differences between plants and animals. Address whether common regulatory pathways are conserved in animal and plant development. Are the same developmental paradigms used? Are the same types of proteins used for development in these different kingdoms? What plant models are used to study developmental mechanisms? Early patterning of the Arabidopsis embryo and homeotic genes regulating flower patterning could be a focus.

**Lecture 9**
What is the genetic basis for complex behaviors?
Discuss how the same approaches that have been used to understand development can be applied to complex behaviors, including learning and memory. How have learning and memory been dissected in an invertebrate model system like Drosophila or C. elegans? Describe how the genetic screens were done. Discuss some of the genes that were identified and the nature of these gene products. Extend the role of these genes in vertebrate learning and memory. Alternatively, other complex behaviors (e.g. circadian behavior) could be discussed.

**Module 3: Tropical Wet Forest Ecosystem Diversity**
*Students will examine the evidence for the loss of biodiversity in the context of the systems from which this evidence was obtained.*
(7 lectures, 3 recitations)
Lecture 10
What is tropical forest?
Introduction of tropical climates (sun, water, atmosphere and topographic effects).
Distinguish the three levels of biodiversity - examples from tropical forest; ecosystem diversity exemplified by different types of tropical forest (evergreen/wet; seasonal; dry; cloud; etc.) and other ecoregion types; include ecoregional geography.
Demonstrate TWFE species diversity.
Distinguish key taxa and identify phylogenetic relations (kingdom through class).
Relate form and function to biological classification and ecology of plants and animals.

Lecture 11
Why are there so many species?
Describe ecosystem structure, including trophic levels and energy flow.
Define niche and the different categories thereof (e.g., auto- vs. heterotroph; producers vs. consumers) including fundamental and realized niches, and competition and results thereof; relate back to form and function for each group.
Illustrate macrostructure of TWFE (canopy strata; special symbiotic forms).
Describe energy flow and trophic pyramids; emphasize magnitude of insolation.
Define species richness and diversity and measurement thereof – see Recitation 6.
What are the hypotheses for the origin of tropical diversity?

Recitation 6
Measuring community richness and diversity.
Working with community richness measures is somewhat less mathematically complex than working with community evenness measures of diversity. The former is more practical to do, however, since it only requires knowledge of species presence or absence, and lots of databases are available for such data; this is also what most people are thinking of with regards to (species) diversity, and comparisons thereof. Evenness measures require knowledge of proportional abundances of each species and so appropriate databases are not necessarily that easy to find.

Two sources including such data for certain groups of vertebrates are:


Lecture 12
Metabolic variation in TWFE
Describe photosynthesis with regards to summary reaction and a basic description of the component processes, including raw materials and products; include variation in carbon fixation.
Describe cellular respiration with regards to summary reaction and a basic description of the component processes, including raw materials and products; include variation in anaerobic processes.
Recognize different processes for matter and energy in ecosystems, including the second law of thermodynamics as it relates to ecosystem structure and function.

Explain why nutrients cycle in ecosystems.

Describe the basic nutrient cycles for carbon, nitrogen and water; include sources and sinks, as well as human alterations thereof; consider tropical soil structure and nutrients.

Explain gross and net primary productivity, and biomass; explain global patterns of NPP and potential limits to productivity.

Distinguish endothermy and ectothermy, and discuss their relationships to respiration and secondary productivity.

**Lecture 13**

Biotic Interactions I

Describe predator – prey relationships within the context of food chains and food webs. Why are food webs more common?

For four categories of prey responses to predators, appearance; structure; chemical; and, behavioral, discuss the range of prey responses to predation.

Chemical ecology – how chemistry helps in communication and defense

Describe and illustrate the various types of symbioses; how might mutualisms be considered especially important in tropical ecosystems?

**Recitation #7**

Develop a list of species that exhibit different patterns of distribution worldwide. Discuss differences in distribution (biogeography; fragmentation of habitat; etc.)

Develop a model: how do you see the world in 50 years? Provided with certain assumptions, students extrapolate to estimate the amounts of cropland, forest, urban areas, and species and biodiversity distributions in 50 years. These results are provided to the lecturer to demonstrate in lecture 15 how the same set of starting parameters can lead to widely differing views of the future of the planet.

**Lecture 14**

Biotic Interactions II

What is social behavior, and what are its advantages and disadvantages?

Illustrate the significance of social behaviors to TWFE community structure and function.

Describe variability in foraging behavior and indicate its relationship to TWFE diversity; how do predators overcome the defenses of prey?

Identify patterns of mating systems and parental care; how are these elaborated in TWFE?

**Lecture 15**

How do we save the TWFE?

Identify and explain the connection between tropical agriculture and conservation of TWFE; consider highways, forest clearing and immigration, as well as additional effects of (tropical) deforestation; compare large-scale with swidden agriculture.

Consider general problem of ecosystem conversion and biodiversity loss.

Climate change and its impact on TWFE.

**Recitation #8:**

Ecoregions
World Wildlife had a major role in developing the hotspot concept (along with Conservation International and The Nature Conservancy), and they co-sponsored big books titled “Hotspots” (a term for concentrated ecological regions of unusually high biodiversity) and “Megadiversity” (a term for countries with unusually high biodiversity). CI still features the term on their website, but WWF and TNC have switched to the term ecoregion, which is arguably better rooted in database science.

Each student or group will pick a specific ecoregion, and will have to discuss the justification for investment in preserving biodiversity in that area of the world.

Lecture 16
Lecturer reviews results of recitation activity on modeling the world in 50 years (perhaps focusing on the most extreme results only).
Dilemmas in conservation biology: trade-offs in conservation vs human population pressures.
What are the basic principles of population biology, and how do these relate to conservation biology?
How does TWFE illustrate the various kinds of values of biodiversity?
Consider specific examples of species or communities of conservation concern.
What are the techniques available to conservation biologists to use in conserving TWFE biodiversity?

Module 4: Biology and the human experience
The course will conclude with an examination of current literature on human evolution, including studies from different disciplines to demonstrate how our understanding of the topic is supported through integration rather than relying on a single disciplinary approach. Students will integrate their study of biology with the human experience.

Lecture 17
Human genetics
Imagine the year 2012: your entire genetic sequence is known.
2007: What do we know about human genetics and how do we know it?
Modern humans are tremendously diverse
Studies of human mitochondrial DNA; Y chromosome
Isolated populations: Icelandic study; Amish
Drug resistance; different responses to drugs
Limited number of haplotypes
Comparative genomics – information beyond Homo sapiens
Ethics: rights to human data

Recitation 9
Construct a study to determine the genetic basis of selected topics (for example, language acquisition, skin color, metabolic diseases, etc.). Discuss in class the regulations on human research and valid avenues of scientific inquiry.
Lecture 18
Biology and human history
1492 and earlier: What happened? Early colonization and migration
How the Americas were colonized
Relationship between biology and history
Guns, Germs and Steel approach
Using languages to trace human migration... relationship with human genetics and
archaeological studies
“The Columbian exchange” diseases, agriculture
How does human migration impact ecology and vice versa?
Collapse of civilizations

Earlier still – human origins
Domestication of crops and animals
Climate change – glaciation
Why were Neandertals unsuccessful?
Human evolution: Type II diabetes as example
(Which genes are “more rapidly” evolving?)
Recent articles on hominin evolution

Why biologists have come to certain conclusions about human origins
How has comparative genomics been used to address origin of humans and human
migration?

Lecture 19
The bounds of biology
Misconceptions, over-simplifications and outright myths in the popular press

Recitation 10
Discuss the strengths and weaknesses of Jared Diamond’s arguments.
How do biologists study these questions?

One-page paper to be turned in at the time of the final exam:
If mathematics and physics gave us computers and space travel in the 20th century, what
is biology going to give us in the 21st century, and how do you see your role, as a
biologist, in implementing these changes?

Recitation:
Correlate genetic divergence with morphological divergence
Appendix 5: Proposed Biology 320 syllabus

Biology 320
Biological Inquiry

Objectives: A seminar-style class designed to introduce sophomores majoring in biology to methods of inquiry in the biological sciences, to foster faculty-student interactions, to develop appropriate professional behavior, to develop life-long learning skills in the sciences, and to stimulate critical thinking skills.

Course structure: Class meets once per week for 1h 48 min. Students receive 2 credit hours. Class offered Au, Wi, Sp quarters, with different coordinators and speakers each quarter. Maximum enrollment: 100 students each quarter. Class is graded S/U.

Prerequisites: Biology 114 and Rank 2 status (student has earned at least 45 credit hours); restricted to students with a major in the College of Biological Sciences; not open to students with credit for Biochem H200 or MolGen H220, or other similar departmental freshman or sophomore seminars to be developed; or by permission of the Course Coordinator.

Course coordinator: The Course Coordinator is a faculty member in the College of Biological Sciences. Each offering of Biology 320 will be widely publicized to student lists, College of Biological Sciences advisors, and Arts and Sciences advisors at least one quarter in advance. The Coordinator is responsible for inviting and scheduling seminar speakers, preparing and distributing handouts and limited background materials describing the next week’s seminar (typically 3-5 pages), working with discussion leaders to make sure class discussion is appropriate, evaluating each discussion group, and collecting and grading reflection papers each week. All College faculty are expected to participate in Biology 320 (as speakers and/or coordinators).

Grading policy:
Attendance and class participation: 30 points
Journal: 30 points
Discussion leader group activity: 40 points
There is no final exam for this class.
≥ 75 points = Satisfactory
< 75 points = Unsatisfactory

Attendance and class participation: For each absence, no matter what the excuse, the student will receive a 5 point penalty. Under certain circumstances (e.g. serious and unexpected health problems, family emergency), the Course Coordinator may choose to give a student a special assignment to make up points missed due to class absences (e.g. attend a different seminar and prepare
a written report). Participation points will be awarded based on each student's interaction with the seminar speakers, i.e. whether they occasionally ask questions and participate in class discussions – quality of the interaction is more important than quantity.

**Journals** will be collected at the end of the quarter, and may also be collected and reviewed during any class period by the course coordinator. The journal entries have three parts: questions based on the background reading, answers to those questions, and reflections on the significance of the seminar. Each week, students should bring to class their journal, in which they have written at least one question based on their reading of the background material. Questions may include topics such as the significance of the research; the research methods; interpretation of results; how this research relates to specific findings by others; ethics of the research; etc. Before the next class period, each student should briefly answer their own questions, whether or not they were addressed during the seminar or the post-seminar discussions. In addition, students should comment on how the seminar has affected their understanding of the topic addressed.

**Discussion leader group**: A group of 10-12 students each week will be assigned to introduce the speaker and lead the discussion at the end of the seminar.

Responsibilities of the group include:

- Seek out additional background readings and materials (including Internet, textbook, and peer-reviewed publications)
- Post significant readings on the course website, accompanied by a 1-2 sentence synopsis of each posted reading written by one of the group members
- Each individual group member should send the Course Coordinator 2-3 questions for discussion by 4:00 pm 2 days before the seminar [The Course Coordinator will compile and edit the questions, possibly adding a few, and distribute the compiled list to the entire group the day before the seminar]
- Assign responsibilities within the group, such as introducing the speaker, leading the discussion, and thanking the speaker
- Introduce the speaker at the beginning of class (introductions should include the speaker’s name, educational background, current position, and seminar title -- some creativity is acceptable, but speakers should be treated with respect and courtesy)
- At the end of the seminar, ask for questions from the class, seed the discussion by asking questions for the Coordinator-approved list, and steer the class discussion in appropriate directions
- Conclude the classroom discussion and thank the speaker (again, some creativity is acceptable, but speakers should be treated with respect and courtesy)
• Meet with the Course Coordinator to discuss their performance and to document the group’s activities for the Course Coordinator.

Discussion leader group participants will receive up to 20 points as a “group” grade and up to 20 points as an individual score. It is expected that, at a minimum, each student in the group will have asked one question during the discussion and will have summarized one significant paper for the website.

Sample class schedule:
Week 1 (Speaker: Course Coordinator):
- Course expectations and mechanics
- Traditions and expectations in biological inquiry
  - How do scientists choose a research topic?
  - How is research supported?
  - What is a peer-reviewed publication?
- Research databases
- Explain theme for the quarter; background information
- Distribute background reading for Week 2 seminar speaker
- Assign discussion leader groups for weeks 2-10

Weeks 2-10:
- 3:00 Start of class – Discussion leaders introduce speaker
- 3:10 Seminar speaker and title TBA
- 4:00 Speaker concludes - Discussion leaders ask questions and lead discussion -- each discussion leader should ask at least one question; discussion leaders should also watch for questions from the audience; seminar speaker may be involved in discussion, or may stand back and let students engage each other in discussion
- 4:35 Speaker summarizes student discussion, adding his/her own perspective and knowledge to the discussion
- 4:40 Discussion concludes – Discussion leaders thank speaker
- Course Coordinator hands out materials for next week’s speaker and provides a brief transition to the next speaker’s topic
- 4:45 Class dismissed

Course Coordinator meets 5-10 min with group discussion leaders to review their performance

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Appendix 6: Approved Specialization Areas

Specialization Areas for the Biology Major

Note that courses may be approved in the Specialization Areas below which would not otherwise be approved for the Biology major. Students are responsible for checking course prerequisites; not all are included in the lists below. Where several courses are listed with an “or,” only one of those listed may be counted toward the Biology major. When two courses are linked with an “and,” both must be taken to satisfy the requirement within the specialization.

Life Sciences Education (≥ 31 credit hours beyond the core)
Students wishing to pursue a career as a high school science teacher are encouraged to complete a bachelor's degree in the content area (e.g., biology) and apply to the Master’s of Education (M.Ed.) program through Ohio State's College of Education. For additional information about entrance requirements to the M.Ed. program, please refer to www.coe.ohio-state.edu.

Required: Introduction to Biological Chemistry, Biochemistry 511 (5 cr.)
Required: General Genetics, Mol Gen 500 (5 cr.)
Required: Evolution, EEOB 400 (5 cr.)
Required: Basic and Practical Microbiology, Micro 509 (5 cr.)
Required: General Plant Biology, PCMB 300 (5 cr.)
Additional Coursework: Choose at least two courses from the following list or consult with a Biology major advisor for additional options.
  - General Entomology, Entomology 500 (5 cr.)
  - Introduction to Ornithology, EEOB 322 (5 cr.)
  - Diversity and Systematics of Organisms, EEOB 405.01 (4 cr.) (strongly recommended)
  - Ichthyology, EEOB 621 (5 cr.)
  - Mammalogy, EEOB 625 (5 cr.)
  - DNA Fingerprinting Workshops in Columbus Public Schools, Mol Gen, Biochem, or Micro 591 (2 cr.; may be counted only once)

Forensic Biology (≥ 20 credit hours beyond the core)
Recommended additional prerequisite: Introduction to Physical Anthropology, Anthropology 200 (5 cr.)

Required: an introductory course or sequence in biochemistry, Biochemistry 511 or Biochemistry 613 and 614 (5-8 cr.)
Required: an introductory course or sequence in molecular genetics, Mol Gen 500 or Mol Gen 605 and 606 (5-8 cr.)
Additional coursework in molecular biology and forensic science: choose at least three courses or series from the following list:
- Biological Anthropology of the Human Skeleton, Anthropology 603.01, 603.02, 603.03, or 603.04 (5 cr.)
- Forensic Anthropology, Anthropology 640.04 (5 cr., Anthro 603.01 prereq.)
- Third course in Biochemistry and Molecular Biology, Biochemistry 615 (4 cr.)
- Eukaryotic Molecular Genetics Laboratory, Mol Gen 601 (5 cr.)
- Cell Biology, Mol Gen 607 (3 cr.)
- Molecular Genetics, DNA Transactions, Mol Gen 701 (3 cr.)
- A course or sequence in microbiology, Micro 509 or Micro 520 and 521 (5-10 cr.)
- DNA Fingerpinting Workshops in Columbus Public Schools, Mol Gen, Biochem, or Micro 591 (2 cr.; may be counted only once)

Pre-Health Professions (≥ 23 credit hours beyond the core)

Required: an introductory course or sequence in molecular genetics, Mol Gen 500 or Mol Gen 605 and 606 (5-8 cr.)

Additional coursework: choose at least four courses from the following list:

- A course or sequence in biochemistry, Biochemistry 511 or Biochemistry 613 and 614 (5-8 cr.)
- Evolution, EEOB 400 or H400 (5 cr.)
- A course or sequence in microbiology, Micro 509 or Micro 520 and 521 (5-10 cr.)
- Principles of Animal Cellular and Developmental Biology, EEOB 415 or H415 (4 cr.)
- Vertebrate Histology, EEOB 630 (5 cr.)
- A course in human or comparative anatomy, Anatomy 200 or EEOB 410 or H410 (4-5 cr.)
- A sequence in human physiology, Physiology CB 311 and 312 or Physiology CB 601 and 602 (10 cr.)
Appendix 7: 4-Year Sample Curriculum

FRESHMAN YEAR: 51 credit hours
Autumn: Biological Sciences 100
        Chemistry 121
        Mathematics 150
        GEC-Social Science
Winter:  Biology 113
        Chemistry 122
        Mathematics 151
Spring:  Biology 114
        Chemistry 123
        Mathematics 152
        GEC-English 110

SOPHOMORE YEAR: 45 credit hours
Autumn:  Biology 320 (Major course)
        Chemistry 251
        GEC-Foreign Language
        GEC-Arts & Humanities
Winter:  Biology 401 (Major course)
        Chemistry 252
        Chemistry 254 or 245
        GEC-Foreign Language
Spring:  Biology 402 (Major course)
        Chemistry 255 or 246
        GEC-Foreign Language
        Elective

JUNIOR YEAR: 45 credit hours
Autumn:  Major Course
        Physics 111 or 131
        GEC-Foreign Language
Winter:  Major Course
        Physics 112 or 132
        GEC-Social Science
Spring:  Major Course
        Physics 113 or 133
        GEC-Second Writing Course

SENIOR YEAR: 40 credit hours
Autumn:  Major Courses
        GEC-History
Winter:  Major Courses
        GEC-History
        Elective
Spring:  Major Course
        GEC-Arts & Humanities
        GEC-History

(Distribution of credit hours: 60 credit hours GEC excluding natural science and mathematics; 67 credit hours natural science and mathematics prerequisites; 45 credit hours on the major; 9 credit hours of electives = 181 credit hours)