May 5, 2014

Bruno Nachtergaele, Chair
Davis Division of the Academic Senate

Subject: Establishment of New Major in Cognitive Science

Dear Professor Nachtergaele,

The faculty of the Philosophy, Psychology and Linguistics Departments, as well as the Center for Mind and Brain have proposed establishing a major in Cognitive Science. In accordance with the provisions of PPM 200-25, the proposal has been reviewed by Dean George R. Mangun, Division of Social Sciences, who has expressed support for the proposed action.

After careful review the College of Letters and Science Executive Committee has recommended approval of the proposal to establish the major in Cognitive Science. On behalf of the Executive Committee, I am hereby forwarding the proposal to you for review and action by the Davis Division.

Sincerely,

Phillip Shaver, Chair
Executive Committee
College of Letters and Science

cc: B. Floyd, Director
Undergraduate Education and Advising
College of Letters & Science
Proposal for the Creation of an Interdisciplinary Undergraduate Major in Cognitive Science

Professor Philip Shaver Chair,
Executive Committee College
of Letters and Science

Dear Professor Shaver

With the support of the Dean of the Division of Social Science and of the Departments of Philosophy, Psychology, and Linguistics, a conference committee consisting of faculty in these departments as well as the Center for Mind and Brain hereby propose creation of a new interdisciplinary undergraduate Major in Cognitive Science. The Major would lead to either the BA degree or the BS degree.

(This is our fourth submission of the proposal. The current proposal differs in important ways from earlier versions. We thank the Educational Policy Committee for helpful suggestions.)

We believe that this Major will be a welcome addition to the options that UC Davis makes available to its students. It is possible of course at present for students to take an independent major in cognitive science. Although we do not have an accurate count, we believe that cognitive science is one of the most common majors among students doing independent majors. For this reason and others, we believe the new Major may attract a reasonably large number of students. We speculate that the program may have as many as 150 to 250 majors when it matures.

1) This proposal has been prepared in accord with UC Davis PPM 200-25 and the Policies and Procedures of the College of Letters and Science, which permit a major to be established by a “conference” among members of two or more departments. The members of the committee are Bernard Molyneux (Chair of the Committee, Department of Philosophy), Steve Luck (Director of the Center for Mind and Brain, Department of Psychology), David Corina (Center for Mind and Brain, Department of Linguistics), and David Copp (Chair of the Department of Philosophy). During the review process, inquiries and decisions regarding the major should be communicated to David Copp, who will then transmit them to the rest of the committee.

2) According to PPM 200-25, the major must be under “the sole or joint jurisdiction” of an academic unit or units such as a department or departments or a college or division. We do not want to create a new academic unit – an interdisciplinary Program with a capital “P”. Instead, our intention, for simplicity, is to have the major administered by an existing academic unit or units. Since the major is interdisciplinary, there seem to be two reasonable options. First, the major could be under the joint jurisdiction of the core departments of Philosophy, Psychology, and Linguistics. Second, it could be placed under the jurisdiction of the Division of Social Science (DSS). We prefer the second option – and the Dean of the Division has agreed to it –
because it seems the simpler of the two. In this case, the Director of the major would chair the Advisory and Curriculum Committees for the major (see below) and would report to the Dean of the Division.

3) We have included in the set of documents attached to this letter a document entitled “Procedures and Governing Regulations, Cognitive Science.” This document specifies that, in accord with UC Davis PPM 200-25, the major would be under the jurisdiction of the Division of Social Science (DSS). The program would be administered by a Director who would chair an Advisory Committee and a Curriculum Committee. The Director would be appointed for a three year term by the Dean of the DSS after consultation with the chairs of the Departments of Philosophy, Psychology, and Linguistics. The Director would appoint the members of the Advisory Committee from among faculty interested in cognitive science after consultation with the chairs of the Departments of Philosophy, Psychology, and Linguistics. The Director would appoint the members of the Curriculum Committee from the membership of the Advisory Committee after consultation with the chairs of the Departments of Philosophy, Psychology, and Linguistics. The Director reports to the Dean of the DSS.

4) Staff support for the major will be provided by the Yellow Cluster administrative support center, of which Carmina Caselli is the CAO, and the program office will be in the Department of Philosophy.

Our Dean, G. Ron Mangun, is fully in support of the new major and we have discussed staff support for the major with him and Assistant Dean Steven Roth. They have decided that the new major will be given administrative support by the Yellow Cluster. We have consulted CAO Carmina Caselli of the Yellow Cluster. She suggested that she would need 0.5 FTE in addition to the staff already housed in the Cluster. In a recent email she said:

"In the meeting it was discussed that 0.5 FTE would be sufficient staffing and that it would be provided by existing staff within the Yellow Cluster. Our hopes at the time were to trust in the new funding model; with additional students would come additional funds based on SCH (student credit hours). While we wait, we use existing staff. Since that meeting we were told about the Provost’s plan to help increase SAOs across the campus. The Yellow Cluster is targeted to receive one FTE. We don’t know when, but it is in the plan."

5) The proposal is supported by the Departments of Philosophy, Psychology, and Linguistics. These Departments are centrally involved in the major because their courses are among the core courses for the Major and their faculty will be centrally involved in administering the Program. These Departments each voted their support for the proposal. See the attached letters.

The proposal has been approved by all the affected departments whose courses are included as electives for the Major: Biomedical Engineering (BME), Communication, Computer Science (ECS), Economics, Education, Electrical and Computer Engineering (EEC), Human Development, Neurobiology Physiology and Behavior (NPB), Statistics. (See the attached memos.) One or more courses from each of these departments are included on a long list of courses from which majors might select a few. We don't think this would lead to a significant
impact on any of these departments.

6) The proposal includes reference to new courses in cognitive science for which we are or will seek approval from Courses of Instruction Committee. The set of documents submitted with this proposal includes a document entitled “Proposed New Courses: Cognitive Science.” This document provides a one paragraph description of each course.

7) Once these courses are approved, the proposal will require modification. We request that these planned modifications be approved at the same time as the proposal itself in order to save ourselves and the relevant committees and reviewers additional time dealing with changes we can now explain and justify. The planned modifications are explained under [A] and [B] below.

[A] The following two new courses are required by the course of study for the major:

PHI 10, Introduction to Cognitive Science, 4 hrs/week, Lecture/Discussion
CGS 100 Cognitive Science, 3 hours/wk, Lecture/Discussion

Since there is currently no cognitive science major under which either course could be proposed, the former has been proposed as PHI 10 “Introduction to Cognitive Science” so that students interested in beginning the major could take the course right away. The Department of Philosophy is currently seeking approval for this course. After the first year, assuming there then exists a cognitive science major, we plan to seek approval to introduce the course under a three letter code pertaining to the new major, e.g. as CGS 1. We would then like to list it in the major, replacing “PHI 10” wherever it appears in the proposals and in the catalog entry for Cognitive Science with “CGS 1” or whatever code is approved for the course.

For the same reasons, we use the dummy code “CGS 100” for the anticipated upper division cognitive science course. We hope to propose this course upon approval of the cognitive science major.

We hope that approval of the proposal as it currently stands will be construed to include approval of the future modification whereby “PHI 10” will be replaced with “CGS 1” and also to include approval of the addition of CGS 100 without the need to go back to the committee.

[B] The proposed course of study for the new major currently requires students to take both the three credit hour lecture course, PHI 13, and the one credit hour companion course PHI 13G which adds a writing requirement and discussion sections. For various reasons that are not relevant here, the Department of Philosophy is currently seeking approval of a change whereby PHI 13 will remain a three credit-hour lecture course and PHI 13G will become a four credit-hour course that subsumes both the lectures of PHI 13 and the writing requirement and discussion sections. Once this change is approved, we will need to modify the requirements for the Cognitive Science major to replace all occurrences of “PHI 13 and PHI 13G” with “PHI 13G” and also of course to adjust wording to preserve the grammaticality of the resulting sentences.
We hope that approval of the proposal as it currently stands will be construed to include approval of the future modification – after PHI 13G is changed to become a four credit-hour course – whereby the requirement that students take both PHI 13 and PHI 13G will be replaced with a requirement to take PHI 13G.

8) The Policies and Procedures of the College specify that

“Proposals should minimally include:

a) The name of the sponsoring department or program and the name of a faculty representative to whom inquiries and decisions regarding the major could be communicated during the review process.
b) The purpose and distinctive features of the program. How does it differ from existing majors on campus and in the UC system?
c) A separate page detailing the proposed requirements for the major as they would appear in the General Catalog
d) Relationship of the program to the academic plans for the college and campus.
e) Resource implications of establishing the major. This should include estimated costs of new courses or augmented instructional support for existing courses that could be expected to experience increased enrollment demand.
f) Evidence of undergraduate student interest in the subject matter and estimates of the number of students expected to enroll in the proposed new major for the first five years.
g) Comments on the proposal from Chairs and Directors of academically associated departments and programs, and, if available, students interested in pursuing the minor.”

Item a) has been dealt with in this memorandum. Items b) through f) are dealt with in the attached detailed proposal. Item g) is dealt with in separate attachments. A list of the academically associated departments and programs is found above under 5).

Yours sincerely,

[Signature]

David Copp
Distinguished Professor
Chair
Department of Philosophy
Procedures and Governing Regulations, Cognitive Science

January 2014

1. In accord with UC Davis PPM 200-25, the major is under the jurisdiction of the Division of Social Science (DSS).

2. The program is administered by a Director who chairs an Advisory Committee and a Curriculum Committee.

3. The Director is appointed for a three year term by the Dean of the DSS after consultation with the chairs of the Departments of Philosophy, Psychology, and Linguistics.

4. The Director appoints the members of the Advisory Committee from among faculty interested in cognitive science after consultation with the chairs of the Departments of Philosophy, Psychology, and Linguistics.

5. The Director appoints the members of the Curriculum Committee from the membership of the Advisory Committee after consultation with the chairs of the Departments of Philosophy, Psychology, and Linguistics. The Curriculum Committee considers and decides by majority vote on all proposed changes in the major and in courses offered by the major.

6. The Director reports to the Dean of the DSS and, at least once each academic year, to the Advisory Committee.
Proposed New Courses: Cognitive Science

PHI 10/CGS 1: Concepts and techniques in the post-behaviorist interdisciplinary study of mind. Elementary introductions to the study of memory, mental representation, symbol systems, neural networks, automata theory, artificial intelligence, generative grammar, formal linguistics, psycholinguistics, the language of thought hypothesis, mental modularity, generative grammar, brain mapping, the mind-body problem and the search for the neural correlates of consciousness. Connections between the various cognitive sciences are emphasized.

Illustrative Reading:

CGS 100: Cognitive Science: This course will be a capstone course in which students are given the opportunity to see the various courses they have taken from a unified inter-disciplinary perspective. When possible, the course will include contributions from guest lecturers, and may take the form of a speaker or seminar series. Students will write a synoptic paper or papers on topics assigned by the instructor.

The following related courses in Philosophy are also under review.

PHI 136: Formal Epistemology: Introduction to recent formal and mathematical approaches to questions of traditional interest to the epistemologist, i.e. to questions concerning knowledge and to the justification and revision of belief in light of evidence. Topics will include the AGM postulates for belief revision; the use of Kripke models for modeling knowledge, including multi-agent models; and Bayesian approaches to belief revision in light of evidence.

PHI 133 (to be proposed) Logic for Artificial Intelligence: Students are introduced to a research tradition in automated reasoning that emphasizes the development of non-monotonic logics (extensions of classical logic that permit revisions and inferences from lack of contrary evidence). These approaches are said to be more psychologically plausible and more computationally tractable than the rival, Bayesian, approaches, which emphasize accuracy. The course may either focus entirely on a rigorous exploration of non-monotonic logics or cede time to contrastive Bayesian approaches.

Illustrative Reading: Lukaszewicz, Witold, Non-Monotonic Reasoning: Formalization of Commonsense Reasoning
MAJOR IN COGNITIVE SCIENCE

COURSE OF STUDY LEADING TO AB IN COGNITIVE SCIENCE
DESCRIPTION OF THE PROPOSED AB IN COGNITIVE SCIENCE

Document prepared by Bernard Molyneux, G.J. Mattey and Joshua Peterson.

May 2, 2014

Contact Information

Lead Proposer
Bernard Molyneux (molyneux@ucdavis.edu)

Steering Committee
David Copp (dcopp@ucdavis.edu)
David Corina (dpcorina@ucdavis.edu)
Steve Luck (sjluck@ucdavis.edu)
Bernard Molyneux (molyneux@ucdavis.edu)

1 General

1. Name of Program:
   Cognitive Science

2. Campus:
   University of California, Davis

3. Degree/Certificate
   Bachelor of Arts

4. CIP Classification:
   (to be completed by Office of the President)
5. Date to be started:
   September 2014

6. If modification of existing program, identify that program and explain
   changes.
   N/A

7. Purpose (academic or professional training) and distinctive features (how
does this program differ from others, if any, offered in California?):
   The program would produce students capable of graduate study in the emerging inter-
disciplinary field of cognitive science, and provide students heading into the workplace
with a range of skills drawn from different academic backgrounds and relevant to a range
of professions. The program would match the already existing cognitive science programs
at many other universities across the country and internationally, including five other UC
campuses. The unique environment provided by UC Davis is optimal for the cultivation of
a cognitive science major given the resources it offers including the UC Davis Center for
Mind and Brain, the Center for Neuroscience, the MIND Institute, the Institute for Social
Sciences and the Humanities Institute.

8. Type(s) of students to be served:
   Due to the interdisciplinary nature of the major, the program targets students seek-
ing a broad inter-disciplinary approach to the study of mind, seeking contributions from
philosophy, psychology, linguistics, neuroscience, computer science, education, human de-
velopment, communication, systems and control and, courses permitting, anthropology and
sociology.

9. If program is not in current campus academic plan, give reason for
   proposing program now:
   In the absence of an established cognitive science major, UC Davis students have re-
cently picked up the slack by designing and approving their own individual majors in
cognitive science, with both BA and BS variants. There have, however, been questions
raised at UC Davis about the viability of keeping the individual major as an option for UC
Davis students. This has acted as a catalyst for a number of faculty to press ahead with
developing a cognitive science major.

10. If program requires approval of a licensure board, what is the status of
    such approval?
    N/A

11. Please list special features of the program (credit for experience, in-
    ternships, lab requirements, unit requirements, etc.)
The major would inherit the internships and honors thesis options of its constituting departments. This allows for a diverse array of both empirical and theoretical research options for students of the major.

12. List all new courses required: Department, Course Number, Title, Hours/Week Lecture Lab.
Two new courses are required, and four other new courses are anticipated and are included in the list of electives. The former two are:

PHI 10 (Philosophy) Introduction to Cognitive Science, 4 hrs/week, Lecture/Discussion
CGS 100 Cognitive Science, 3 hours/wk, Lecture/Discussion

Since there is currently no cognitive science major under which either course could be proposed, the former has been proposed as PHI 10 “Introduction to Cognitive Science”. After the first year, assuming there then exists a cognitive science major, we plan to list it under a three letter code pertaining to the new major, e.g. as CGS 1. For the same reasons, we use the dummy code “CGS 100” for the anticipated upper division cognitive science course. We hope to propose this course upon approval of the cognitive science major.

Two further courses are to be offered by the philosophy department in partial support of the new major:

PHI 133 (Philosophy) Logic for Artificial Intelligence, 4 hours/wk, Lecture/Discussion
PHI 136 (Philosophy) Formal Epistemology, 4 hours/wk, Lecture/Discussion

These courses concentrate on mathematical and set-theoretical approaches to processes involved (in 133) in common sense non-monotonic logical inference of the sort used in machine reasoning and (in 136) to updating and reasoning about knowledge and belief representation systems. PHI 136 has been submitted for approval to the course catalog. PHI 133 is to be submitted during the current academic year to be available, if approved, in the 2015-16 year.

The following two courses have been proposed independently of the new major but are included in the list of anticipated electives:

ECS 171 (Engineering: Computer Science) Machine Learning, 4hrs/week, Lecture/Discussion
NPB 163 (Neurobiology, Physiology, Behavior) Systems Neuroscience, 3 hrs/week, Lecture

13. List all other required courses: Department, Course Number, Title, Hours/Week Lecture Lab
See section 2 below.

14. List UC campuses and other California institutions, public or private, which now offer or plan to offer this program or closely related programs:

- University of California, Berkeley, Cognitive Science (B.A.)
- University of California, Los Angeles, Cognitive Science (B.S.)
- University of California, Merced, Cognitive Science (Ph.D., B.A., B.S., Minor)
- University of California, Santa Cruz, Cognitive Science (B.S.)
- University of California, San Diego, Department of Cognitive Science (Ph.D., B.S., B.A.) California State
- California State University, Stanislaus, Department of Cognitive Studies (B.A., Minor)
- California State University, Fresno, Cognitive Science Program (B.S., Minor)

For additional programs, by country, see: http://en.wikipedia.org/wiki/List_of_institutions_granting_degrees_in_cognitive_science

15. List any related program offered by the proposing institution and explain relationship.

   The cognitive science major draws from, and therefore relates to, each of the following majors at UC Davis:

- Psychology (BA, BS)
- Philosophy (AB)
- Linguistics (AB)
- Computer Science (BS)
- Neurobiology, Physiology, and Behavior (BS)
- as well as Anthropology, Human development, Sociology, Communication, Statistics

   Cognitive science is characterized by the fact that it takes an internal (as opposed to behavioral) approach to the question of investigating human psychology, emphasizing the logical, computational and neural processes that go into the production of external behavior, and drawing heavily from the history of theorizing on logic, mental representation
and language processing undertaken in philosophy and linguistics, and upon our knowledge of computation and embodied robotics as investigated in computer science and engineering.

16. Summarize employment prospects for graduates of the proposed program. Give results of job market survey if such has been made.

UC Berkeley provides a four year profile (2003-2006). Out of 510 graduates (42% average respondents rate), 53% were employed, 14% were attending graduate school, 22% were seeking employment, and 11% engaging in other endeavors. Within the employment sector, 73% were for profit, 4% not-for-profit, 19% education, and 4% government. Employers range from Google, Inc. to Princeton University. Titles range from Engineer to Research Coordinator. In 2011, proportion of graduate school attendance rose to 27%. The average salary was $45,147. https://career.berkeley.edu/Major2006/CogSci.stm


17. Give estimated enrollment for the first 5 years and state basis for estimate.

The number of graduates per year ranged from 25 to 108 across UC campuses. We would expect, for the AB and BS combined, to have about 150-250 declared majors in an average year once the program is established.

18. Give estimates of the additional cost of the program by year for 5 years in each of the following categories: FTE Faculty, Library Acquisitions, Computing, Other Facilities, Equipment, Provide brief explanation of any of the costs where necessary.

We do not anticipate the need for additional faculty outside of the contributing departments in the near term. In the middle term, if the program grows as expected, we anticipate 1 faculty FTE in a core cognitive science area or as a joint appointment. We see no reason for additional library acquisitions, computing, facilities, or equipment in the near or middle term. We anticipate needing .25 staff FTE at the outset, with eventual growth to .5 FTE

19. How and by what agencies will the program be evaluated?

The program will be reviewed by each of the departments – philosophy, psychology and linguistics - centrally involved in the major and by the Curriculum Committee to be established for the major. Learning outcomes will be established and students in the program will be evaluated for their progress in achieving these outcomes.
2 Outline of Major

2.1 Overview

The major is organized around a central core of requirements designed to ensure that the student has an understanding of the computational, linguistic, neurobiological, philosophical and psychological components of the cognitive sciences. In completing the preparatory subject matter requirements and items 1 and 2 of the depth requirements, students will take at least one course in each of the major areas. After acquiring this broad introduction, item 3 of the depth requirements is designed to lead students to specialize in two of the subfields. Item 4 of the depth requirements permits the students to round-out the major according to their intellectual inclinations.

2.2 A.B. Major Requirements

2.2.1 Preparatory Subject Matter

<table>
<thead>
<tr>
<th>Course</th>
<th>Description</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHI 10</td>
<td>(Cognitive Science 1 after first year of major) Intro Cognitive Science</td>
<td>4</td>
</tr>
<tr>
<td>LIN 1</td>
<td>Introduction to Linguistics</td>
<td>4</td>
</tr>
<tr>
<td>PHI 13+13G Minds, Brains and Computers</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>PSC 001</td>
<td>Introduction to Psychology</td>
<td>4</td>
</tr>
<tr>
<td>PSC 041</td>
<td>Research Methods in Psychology</td>
<td>4</td>
</tr>
<tr>
<td>STA 013</td>
<td>Elementary Statistics (or STA 100)</td>
<td>4</td>
</tr>
<tr>
<td>PHI 12</td>
<td>Introduction to Symbolic Logic</td>
<td>4</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>28</td>
</tr>
</tbody>
</table>

2.2.2 Depth Subject Matter

With reference to the course groupings listed in section 3, students pursuing the AB in Cognitive Science must complete the following requirements.

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. All courses from group A</td>
<td>12</td>
</tr>
<tr>
<td>2. One course from group B.</td>
<td>4</td>
</tr>
<tr>
<td>3. At least sixteen units from exactly two of the groups B through F.</td>
<td>16</td>
</tr>
<tr>
<td>4. Twelve additional units from any of the groups B through G.</td>
<td>12</td>
</tr>
<tr>
<td>Total Depth Requirement</td>
<td>44</td>
</tr>
<tr>
<td>Total Major Requirement</td>
<td>72</td>
</tr>
</tbody>
</table>
3 Course Groups

The starred courses in the following are those that, as covered in item 12, are not yet offered in the course catalog. All courses in the course groups can be taken without additional preparation. CGS1 (PHI10 for first year) “Introduction to Cognitive Science” is substituted as prerequisite in place of PSC 100 “Introduction to Cognitive Psychology” throughout, by arrangement with the Psychology dept.
Figure 1: Map of prerequisites for group A courses. Arrows head from the required course to the course for which it prepares the student.

3.1 **Group A: Core**

*CGS 100 Cognitive Science ................................................................. 4
PSC 101 Intro. Psychobiology ................................................................. 4
PHI 112 Intermediate Symbolic Logic ..................................................... 4
3.2 Group B: Computation

LIN 177 Computational Linguistics .................................................. 4
*PHI 133 Logic for Artificial Intelligence ........................................... 4
Figure 3: Map of prerequisites for group C courses. The key is the same as before, but with blue boxes representing group C courses. CGS 1 will replace PSC 100 as prerequisite.

**Group C: Neuroscience**
- LIN 175 Biological Basis of Language ........................................ 4
- PSC 121 Physiological Psychology .................................................. 4
- PSC 135 Cognitive Neuroscience ................................................... 4
3.3 Group D: Linguistics

LIN 103A Linguistic Analysis I: Phonetics, Phonology, Morphology
LIN 103B Linguistic Analysis II: Morphology, Syntax, Semantics
LIN 131 Intro Syntactic Theory
LIN 141 Semantics
LIN 171 Intro Psycholinguistics
LIN 173 Language Development
3.4 Group E: Philosophy

PHI 103 Philosophy of Mind ................................................. 4
PHI 104 The Evolution of Mind ................................................. 4
*PHI 136 Formal Epistemology ................................................. 4
3.5 Group F: Psychology

PSC 100 Introduction to Cognitive Psychology ........................................ 4
PSC 127 Animal Cognition ................................................................. 4
PSC 130 Human Learning and Memory .................................................. 4
PSC 131 Perception ............................................................................ 4
PSC 132 Language and Cognition ......................................................... 4
PSC 136 Psychology of Music ............................................................... 4
PSC 140 Developmental Psychology ..................................................... 4
PSC 141 Cognitive Development ......................................................... 4
3.6 Group G: Other

No additional lower division preparation is required for any courses in group G. Where additional upper division preparation is required, it is indicated. In all cases, the upper division preparation required is part of the cognitive science major.

**Communication**
CMN 101 Communication Theories .................................................. 4
CMN 105 Semantic and Pragmatic Functions of Language. ......................... 4
CMN 138 Communication and Cognition. ............................................. 4
Both 105 and 138 require CMN 101 and CMN 102 or equivalent research methods course, for which cogsci students can substitute PSC41.

**Education**
EDU 110 Educational Psychology ...................................................... 4
EDU 173 Language Development *(requires LIN 103A, 103B)* ....................... 4

**Human Development**
HDE 100C Adulthood and Aging ....................................................... 4
HDE 102 Social and Personality Development *(requires PSC 140)* ................. 4
HDE 132 Individual Differences in Cognition ....................................... 4
HDE 161 Applied Cognition and Aging .............................................. 4
HDE 163 Cognitive Neuropsychology in Adulthood and Aging ..................... 4

**Linguistics**
LIN 112 Phonetics ............................................................... 4
LIN 121 Morphology *(Requires Linguistics 103A, 103B)* ..................... 4
LIN 150 Languages of the World .................................................... 4
LIN 152 Language Universals and Typology *(Requires Linguistics 103B)* .... 4
LIN 182 Multilingualism .............................................................. 4

**Philosophy**
PHI 102 Theory of Knowledge ....................................................... 4
PHI 125 Theory of Action ............................................................ 4
PHI 128 Rationality ................................................................. 4
PHI 137 A, B or C, Philosophy of Language ....................................... 4

**Psychology**
PSC 113 Developmental Psychobiology ................................................ 4
PSC 124 Comparative Neuroanatomy .................................................. 4
PSC 129 Sensory Processes ........................................................... 4
PSC 148 Developmental Disorders (Requires PSC-140 or PSC-141.) .................. 4
PSC 152 Social Cognition ................................................................. 4

Statistics
STA 106 Applied Statistical Methods: Analysis of Variance ......................... 4
STA 108 Applied Statistical Methods: Regression Analysis .......................... 4
STA 141 Statistical Computing .................................................................. 4
MAJOR IN COGNITIVE SCIENCE

COURSE OF STUDY LEADING TO BS IN COGNITIVE SCIENCE
DESCRIPTION OF THE PROPOSED BS IN COGNITIVE SCIENCE

Document prepared by Bernard Molyneux, G.J. Mattey and Joshua Peterson.

May 2, 2014

Contact Information

LeadProposer
Bernard Molyneux (molyneux@ucdavis.edu)

Steering Committee
David Copp (dcopp@ucdavis.edu)
David Corina (dpcorina@ucdavis.edu)
Steve Luck (sjluck@ucdavis.edu)
Bernard Molyneux (molyneux@ucdavis.edu)

1 General

1. Name of Program:
   Cognitive Science

2. Campus:
   University of California, Davis

3. Degree/Certificate
   Bachelor of Science

4. CIP Classification:
   (to be completed by Office of the President)
5. Date to be started:
September 2014

6. If modification of existing program, identify that program and explain changes.
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7. Purpose (academic or professional training) and distinctive features (how does this program differ from others, if any, offered in California?):
The program would produce students capable of graduate study in the emerging interdisciplinary field of cognitive science, and provide students heading into the workplace with a range of skills drawn from different academic backgrounds and relevant to a range of professions. The program would match the already existing cognitive science programs at many other universities across the country and internationally, including five other UC campuses. The unique environment provided by UC Davis is optimal for the cultivation of a cognitive science major given the resources it offers including the UC Davis Center for Mind and Brain, the Center for Neuroscience, the MIND Institute, the Institute for Social Sciences and the Humanities Institute.

8. Type(s) of students to be served:
Due to the interdisciplinary nature of the major, the program targets students seeking a broad inter-disciplinary approach to the study of mind, seeking contributions from philosophy, psychology, linguistics, neuroscience, computer science, education, human development, communication, systems and control and, courses permitting, anthropology and sociology.

9. If program is not in current campus academic plan, give reason for proposing program now:
In the absence of an established cognitive science major, UC Davis students have recently picked up the slack by designing and approving their own individual majors in cognitive science, with both BA and BS variants. There have, however, been questions raised at UC Davis about the viability of keeping the individual major as an option for UC Davis students. This has acted as a catalyst for a number of faculty to press ahead with developing a cognitive science major.

10. If program requires approval of a licensure board, what is the status of such approval?
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11. Please list special features of the program (credit for experience, internships, lab requirements, unit requirements, etc.)
The major would inherit the internships and honors thesis options of its constituting departments. This allows for a diverse array of both empirical and theoretical research options for students of the major.

12. List all new courses required: Dept, Course #, Title, Hrs/Week Lecture Lab.
   Two new courses are required, and four other new courses are anticipated and are included in the list of electives. The former two are:

   PHI 10 (Philosophy) Introduction to Cognitive Science, 4 hrs/week, Lecture/Discussion
   CGS 100 Cognitive Science, 3 hours/wk, Lecture/Discussion

   Since there is currently no cognitive science major under which either course could be proposed, the former has been proposed as PHI 10 “Introduction to Cognitive Science”. After the first year, assuming there then exists a cognitive science major, we plan to list it under a three letter code pertaining to the new major, e.g. as CGS 1. For the same reasons, we use the dummy code “CGS 100” for the anticipated upper division cognitive science course. We hope to propose this course upon approval of the cognitive science major.

   Two further courses are to be offered by the philosophy department in partial support of the new major:

   PHI 133 (Philosophy) Logic for Artificial Intelligence, 4 hours/wk, Lecture/Discussion
   PHI 136 (Philosophy) Formal Epistemology, 4 hours/wk, Lecture/Discussion

   These courses concentrate on mathematical and set-theoretical approaches to processes involved (in 133) in common sense non-monotonic logical inference of the sort used in machine reasoning and (in 136) to updating and reasoning about knowledge and belief representation systems. PHI 136 has been submitted for approval to the course catalog. PHI 133 is to be submitted during the current academic year to be available, if approved, in the 2015-16 year.

   The following two courses have been proposed independently of the new major but are included in the list of anticipated electives:

   ECS 171 (Engineering: Computer Science) Machine Learning, 4hrs/week, Lecture/Discussion
   NPB 163 (Neurobiology, Physiology, Behavior) Systems Neuroscience, 3 hrs/week, Lecture

13. List all other required courses: Dept, Course #, Title, Hrs/Week Lecture Lab
   See section 2 below.
14. List UC campuses and other California institutions, public or private, which now offer or plan to offer this program or closely related programs:

- University of California, Berkeley, Cognitive Science (B.A.)
- University of California, Los Angeles, Cognitive Science (B.S.)
- University of California, Merced, Cognitive Science (Ph.D., B.A., B.S., Minor)
- University of California, Santa Cruz, Cognitive Science (B.S.)
- University of California, San Diego, Department of Cognitive Science (Ph.D., B.S., B.A.) California State
- California State University, Stanislaus, Department of Cognitive Studies (B.A., Minor)
- California State University, Fresno, Cognitive Science Program (B.S., Minor)

For additional programs, by country, see: http://en.wikipedia.org/wiki/List_of_institutions_granting_degrees_in_cognitive_science

15. List any related program offered by the proposing institution and explain relationship.

The cognitive science major draws from, and therefore relates to, each of the following majors at UC Davis:

- Psychology (AB, BS)
- Philosophy (AB)
- Linguistics (AB)
- Computer Science (BS)
- Neurobiology, Physiology, and Behavior (BS)
- as well as Anthropology, Communication, Economics, Education, Electrical, Biomedical and Mechanical Engineering, Human development, Sociology, and Statistics.

Cognitive science is characterized by the fact that it takes an internal (as opposed to behavioral) approach to the question of investigating human psychology, emphasizing the logical, computational and neural processes that go into the production of external behavior, and drawing heavily from the history of theorizing on logic, mental representation and language processing undertaken in philosophy and linguistics, and upon our knowledge
of computation and embodied robotics as investigated in computer science and engineering.

16. Summarize employment prospects for graduates of the proposed program. Give results of job market survey if such has been made.

UC Berkeley provides a four year profile (2003-2006). Out of 510 graduates (42% average respondents rate), 53% were employed, 14% were attending graduate school, 22% were seeking employment, and 11% engaging in other endeavors. Within the employment sector, 73% were for profit, 4% not-for-profit, 19% education, and 4% government. Employers range from Google, Inc. to Princeton University. Titles range from Engineer to Research Coordinator. In 2011, proportion of graduate school attendance rose to 27%. The average salary was $45,147. https://career.berkeley.edu/Major2006/CogSci.stm


17. Give estimated enrollment for the first 5 years and state basis for estimate.

The number of graduates per year ranged from 25 to 108 across UC campuses. We would expect, for the AB and BS combined, to have about 150-250 declared majors in an average year once the program is established.

18. Give estimates of the additional cost of the program by year for 5 years in each of the following categories: FTE Faculty, Library Acquisitions, Computing, Other Facilities, Equipment, Provide brief explanation of any of the costs where necessary.

We do not anticipate the need for additional faculty outside of the contributing departments in the near term. In the middle term, if the program grows as expected, we anticipate 1 faculty FTE in a core cognitive science area or as a joint appointment. We see no reason for additional library acquisitions, computing, facilities, or equipment in the near or middle term. We anticipate needing .25 staff FTE at the outset, with eventual growth to .5 FTE

19. How and by what agencies will the program be evaluated?

The program will be reviewed by each of the departments – philosophy, psychology and linguistics - centrally involved in the major and by the Curriculum Committee to be established for the major. Learning outcomes will be established and students in the program will be evaluated for their progress in achieving these outcomes.
2 Outline of Major

2.1 Overview

The BS is organized into two streams. The first emphasizes computational approaches to the study of mind relating to work in artificial intelligence. The second emphasizes neuroscientific and neuropsychological approaches. The BS is designed to prepare students in either stream for graduate work in a related field while nonetheless giving them a rich appreciation of work in other areas, and of the holistic, interdisciplinary approach to the mind that characterizes cognitive science.

The preparatory material for the two streams overlaps in preparing the student for a broad range of upper division courses in the cognitive sciences, but differs in the specialist preparation required. Students within each stream will find that they have the lower division preparatory matter required to take any upper division course within the major. Where further upper division preparation is required, that is also part of the major.

The upper division requirements are arranged into groups representing the appropriate sub-areas. CGS1 (PHI10 for first year) “Introduction to Cognitive Science” is substituted as prerequisite in place of PSC 100 “Introduction to Cognitive Psychology” throughout, by arrangement with the Psychology dept.

Care was taken to bring students within the vicinity of the 90 credit area requirement for science. Stream 1 requires 70-78 natural science and math credits. Stream 2 requires 76-86. It is assumed that new courses ECS 171 Machine Learning and NPB 163 Systems Neuroscience will count as math/natural science credits in the college.
3 Stream 1: Computational Emphasis

3.1 Preparatory Matter for Stream 1

3.1.1 Preparatory Matter: Universal

The universal preparatory subject matter is common to both streams of the BS and overlaps considerably with the preparatory material for the AB. The aim of this set of courses is, primarily, to give the student a broad introduction to the cognitive sciences that will prepare her to take courses in all the relevant fields. The list differs from the list in the AB in also including statistics and calculus preparation.

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAT 16AB Short Calculus (or 17AB or 21AB)</td>
<td>6-8</td>
</tr>
<tr>
<td>STA 13 Elementary Statistics*</td>
<td>4</td>
</tr>
<tr>
<td>*PHI 10 (Cognitive Science 1 after first year of major) Intro Cognitive Science</td>
<td>4</td>
</tr>
<tr>
<td>LIN 1 Introduction to Linguistics</td>
<td>4</td>
</tr>
<tr>
<td>PHI 13+13G Minds, Brains and Computers</td>
<td>4</td>
</tr>
<tr>
<td>PSC 001 General Psychology</td>
<td>4</td>
</tr>
<tr>
<td>PSC 041 Research Methods in Psychology</td>
<td>4</td>
</tr>
</tbody>
</table>

3.1.2 Specialist Preparatory Matter for Stream 1

Students in stream 1 must complete all the courses in this section. The material here is not particular to the sciences of the mind, but is essential preparation for upper division courses on artificial intelligence and machine learning.

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAT 22A+22AL Linear Algebra</td>
<td>(3+1)</td>
</tr>
<tr>
<td>ECS 20 Discrete Mathematics for Computer Science</td>
<td>4</td>
</tr>
<tr>
<td>ECS 30 Introduction to Programming and Problem Solving</td>
<td>4</td>
</tr>
<tr>
<td>ECS 40 Introduction to Software Development and OOP</td>
<td>4</td>
</tr>
<tr>
<td>ECS 50 Computer Organization and Machine-Dependent Programming</td>
<td>4</td>
</tr>
<tr>
<td>ECS 60 Data Structures and Programming</td>
<td>4</td>
</tr>
<tr>
<td>PHI 12 Introduction to Symbolic Logic</td>
<td>4</td>
</tr>
</tbody>
</table>

Total Preparation ..................................................... 58-60
(of which) Natural Science/Mathematics .................... 38-40

*To be disjoined with STA 32 Basic Statistical Analysis Through Computers (3 units).
Figure 1: All stream 1 preparatory material, with all prerequisites shown. All prerequisites for preparatory material are themselves part of the stream 1 preparatory material.

3.2 Depth Subject Matter for Stream 1

With reference to the course groupings listed in section 4, students pursuing the BS in Cognitive Science must complete the following requirements. (Numbers in italics to the right of the unit count are the number of credits qualifying as natural science or math.)

Units

1. All options from group A. .......................................................... 12 (4)
2. Three options from group B. ...................................................... 12 (4-12)
3. One option from group C. ....................................................... 4 (4)
4. One option from group D. ....................................................... 4 (0)
5. Five options from group E. ..................................................... 20 (20)

Total Depth Requirement ......................................................... 52 (32-40)
Total Major Requirement ....................................................... 110-112 (70-78)
4 Stream 1 Groups

Figure 2: Map of prerequisites for group A courses.

4.1 Stream 1 Group A: General

Students in stream 1 must complete all courses from group A.

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>*CGS 100 Cognitive Science</td>
<td>4</td>
</tr>
<tr>
<td>ECS 140 Programming Languages</td>
<td>4</td>
</tr>
<tr>
<td>PHI 112 Intermediate Symbolic Logic</td>
<td>4</td>
</tr>
</tbody>
</table>
4.2 Stream 1 Group B: Computation

Students in stream 1 must complete at least three options from group B.

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECS 120 Intro Theory of Computation</td>
<td>4</td>
</tr>
<tr>
<td>ECS 170 Intro Artificial Intelligence</td>
<td>4</td>
</tr>
<tr>
<td>*ECS 171 Machine Learning</td>
<td>4</td>
</tr>
<tr>
<td>LIN 177 Computational Linguistics</td>
<td>4</td>
</tr>
<tr>
<td>*PHI 133 Logic for Artificial Intelligence</td>
<td>4</td>
</tr>
</tbody>
</table>
4.3 Stream 1 Group C: Neuroscience

Students in stream 1 must complete one option from group C.

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>LIN 175 Biological Basis of Language</td>
<td>4</td>
</tr>
<tr>
<td>PSC 101 Intro. Psychobiology</td>
<td>4</td>
</tr>
<tr>
<td>PSC 135 Cognitive Neuroscience</td>
<td>4</td>
</tr>
</tbody>
</table>
4.4 Stream 1 Group D: Philosophy and Linguistics

Students in stream 1 must take one option from group D.

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>LIN 103A Linguistic Analysis I: Phonetics, Phonology, Morphology</td>
<td>4</td>
</tr>
<tr>
<td>LIN 103B Linguistic Analysis II: Morphology, Syntax, Semantics</td>
<td>4</td>
</tr>
<tr>
<td>LIN 150 Languages of the World</td>
<td>4</td>
</tr>
<tr>
<td>LIN 182 Multilingualism</td>
<td>4</td>
</tr>
<tr>
<td>PHI 103 Philosophy of Mind</td>
<td>4</td>
</tr>
<tr>
<td>PHI 104 The Evolution of Mind PHI 136 Formal Epistemology</td>
<td>4</td>
</tr>
</tbody>
</table>
Figure 6: Map of prerequisites for those group E courses yet to appear in a prerequisites map.

4.5 Stream 1 Group E: Further Computation and Psychology

Students take five courses from E. No course may be used both to satisfy a group C requirement and a group E requirement.

PSC 100 Introduction to Cognitive Psychology ................................................. 4
PSC 101 Intro. Psychobiology ............................................................... 4
PSC 103A. Statistical Analysis of Psychological Data ........................................... 5
PSC 103B. Statistical Analysis of Psychological Data .......................................... 4
PSC 113 Developmental Psychobiology .......................................................... 4
PSC 121 Physiological Psychology .............................................................. 4
PSC 122 Advanced Animal Behavior ............................................................ 4
PSC 124 Comparative Neuroanatomy ........................................................... 4
PSC 127 Animal Cognition ........................................................................ 4
PSC 129 Sensory Processes ........................................................................ 4
PSC 130 Human Learning and Memory ......................................................... 4
PSC 131 Perception .................................................................................. 4
PSC 135 Cognitive Neuroscience: The Biological Foundations of the Mind .......... 4
5 Stream 2: Neuroscience Emphasis

5.1 Preparatory Matter for Stream 2

5.1.1 Preparatory Matter: Universal

As with stream 1, the universal preparatory subject matter is common to both streams of the BS and overlaps considerably with the preparatory material for the AB. The aim of this set of courses is, primarily, to give the student a broad introduction to the cognitive sciences that will prepare her to take courses in all the relevant fields. The list differs from the list in the AB in also including statistics and calculus preparation.

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAT 16AB Short Calculus</td>
<td>6</td>
</tr>
<tr>
<td>STA 13 Elementary Statistics</td>
<td>4</td>
</tr>
<tr>
<td>*PHI 10 (CGS 1 after first year of major) Intro Cognitive Science</td>
<td>4</td>
</tr>
<tr>
<td>LIN 1 Introduction to Linguistics</td>
<td>4</td>
</tr>
<tr>
<td>PHI 13+13G Minds, Brains and Computers</td>
<td>4</td>
</tr>
<tr>
<td>PSC 001 General Psychology</td>
<td>4</td>
</tr>
<tr>
<td>PSC 041 Research Methods in Psychology</td>
<td>4</td>
</tr>
</tbody>
</table>

5.1.2 Specialist Preparatory Matter for Stream 2

Students in stream 2 must complete the following:

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHY 7 ABC (or 9 ABC) General Physics</td>
<td>12-15</td>
</tr>
<tr>
<td>MAT 16C Short Calculus (or 17A or 21A)</td>
<td>3-4</td>
</tr>
<tr>
<td>BIS 2ABC Introduction to Biology</td>
<td>14</td>
</tr>
</tbody>
</table>

Total Preparation ................................................. 59-63
(of which) Natural Science/Mathematics ................. 43
Figure 7: All stream 2 preparatory material, with all prerequisites shown. All prerequisites for preparatory material are themselves part of the stream 2 preparatory material.

5.2 Depth Subject Matter for Stream 2

With reference to the course groupings listed in section 6, students pursuing the BS in Cognitive Science must complete the following requirements. (Numbers in italics to the right of the unit count are the number of credits qualifying as natural science or math.)

Units

1. All options from group A. .............................................................. 17 (17)
2. One option from group B. ............................................................... 4-5 (0-5)
3. 12-13 units from group C. ............................................................. 12-13 (8-13)
4. Two options from group D ........................................................... 8 (0)
5. Two options from group E. ........................................................... 8 (8)

Total Depth Requirement .......................................................... 49-51 (33-43)
Total Major Requirement ......................................................... 108-114 (76-86)
6 Stream 2 Groups

Figure 8: All group A courses with preparation required.

6.1 Stream 2 Group A: General

Students in stream 2 must complete all courses from group A.

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>*CGS 100 Cognitive Science</td>
<td>4</td>
</tr>
<tr>
<td>NPB 100 Neurobiology</td>
<td>4</td>
</tr>
<tr>
<td>PSC 103A Statistical Analysis of Psychological Data</td>
<td>5</td>
</tr>
<tr>
<td>PSC 103B Statistical Analysis of Psychological Data</td>
<td>4</td>
</tr>
</tbody>
</table>
6.2 Stream 2 Group B: Computation

Students in stream 2 must complete one option from group B.

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>LIN 177 Computational Linguistics</td>
<td>4</td>
</tr>
<tr>
<td>NPB 167 Computational Neuroscience</td>
<td>5</td>
</tr>
</tbody>
</table>

Figure 9: All group A courses with preparation required.
Figure 10: All group C courses with preparation required.

6.3 Stream 2 Group C: Neuroscience

Students in stream 2 must complete 12-13 units from group C.

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>NPB 112 Neuroscience</td>
<td>3</td>
</tr>
<tr>
<td>NPB 152 Hormones and Behavior</td>
<td>3</td>
</tr>
<tr>
<td>NPB 161 Developmental Neurobiology</td>
<td>3</td>
</tr>
<tr>
<td>NPB 162 Neural Mechanisms of Behavior</td>
<td>3</td>
</tr>
<tr>
<td>*NPB 163 Systems Neuroscience</td>
<td>3</td>
</tr>
<tr>
<td>NPB 164 Mammalian Vision</td>
<td>4</td>
</tr>
<tr>
<td>NPB 165 Neurobiology of Speech Perception</td>
<td>3</td>
</tr>
<tr>
<td>LIN 175 Biological Basis of Language</td>
<td>4</td>
</tr>
<tr>
<td>PSC 101 Intro. Psychobiology</td>
<td>4</td>
</tr>
<tr>
<td>PSC 121 Physiological Psychology</td>
<td>4</td>
</tr>
<tr>
<td>PSC 135 Cognitive Neuroscience</td>
<td>4</td>
</tr>
</tbody>
</table>
6.4 Stream 2 Group D: Philosophy and Linguistics

Students in stream 2 take two courses from D.

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>LIN 103A Linguistic Analysis I: Phonetics, Phonology, Morphology</td>
<td>4</td>
</tr>
<tr>
<td>LIN 103B Linguistic Analysis II: Morphology, Syntax, Semantics</td>
<td>4</td>
</tr>
<tr>
<td>LIN 150 Languages of the World</td>
<td>4</td>
</tr>
<tr>
<td>LIN 182 Multilingualism</td>
<td>4</td>
</tr>
<tr>
<td>PHI 103 Philosophy of Mind</td>
<td>4</td>
</tr>
<tr>
<td>PHI 104 The Evolution of Mind</td>
<td>4</td>
</tr>
</tbody>
</table>

Figure 11: All group D1 courses with preparation required.
Figure 12: All group D2 courses yet to appear in a prerequisites map, with preparation required.

6.5 Stream 2 Group E: Psychology

Students choose two. Courses already used to satisfy other requirements may not be reused for the group E requirement.

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSC 100 Introduction to Cognitive Psychology</td>
<td>4</td>
</tr>
<tr>
<td>PSC 101 Intro. Psychobiology</td>
<td>4</td>
</tr>
<tr>
<td>PSC 113 Developmental Psychobiology</td>
<td>4</td>
</tr>
<tr>
<td>PSC 121 Physiological Psychology</td>
<td>4</td>
</tr>
<tr>
<td>PSC 122 Advanced Animal Behavior</td>
<td>4</td>
</tr>
<tr>
<td>PSC 124 Comparative Neuroanatomy</td>
<td>4</td>
</tr>
<tr>
<td>PSC 127 Animal Cognition</td>
<td>4</td>
</tr>
<tr>
<td>PSC 129 Sensory Processes</td>
<td>4</td>
</tr>
<tr>
<td>PSC 130 Human Learning and Memory</td>
<td>4</td>
</tr>
<tr>
<td>PSC 131 Perception</td>
<td>4</td>
</tr>
<tr>
<td>PSC 132 Language and Cognition</td>
<td>4</td>
</tr>
<tr>
<td>PSC 135 Cognitive Neuroscience</td>
<td>4</td>
</tr>
</tbody>
</table>
MAJOR IN COGNITIVE SCIENCE

DRAFT CATALOG COPY
Cognitive Science
(College of Letters and Science)
Program Office. 1240 Social Sciences
and Humanities Building (530) 752-0703

The Major Programs
The cognitive science major is designed to provide a broad interdisciplinary approach to the study of mind that includes courses from different departments and attracts students with a variety of interests. It emphasizes a multi-faceted approach to the study of mind that integrates concepts and techniques from psychology, artificial intelligence, linguistics, neurology, philosophy and other relevant fields.

For students interested in the liberal arts the Cognitive Science major can be pursued as a Bachelor of Arts (A.B.) program. Alternatively, it can be pursued as a Bachelor of Science (B.S.) program for students with a stronger interest in the mathematical, neurological and computational foundations of the discipline. The main objective of both programs is to give the student a broad grounding in the integrated sciences of the mind and to connect approaches from different fields. Students must complete a number of core courses for the degree, as well as a number of specialty courses on such wide-ranging topics as logic for artificial intelligence, computational linguistics, cognitive neuroscience, animal cognition and the psychology of music.

Career Alternatives. A degree in cognitive science provides broad intellectual foundations useful for careers in a variety of areas, including teaching, business, social work/counseling and the information technology industry. An undergraduate education in cognitive science also prepares the student for graduate study in appropriate subfields of psychology, linguistics, philosophy and informatics. It is also suitable training for pre-medicine, pre-law, and pre-management students.

A.B. Major Requirements:

<table>
<thead>
<tr>
<th>Preparatory Subject Matter</th>
<th>UNITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Linguistics 1</td>
<td>4</td>
</tr>
<tr>
<td>*Philosophy 10</td>
<td>4</td>
</tr>
<tr>
<td>Philosophy 13+13G</td>
<td>4</td>
</tr>
<tr>
<td>Psychology 001</td>
<td>4</td>
</tr>
<tr>
<td>Psychology 041</td>
<td>4</td>
</tr>
<tr>
<td>Statistics 13</td>
<td>4</td>
</tr>
<tr>
<td>Philosophy 12</td>
<td>4</td>
</tr>
</tbody>
</table>

*Starting 2015-2016, PHI 10 will be replaced by Cognitive Science 1.

<table>
<thead>
<tr>
<th>Depth Subject Matter</th>
<th>44</th>
</tr>
</thead>
<tbody>
<tr>
<td>All courses from group A</td>
<td>12</td>
</tr>
<tr>
<td>Group A: Core</td>
<td></td>
</tr>
</tbody>
</table>
One 4-unit upper division course in cognitive science (to be initiated 2015-2016), Psychology 101, Philosophy 112
One course from group B........4
Group B: Computation
Linguistics 177, Philosophy 133
A further sixteen units from two of the groups B through F.....16
Group C: Neuroscience
Psychology 121, 135
Group D: Linguistics
Linguistics 103A, 103B, 131, 141, 171, 173
Group E: Philosophy
Philosophy 103, 104, 136
Group F: Psychology
Psychology 108, 127, 130, 131, 132, 136, 140, 141
Twelve additional units from the groups B through G........12
Group G: Other

Total Units for the Major.........72

B.S. Major Requirements:
Students select to pursue either the computational stream (stream 1) or the neuroscience stream (stream 2).

Stream 1 (Computational) UNITS
Preparatory Subject Matter ..... 58-60
Eng. Computer Science 20........4
Eng. Computer Science 30........4
Eng. Computer Science 40........4
Eng. Computer Science 50........4
Eng. Computer Science 60........4
Linguistics 1 ................4
Mathematics 16AB (or 17AB or 21AB) .........................6-8
Mathematics 22A+22L..........4
*Philosophy 10 .................4
Philosophy 12................4
Philosophy 13+13G ..........4
Psychology 001 ...............4
Psychology 041 ...............4
Statistics 13 (or STA 102).....4
*Starting 2015-2016, PHI 10 will be replaced by Cognitive Science 1.

Depth Subject Matter ............. 52
All courses from group A.......12
Group A: Core
One four-unit upper division course in cognitive science (to be initiated 2015-2016),
Engineering: Computer Science 140, Philosophy 112
Three courses from group B.
......................................12
Group B: Computation
Eng. Computer Science 120, 170, 171, Linguistics 177, Philosophy 133
One course from group C.......4
Group C: Neuroscience
Linguistics 175, Psychology 101, 135
One course from group D.......4
Group D: Philosophy/Linguistics
Linguistics 103A, 103B, 150, 182, Philosophy 103, 104, 136
Five courses from group E in addition to any taken to satisfy group C requirements........20
Group E: Psychology
Psychology 100, 101, 103A, 103B, 113, 121, 122, 124, 127, 129, 130, 131, 135

Total Units for the Major.... 110-112

Stream 2 (Neuroscience) UNITS
Preparatory Subject Matter...... 59-65
Biological Science 2ABC .........14
Linguistics 1 ....................4
Mathematics 16ABC (or 17ABC or 21ABC) .....................9-12
*Philosophy 10 ..................4
Philosophy 13+13G .............4
Physics 7ABC (or 9ABC) ......12-15
Psychology 001 .................4
Psychology 041 ..................4
Statistics 13 (or STA 102) .....4
*Starting 2015-2016, PHI 10 will be replaced by Cognitive Science 1.

Depth Subject Matter............ 49-51
All courses from group A........17
Group A: Core
One four-unit upper division course in cognitive science (to be initiated 2015-2016), NPB 100, Psychology 103A, 103B
One course from group B. ....4-5
Group B: Computation
Linguistics 177, NPB 167
12-13 units from group C....12-13
Group C: Neuroscience
NPB 112, 152, 161, 162, 163, 164, 165, Linguistics 175,
Psychology 101, 121, 135
Two courses from group D.....8
Group D:Philosophy/Linguistics
Linguistics 103A, 103B, 150, 182, Philosophy 103, 104
Two courses from group E in addition to any taken to satisfy group C requirements........8
Group E: Psychology
Psychology 100, 101, 113, 121, 122, 124, 127, 129, 130, 131, 132, 135

Total Units for the Major.... 108-116

Major Advisers. David Copp
(Philosophy) David Corina
(Linguistics) Steve Luck (Psychology)
Bernard Molyneux (Philosophy)
DIVISIONAL AND DEPARTMENTAL APPROVALS OF THE CREATION OF THE MAJOR IN COGNITIVE SCIENCE

A) THE DSS DEAN AND THE CORE DEPARTMENTS
November 21, 2013

PROFESSOR PHILIP SHAVER, CHAIR
College of Letters and Science Executive Committee

Re: Cognitive Science Major

Dear Professor Shaver:

I wish to express my strong support for the proposal to create a new interdisciplinary major in Cognitive Science, with courses of study leading to either the BA or the BS degree. The major is being proposed by a "conference" of faculty from Philosophy, Psychology, Linguistics, and the Center for Mind and Brain, as provided for by UC Davis PPM 200-25. It will be managed by the faculty of the new program in Cognitive Science, an interdisciplinary group of faculty members, under the "jurisdiction" of the Division of Social Science (DSS) for the College, as also provided for by PPM 200-25.

This program and major will be administered through the Division of Social Science (DSS) for the College. The DSS administrative Yellow Cluster will provide the administrative support, which is highly appropriate given that that cluster supports Psychology, Philosophy and the Center for Mind and Brain, the faculty members of which will participate in the major. The Program Director would be appointed for a three-year term by the Dean, after consulting with the participating faculty of the Program in Cognitive Science (i.e., Program Committee, involving faculty members from Philosophy, Psychology, Linguistics and departments outside the division, such as Computer Science). Annually, the Program Director would recommend members for the Program Committee, which would be forwarded to the L & S Executive Committee for approval.

The new major promises to make a major contribution to the options available for undergraduates on the Davis campus and to strengthen important interdisciplinary links among faculty working in cognitive science. Although there is some natural shared intellectual content with existing majors (e.g., Psychology), Cognitive Science occupies a unique interdisciplinary space among the relevant contributing disciplines. Therefore, I believe offering this major will greatly benefit our students.

I am very excited about this development.

Sincerely,

George R. Mangun, Dean
Division of Social Sciences
27 November 2013

Professor Philip Shaver Chair,
Executive Committee College
of Letters and Science UC
Davis

Dear Professor Shaver

This is to confirm that the faculty of the Department of Philosophy voted unanimously to support the proposal I am submitting to you that calls for the creation of an interdisciplinary undergraduate Major in Cognitive Science.

Yours sincerely,

David Copp
Distinguished Professor
Chair
Department of Philosophy
Re: Cognitive Science Proposal (Psychology)

Paul D. Hastings <pdhastings@ucdavis.edu>  
To: David Copp <dcopp@ucdavis.edu>  
Cc: Bernard Molyneux <molyneux@ucdavis.edu>  

Tue, Nov 26, 2013 at 6:07 PM

Hi David and Bernard,

Psych is on board. I gave folks 24 hours to respond. There was a lot of enthusiasm, no opposition, and a few comments (see attached)

Paul

On 11/25/2013 6:12 PM, David Copp wrote:

Hi Paul

I know you have a lot on your plate so I hate to bother you with this. But a quick email from you confirming psychology's support for the new major in cognitive science would be a huge help. I'm planning to submit this Wednesday in order to meet the deadline for new curricular proposals.

best

David

On Mon, Nov 18, 2013 at 10:06 AM, Paul Hastings <pdhastings@ucdavis.edu> wrote:

Hi David,

Thanks for the reminder! I will set up the evote for this week.

Paul

> Hi Paul
> > I wonder whether you have been able to poll your faculty?
> > > Best
> > > David
> > >
> > > On Wed, Nov 6, 2013 at 12:04 PM, Paul Hastings  
> > <pdhastings@ucdavis.edu> wrote:
> > > Hi David,
> > > > It turned out about a dozen people are unavailable today, so we're not
> > > > meeting.
> > > >
November 7, 2013

David Copp, Chair
Philosophy

Dear Prof. Copp,
This brief letter is to inform you that the faculty in Linguistics voted unanimously in favor of the Philosophy department starting an undergraduate major in Cognitive Science.

We realize that many of our courses in Linguistics will be relevant to this major and look forward to having your students in our classes. Please do not hesitate to contact me if you have any questions.

Sincerely,

Vai Ramanathan, Professor
Linguistics; 752-0191
Vramanathan@ucdavis.edu
New Cognitive Science Major

Carmina Caselli <rcaselli@ucdavis.edu>
To: David Copp <dcopp@ucdavis.edu>

Tue, Nov 26, 2013 at 12:32 PM

Dear David,

The Yellow Cluster is willing and prepared to administer the new Cognitive Science major.

Best,

Carmina

Carmina Caselli
CAO – Yellow Cluster
L&S Division of Social Sciences
DIVISIONAL AND DEPARTMENTAL APPROVALS OF THE CREATION OF THE MAJOR IN COGNITIVE SCIENCE

B) OTHER AFFECTED DEPARTMENTS
Proposed Cognitive Science Program (Computer Science)

Nina Amenll <anarJaOts.uc@dlrob={({ldU> To:DIMdCllpp <dcoppucquedallt.ldU>
Cc:PhilipRae <uo utQcs.ucdlrolll.ldU>, a-d MIlynaull <mdyn-pr@ucdlIlle.eclP

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Nina

On Mon. Nov18. 2013 at 10:34 AM. Da'ld CclIP <dv .ecll'> v.rote:
Dear J-b1na fllf1 PI'Ilp

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DIME!

On Wed, Nov&. 2013 at 2018 PM, Dmlcl CciIP <ck• IC:dailluct, 'Mlto:
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Whon l W1Vte illSt mcnn, then- of cu moetiend rd be to meet IMih you., . _if you 1llink th8t wr: "1be uesU. Wo're aiming to meet a delldino of lho ond ofilllomelbor.-ld wo.- teqlillld to get lho
approval of all affected units. For this reason, if you would like to meet, it would be good if we could meet soon – at your convenience. In any case, it appears that I need to ask you to poll your members to get their approval for the introduction of this major. If you would do this – after talking or any further clarification we can offer– we would appreciate it wry much.

With thanks,

Da\Ad

On Mon, Oct 14, 2013 at 9:43AM, Da’lid Copp <dcopp@ucda\As.edu> wrote:

Dear Nina and Philip,

I'm attaching two draft proposals, on for a BA and one for a BS in cognitiw science. I'll certainly get in touch to arrange a meeting just as soon as I can.

best

Da\Ad

On Mon, Oct 14, 2013 at 3:13AM, Nina Amenta <amenta@cs.ucda\As.edu> wrote:

Dear Da\Ad,

This sounds wry interesting. I didn't know that major in cognitiw science was in the works. Do you haw any drafts or whitepapers or something that we can look at?

I am out of town until Friday the 18th, but if you want to get started on this quickly, you could talk to Prof. Phil Rogaway earlier next week. Maybe you know Phil? He's interested in Cognitiw Science, and he's also the Chair of our Undergraduate Committee. I'm 'ccing him.

I am available on the afternoon of the 18th, if you want to meet.

Best regards!

Nina

On Sun, Oct 13, 2013 at 3:03PM, Da\Ad Copp <dcopp@ucda\As.edu> wrote:

Dear Nina (if I may)

The steering committee that has been working on a proposed major in cognitiw science is nearly finished its work and it's time to consult with programs like Computer Science (ECS) that we would like to be inwld to be sure that we take your concerns into account. ECS courses are central to our proposal but we hope therefore that there won't be any major surprises or worries. We will send you the proposal as soon as we finish some fine-tuning to reflect our most recent decisions. We will want to meet with you and other "stakeholders" in the near future since we are aiming to submit the proposal by the end of Novwmer.

best regards,

Da\Ad

Da\Ad Copp,
Cognitive Science Program Proposal

Harold Levine <hlevine@ucdavis.edu>  
To: David Copp <dcopp@ucdavis.edu>  
Cc: Paul Heckman <peheckman@ucdavis.edu>

Dear Professor Copp,

Thank you for giving the School of Education an opportunity to review the Cognitive Science Program Proposal. It has been discussed internally with Associate Dean Paul Heckman, our Faculty Executive Committee, and myself. We believe the program will represent a valuable addition to campus academic offerings and will positively impact the School of Education by slightly increasing student interest in our undergraduate courses. We are supportive of this Proposal going forward.

Sincerely,

Harold Levine
--

Harold G. Levine  
Dean and Professor  
School of Education  
University of California, Davis  
One Shields Ave.  
Davis, California 95616

PH: (530) 752-4663  
FAX: (530) 752-8019

https://mail.google.com/mail/u/0?ui=2&ik=2bb4cd6682&view=pt&search=inbox&msg=14296460e4a22a75
Re: Cognitive Science Program Proposal (EEC)

nt Wllklln <kcH&e .edU>       Man, NDv18, 2013 at 10:60 Nd
To: DlMd Clpp <dcoppUcdallt.edU>
Cc: lwmtG-.ucd!Mt.edu, Ballad MGyaul <malynaiEJtOlCdl'le.edu>, SIINII..uck <aJiuck@ucdalla eclP, Da\Id
Oorlna <dpco .edU>

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Regard&,

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Cognitive Science Proposal (Human Development)

Beth A. Ober <baober@ucdavis.edu>  
To: David Copp <dcopp@ucdavis.edu>  
Cc: Patsy E Owens <peowens@ucdavis.edu>, Bernard Molyneux <molyneux@ucdavis.edu>

Dear David,

The proposed major in Cognitive Science looks terrific, and based on David's summary of the four HD courses that would be included as electives, I do not think that the new major will have a significant impact on enrollment in HD courses. Therefore, I am pleased to endorse the proposed major, including the HD elective courses.

Best wishes,

Beth

Beth A. Ober  
Chair, Human Development unit  
Vice Chair, Dept of Human Ecology

From David Copp's, Nov. 6 email:
>> We are proposing four HDE courses (101, 132, 161, and 163) to be included on a long list of 19 courses from which our majors might select one or two. We don't think this would lead to a significant impact on your courses. The major will be small to begin with and we doubt that we will exceed 150 majors in the long run. Even if 10% of the 150 decide to take one of the HDE courses, this would mean only 15 of the maximum we expect, so that in each year, it would mean perhaps five students would take one of the courses. We hope therefore that there won't be any major worries.

[Quoted text hidden]
Proposed Major in Cognitive Science and NPB

James Trimmer <jtrimmer@ucdavis.edu>  Sat, Nov 23, 2013 at 9:35 AM
To: David Copp <dcopp@ucdavis.edu>

Hi David,

We completed our "polling" prior to receiving this information. I attach the results. As you can see there are concerns from some about needing to accommodate more students in our already too large (in our opinion) upper division courses. But if this indeed is a small major it may not be a substantial impact.

Jim

On Nov 22, 2013, at 9:24 AM, David Copp wrote:

Hi Jim

We would like to change our proposal slightly in light of our recognizing a few additional NPB courses that seems appropriate to Cognitive Science. We hope you agree that these changes are good and that we won't jeopardize your support or complicate your polling of your members.

(2) In group G, which is a group of courses students can take to round out their study, in the section called "Other: NPB", we would like to add five courses:

- NPB 152 Hormones and Behavior
- NPB 161 Developmental Neurobiology
- NPB 162 Neural Mechanisms of Behavior
- NPB 164 Mammalian Vision
- NPB 165 Neurobiology of Speech Perception

We understand that our students would have to fulfill any prerequisites needed for these courses. It's not likely that our students would flood these classes, to say the least, but we think them appropriate to "round out" the list.

Please let us know if you foresee any problems.

With thanks,

David

On Mon, Nov 18, 2013 at 1:43 PM, James Trimmer <jtrimmer@ucdavis.edu> wrote:

Hi David,

We did not get to this at the faculty meeting. I have asked our MSO to set up an online vote that will be completed by Thursday at 5 PM. I apologize for the delay.

Jim

On Nov 18, 2013, at 10:16 AM, David Copp <dcopp@ucdavis.edu> wrote:
I support the creation of the Cognitive Neuroscience major by the faculty of the College of Letters and Science.

Total: 30
Yes: 14
No: 1
Abstain: 2
Leave: 4
Did not Vote: 9

Vote: Yes
Comments: A great idea, spearheaded by the right person to do this (Steve Luck). Would be a nice complement to our major.

Vote: Yes
Comments: I think something like this is much needed.

Vote: Yes
Comments: The Cognitive Neuroscience major looks like a great program to me. I don't anticipate any problems with accommodating students in this program in NPB courses.

Vote: Yes
Comments: This seems reasonable to me, but we will need to pay attention to how this might impact our major revision (need to maintain service courses perhaps in addition to serving our own majors).

Vote: No
Comments: Why do we need another major that is similar to others on campus when we don't even support the majors that are on the books?

Vote: Abstain
Comments: I am neutral on this topic. If the expectation is that a large number of students in L and S would be taking NPB neurobiology courses as part of this new major, that could be good or bad for the NPB department, and I don't have a clear idea which at the present time. If our new Neurobiology track in the revised major is popular, then it could become a problem to provide seats for these L and S students in our courses. If the numbers of students in the Neurobiology track are not super-high, then it actually could be advantageous to have some students from L and S interested in taking the courses. My inclination is that it basically would be fine if this major existed and I can see how having those students have access to NPB courses in Neurobiology would be beneficial to the major. But I don't feel strongly that such a major is needed (I don't know whether it is). So I would say it's fine if it happens, but I don't really care much either way.

Vote: Abstain
Comments: This has not been discussed among the NPB faculty and I do not feel I know enough about the pros/cons and impact on the NPB department of creating a Cognitive Neuroscience major to make an informed vote.
Cognitive Science Program (Statistics)

Hans Mueller <hmueller@ucdavis.edu>
To: David Copp <dcopp@ucdavis.edu>

Mon, Nov 25, 2013 at 6:06 PM

Professor David Copp
Chair, Department of Philosophy
November 25, 2013

Dear David,

the Department of Statistics has no objections to the proposal for
BS/BA in Cognitive Science, to be offered in the College of Letters
and Science at UCD. The statistics faculty look forward to teach the
statistics courses for the
students who pursue the major.

Sincerely

Hans

Hans-Georg Mueller
Chair, Department of Statistics
November 12, 2013

To Whom It May Concern:

The faculty of the Department of Biomedical Engineering met on November 8, 2013 and voted its support for the proposal by the Departments of Philosophy, Psychology, and Linguistics to create a new interdisciplinary major in Cognitive Science within the College of Letters and Science. We have studied the proposal and we have no objection. Indeed we support the proposal.

Sincerely,

Kyriacos Athanasiou, Ph.D., P.E.
Distinguished Professor of Biomedical Engineering and Orthopaedic Surgery
Chair, Department of Biomedical Engineering
The Child Family Professor of Engineering
University of California, Davis

Editor-in-Chief, Annals of Biomedical Engineering
Proposed Cognitive Science Major (Communication)

Geo... Barnett <gill@ll8ttfius:da\b.ediP>
To: DIMd Celp<dcoppQucdalll.ediP>

Man, Nov 11, 2013 at 1:39PM

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DIMJ, CA 85618 USA

https://mail.google.com/mail/u/0?ik=251e2b4ec9db28evew-pit&safe=chair issues -- cog nlive sciences&search=cali mag=14249f246262od6
Dear David:

We have polled the economics faculty concerning the proposed Cognitive Science major. Of the 26 faculty eligible to vote: 23 voted in favor, 2 were absent, and 1 was on academic leave. Best of luck with this endeavor.

Ann