

Approval Form C 206

Proposal Title: _____

Sponsor(s) _____ Dept.: _____ Ext. _____

Check one: Course Specialization Concentration Minor Achievement Certificate
 Certification Program Major Program Minor Change _____
(please name deletion or credit/title/catalog change)

Undergraduate Graduate _____ Credit Hours

<p>Step 1 (Department)</p> <p><input checked="" type="checkbox"/> Approved <u>4-13-94</u> <small>Date</small></p> <p><input type="checkbox"/> Not Approved</p> <p><u>Charles Stanfort</u> <small>Dept. CC Chairperson</small></p> <p><input checked="" type="checkbox"/> Reviewed <u>3</u> <small>Date</small></p> <p><u>[Signature]</u> <small>Dept. Chairperson</small></p>	<p>Step 2 (Receipt)</p> <p><input type="checkbox"/> SCC# <u>93-92-14</u></p> <p>Proposal Received: _____ <small>Date</small></p> <p style="text-align: center;">APR 14 1994</p> <p style="text-align: center;">RECEIVED</p> <p><u>[Signature]</u> <small>SCC Chairperson</small></p>	<p>Step 3 (School CC)</p> <p>Reviewed <u>5/2/94</u></p> <p><input checked="" type="checkbox"/> Approved <input type="checkbox"/> Not Approved</p> <p>Comments:</p> <p>_____</p> <p><u>Joanne Scott</u> <small>School Curr Comm Chairperson</small></p>
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<p>Step 4 (Academic Dean)</p> <p><input checked="" type="checkbox"/> Recommend <input type="checkbox"/> Not Recommend <input type="checkbox"/> Conditionally Recommend (see comments)</p> <p>Reviewed <u>5/2/94</u> <small>Date</small></p>	<p>Comments:</p> <p style="text-align: center;"><u>[Signature]</u> <small>Signature, Dean of School</small></p>
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<p>Step 5 (SCC)</p> <p>Open Hearing <u>5/1/94</u> <small>Date</small></p>	<p><input checked="" type="checkbox"/> Approved by Senate Curriculum Committee <u>5/16/94</u> <small>Date</small></p>	<p><input type="checkbox"/> Returned to sponsor(s) for the following reasons:</p> <p style="text-align: center;"><u>Returned to department for minor changes.</u></p>
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<p>Step 6 (Senate)</p> <p>Presented to Senate <u>5/1/94</u> <small>Date</small></p>	<p><input checked="" type="checkbox"/> Approved <input type="checkbox"/> Not Approved</p> <p>Notification to Executive Vice-President/Provost <u>5/2/94</u> <small>Date</small></p> <p><u>[Signature]</u> <small>Signature, SCC Chairperson</small></p>
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Step 7 (Executive V.P./Provost)

Received 6/14/94
Date

Approved Yes No

If no, reasons are as follows:

Student credit hours _____

Faculty load hours _____

Equalized credit hours _____

Official copy and approval sheet filed _____
Date

*BOT committee
6/18/94*

[Signature]
Signature, Executive Vice-President/Provost

Registrar

Approved course description received 22 Aug 94
Date

Hegis Taxonomy and Course Number assigned Concentration C-206

[Signature]
Signature, Registrar

22 Aug 94
Date

Notification forwarded:

- Senate Curriculum Committee Chairperson
- Department Chairperson(s)
- Academic Dean(s)
- Registrar
- Sponsor(s)

Proposal for a Concentration Program: Cartography and Geographical Information Systems

1. Abstract of Proposal:

The title of this program, sponsored by all members of the geography faculty, is "Concentration in Cartography and Geographical Information Systems." The need for the program stems from the rapid growth in the use of automated methods in cartography and the surge in the development of Geographical Information Systems [GIS] in public sector agencies and private sector firms. Although the word, "geographic," appears in the name of this new discipline, both it and cartography are, in fact, multi-disciplinary areas of study to which practitioners bring a variety of expertise and academic backgrounds including mathematics, computer science, engineering, geology, business, urban and regional planning, resource management, and marketing. In recognition of the diversity of academic backgrounds of those who wish to gain expertise in the mapping sciences, we are proposing an inter-disciplinary concentration designed to provide education and training in cartography and geographical information systems.

Although the Geography and Anthropology Department will house and administer the program, it includes courses in several Rowan departments including Computer Science, Mathematics, and Management and Management Information Systems. Because those entering the program will come from diverse backgrounds, including computer science, environmental science, mathematics, business, and, eventually, engineering, we will keep the course requirements as flexible as possible to allow tailoring the courses taken by each student to his or her needs. For instance, a computer science or management information systems student would be advised to select program courses from those in cartography, digital cartography, remote sensing, and GIS. A student who entered the program with some background in earth sciences would be advised to select program courses from those in computer science, geography, management information systems, and mathematics. One very important implication of the likely diversity of the backgrounds of those entering the program is that strong, personalized, quality academic advising is imperative. This advising will ensure that those who complete the program will be able to achieve its specific objectives, which are listed later within this proposal, either as a result of course work and projects carried out in conjunction with the program or as a result of previous training and experience in conjunction with course work and projects carried out as part of the program.

We will seek approval of the concentration program during the current [1993-1994] academic year. After we gain approval, we plan to advertise the program to the Rowan College community. The planned program initiation date will be the spring semester of 1995.

All of the courses that comprise the program are already a part of the curriculum of the participating departments. Staff, library holdings, and laboratory space are all adequate to support this program. Of course, computer hardware and software must be maintained at reasonably state-of-the-art levels for this program to succeed. The pending approval of \$1.9 million for enhancing academic computing at Rowan will ensure that our facilities will be at the state-of-the-art for years to come. The College has recently purchased four workstation licenses for ARC/INFO, the premier commercial GIS software product, and will soon receive the computer hardware on which the software will run. Thus, we are encouraged that we will be able to provide our students with state-of-the-art training on state-of-the-art equipment well into the future.

2. Details:

- a. Title of Proposal: Concentration in Cartography and Geographical Information Systems
- b. Sponsors: The geography faculty of the Department of Geography and Anthropology: Richard Scott, Chair, Edward Behm, Advisor, Wade Currier, Jerry Lint, Charles Stansfield, and Chet Zimolzak.
- c. Scope or size of program: The concentration will require students to complete 21 s.h. selected from the regular course offerings of the following departments: Computer Science, Geography and Anthropology, Management and Management Information Systems, and Mathematics. Although we have no precise estimate of the number of students who will choose to enroll in the program, the area with which the program is concerned is growing rapidly and is projected to continue rapid growth in the future.
- d. Relationship to curriculum: All courses comprising the program are general education or major courses offered regularly by the participating departments. High quality, personalized academic advising is imperative for the success of this program. We will advise students individually on course selection. In assisting students in planning their programs, this advising will take into account the previous training and education of the student along with his or her career goals.
- e. Eligibility: The program is open to students who aspire to be working professionals in cartography, GIS, and related areas or who require skill in these areas in order to perform more effectively in their anticipated careers. We anticipate that many students entering the program will be majors in computer science, business, mathematics, or environmental science. In the future, civil engineering students may well be interested in this program.
- f. Suggested time and scale of implementation: We plan to begin accepting students in the concentration program during the 1995 spring semester. Between now and then we will design advertising and advising materials and publicize the program throughout the college community. In this effort, we will place special emphasis on those departments that we anticipate would have higher levels of interest in the program.
- g. Resource requirements (equipment, library, staff, etc.): The equipment, library materials, faculty, office, and classroom facilities currently serving the geography major program will be used to serve the concentration program. Unless the program grows far beyond our current expectations, these resources will be adequate. Currently some of our upper level courses have a modest amount of available room. Any demand generated by the concentration program should result in these classes having somewhat higher enrollment levels, which is a positive projected outcome. Of course, if there are more students in these upper level courses, then there will be a proportionately higher consumption of consumable materials such as plotter pens, drafting pens, and plotter paper. Should enrollment grow to the point that cost increases become a budget problem, then the department will institute a laboratory fee for those courses requiring additional materials.

We have consulted with the departments of Computer Science, Management and Management Information Systems, and Mathematics to ascertain the impact that concentration program students will have on these departments. Chairs and faculty members of the departments

have assured us that they can accommodate the projected demand generated from students in the concentration program. We have appended letters of support for the concentration from the chairs and other members of participating departments.

3. Rationale: The mission of Rowan College requires an emphasis on both liberal education and career preparation. Through liberal education "... the College fosters student acquisition of knowledge and stresses the importance of ethical reasoning, critical thinking, and appreciation and knowledge of cultural diversity."¹ The latest round of strategic planning mandated that the geography major program should "... continue to make effective use of technological developments within the geography major."² To say that the pace of technical change in our field is accelerating is commonplace to the point of cliché. This acceleration in technology has resulted in an increase in interest in applying spatial analysis, especially through the medium of GIS, to many areas outside the traditional earth sciences. For instance, there is now a trade journal, *Business Geographics*, that is dedicated to dispersing information on spatial analysis and GIS to those interested in business applications. Thus, not only our majors, but also those of other programs may benefit from training in cartography and GIS. The goal of the concentration program in cartography and GIS is to enable students to acquire mapping science skills and related skills in mathematics and computer sciences, which are needed by those who wish to apply the mapping sciences and spatial analysis in a modern environment. Thus, our charge to "continue to make effective use of technical developments" implies that we should make those developments available to as many groups of potential users as possible. We can enhance technical dissemination by creating a concentration program to enable those in related fields to appreciate and employ the benefits of these fascinating new technologies more fully.

4. Essence of the Concentration Program:

- a. Major goal of the program. The major goal of this program is to provide interested students who aspire to enter mapping science professions or who wish to use the techniques of these professions in their work an opportunity to gain the knowledge and technical competence required to succeed. Because we anticipate that those entering the program will come from diverse departments and will aspire to various goals, we have decided to keep the requirements flexible so that we can tailor the program to fit the needs of its participants. The courses from which students can select are from four disciplines: computer science, geography, management information systems, and mathematics. To assure technical competence, we will require students to demonstrate basic competency in at least three of these four areas. Students entering the program will complete an assessment designed to ascertain their level of competency at the outset. Program advisors will use the results of the assessment along with the student's goals to plan the student's program. All students will take a set of at least seven courses selected in consultation with the program advisor.

¹ Focused Mission Statement as revised February 2, 1991.

² Glassboro State College and the Future: Towards a Regional Institution of Excellence: The Glassboro State College Strategic Plan: July 1, 1992 - June 30, 1997, P. 126.

- b. Specific objectives of the program. Here we outline specific objectives students will pursue:
1. Students who complete this program will be both numerate and computer literate to the degree appropriate to their career objectives. Those possessing these competencies as a result of previous training will not be required to complete computer science or mathematics courses as part of the program. Those unable to demonstrate these competencies will be required to complete an appropriate set of mathematics and computer science courses in order to achieve an appropriate level of competence in these areas. The minimum level of competency required of all students will be that expected of those who have completed one year of college level mathematics and one semester of computer programming.³ Students who wish to pursue a GIS concentration must demonstrate a level of programming competency expected of those who have completed at least one year of college level programming courses.
 2. Students who complete this program with an emphasis in GIS or in digital cartography will be able to define and explain the advantages and disadvantages of the major models of database structure, will be able to outline the design principles for effective database management, and will be able to use one of the major commercial database management packages such as dBase.
 3. All students will be able to demonstrate basic cartographic/graphic literacy. They will possess understanding of the various types of map projections and their uses and limitations. They will understand the basics of cartographic communication and map symbolization, and will be able to explain the uses of maps in geographic inquiry. Additionally, they will demonstrate the ability to interpret topographical and thematic maps accurately.
 4. Students will be able to demonstrate basic knowledge of each of the following mapping science areas: 1. cartography, 2. remote sensing and photo interpretation, 3. geographical information systems, 4. digital cartography, and 5. spatial analysis
 5. Students will be able to demonstrate advanced levels of competency in one of the areas outlined in item four. Normally this implies that students will take at least two three hundred level courses a part of their program; however, the fact of taking these courses does not in itself constitute a demonstration of advanced level competency, which will be ascertained by portfolio examination and capstone project.
 6. Students will keep a portfolio of the work they produce in geographic techniques courses. This portfolio, which will be subjected to faculty review, will demonstrate the student's mastery of the specific technique or techniques the student has emphasized in his or her program (e.g., photo interpretation and GIS).
 7. To demonstrate competency in skills learned in techniques courses, students will complete a capstone project chosen in consultation with the academic advisor. In completing this project the student will demonstrate in-depth competency in the use of one geographic technique. This could include such things as applying map design

³ The courses students will take are listed later in this document.

principles to making a map with a computer mapping package, or use of a Geographical Information System to solve a locational problem. If possible, the software used in the capstone project should be the program or programs the student expects to use on the job.

c. Structure or Organization.

Students completing the concentration program will take a battery of at least seven courses selected in consultation with the program advisor and in light of the base line assessment. In making course selections, student and advisor shall consider the academic background and career goals of the student. All students entering the program are required to complete a base line assessment. This assessment will consist of a written examination followed by a personal interview in which the student may present transcripts verifying previous course work, examples of cartographic work, and other pertinent information.

By the time of completion of the program, students will exhibit through life experience or course selection a diverse knowledge in three of the four disciplinary areas represented in the concentration program. Those who are unable to demonstrate such competency through the base line assessment and interview will be required to take courses in at least three of the disciplines in order to attain the required level competency expected of those who complete the program. Students who are able to demonstrate competency in one or more areas at the outset will be encouraged to take a more specialized set of courses concentrating in areas in which initial competence is weaker.

The following table lists the courses included in the concentration program. Students with special needs may petition to have other courses included in their programs. All such inclusions require approval by the program advisor, who may consult with the chair of the course's home department. For example, if a student wishes to have a course in linear algebra included in her or his program, then the program advisor in the Department of Geography and Anthropology, consulting with the chair of the Mathematics Department, will approve the exception. This procedure will ensure flexibility while avoiding chaos.

Table 1. Concentration Program Courses

Business Courses	Course Number
End-User Computing: Database Management [1 s.h.]	0702.210
Design of Database Systems	0702.338
Computer Science Courses	Course Number
Introduction to Programming	0701.102
Structured Programming in Pascal	0704.103
Data Structures and Algorithms	0704.222
Programming Languages	0704.315
Mathematics Courses	Course Number
Precalculus Mathematics	1701.122
Calculus: Techniques and Applications	1703.125
Calculus I	1701.130
Calculus II	1701.131
Discrete Mathematics	1703.150
Geography Courses	Course Number
Introduction to the Mapping Sciences	2206-193
Cartography	2206-306
Remote Sensing / Air Photo Interpretation	2206-308
Remote Sensing II	2206-309
Land Use and Resource Development	2206-310
Geography of Transportation	2206-313
Spatial Analysis	2206-314
Field Studies	2206-315
Computer Cartography	2206-320
Advanced Cartography	2206-321
Quantitative Methods	2206-350
Metropolitan and Regional Planning	2206-355
Introduction to GIS	2206-360
Advanced GIS	2206-415

The interests of personalization and flexibility, along with the diverse backgrounds and goals of the students likely to enroll, preclude establishing rigidly fixed tracks for the concentration program. Course selection will be guided by the need to ensure attainment of the program goal of competency in three of the four component disciplines. Nevertheless, we do want to suggest example sets of courses that constitute appropriate selections for students with a variety of backgrounds and objectives. The first track we outline

is intended for a student majoring in environmental science who wishes to apply GIS in resource management. This student has had minimal background in computing, but wishes to learn GIS.

Table 2. Example Track for Environmental Science Major

Course	Course Number
Introduction to Programming	0701.102
Structured Programming in PASCAL	0704.102
End-User Computing: Database Management [1 s.h.]	0702.210
Design of Database Systems	0702.338
Introduction to the Mapping Sciences	2206.193
Introduction to GIS	2206-360
Advanced GIS	2206-415
Computer Cartography	2206-320

A second example track represents a course sequence followed by a marketing major who wishes to gain a GIS and computer science background that will enable application of GIS in business site selection. This individual already is familiar with the principles of site selection, geo-demographics, and geographical market segmentation and wants to be able to use a GIS macro programming language to develop add-on functions required to carry out specialized operations and procedures.

Table 3. Example Track for Marketing Major

Course Name	Course Number
Introduction to Programming	0701.102
Structured Programming in PASCAL	1704.103
Design of Database Systems	0702.338
Introduction to the Mapping Sciences	2206.193
Remote Sensing / Air Photo Interpretation	2206.308
Introduction to GIS	2206.360
Advanced GIS	2206-415

A third example track specifies a course of study designed for a computer science major who wishes to enter the mapping sciences. This individual has a strong mathematics and computer science background, but no geography or cartography training. The individual seeks a position as a GIS analyst or digital cartographer.

Table 4. Example Track for Computer Science Major

Take All of These	Course Number
Introduction to the Mapping Sciences	2206-193
Cartography	2206-306
Remote Sensing / Air Photo Interpretation	2206-308
Introduction to GIS	2206-360
Computer Cartography	2206-320
Plus Any Two of the Following	
Land Use and Resource Development	2206-310
Geography of Transportation	2206-313
Metropolitan and Regional Planning	2206-355
Advanced Cartography	2206-320
Remote Sensing II	2206-309
Advanced GIS	2206-415

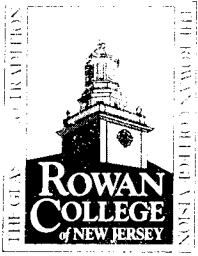
These example tracks by no means exhaust the possible combinations of courses students could take. They are intended to provide illustrative examples.

d. Administration:

The Department of Geography and Anthropology will administer the program. The department chair and academic advisor will have day-to-day responsibility for ensuring the smooth functioning and interdepartmental coordination of the program. The administering department shall consult with the chairs of the following departments in order to obtain approval of any changes in the requirements for the concentration program: Computer Science, Management and Management Information Systems, and Mathematics. Specifically, the administering department shall consult with the home department prior to adding or deleting any of that department's courses. In addition, the administering department shall consult with participating departments from time-to-time in order to ensure smooth functioning of the program. These consultations may concern a variety of issues including, but not limited to frequency and time of course scheduling, course content, and any other issues of concern. Any of the participating departments may call a meeting of the Chairs of participating departments in order to deal with issues that arise.

5. Results of consultation:

The chair of the Department of Geography and Anthropology has consulted with the following department chairs: Dr. Don Stone of Computer Science, Dr. Diane Hamilton of Management and Management Information Systems, and Dr. Gary Itzkowitz of Mathematics. I have also discussed the concentration program and sought advice from the following faculty members in participating departments: Dr. Mike Berman, Mr. Jack Cimprich, and Mr. Seth Bergman of Computer Science, and Dr. Janet Caldwell and Dr. Ron Czocher of Mathematics. Their suggestions or letters summarizing their suggestions follow.



Rowan College of New Jersey

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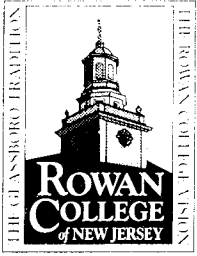
Computer Science Department

To: Richard Scott, Geography and Anthropology
From: Don Stone, Computer Science
Date: March 2, 1994
Re: Proposal for a concentration in cartography
and geographical information systems

DCS

I have reviewed your proposal for a concentration in cartography and geographical information systems, and I believe that the proposed program has been well thought out and can be of benefit to people in a number of different situations. The computer science component of the proposed program appears to be appropriate. GIS is certainly a rapidly growing area, and this program should help focus the College's efforts to be a resource in this area. The success and popularity of the current offerings in cartography and GIS lead one to expect that this program would have a significant enrollment.

Note: the Senate Curriculum Committee has approved changing the name of Structured Programming in Pascal to Computer Science and Programming. In the new version of the course the language will be C++, and the course will carry 4 credit hours, including a new 1 credit hour lab component.



Rowan College of New Jersey

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*School of Business Administration
Department of Management and Management Information Systems*

DATE: February 2, 1999
TO: Richard A. Scott, Chair, Geography
FROM: Diane M. Hamilton, Chair, Management & MIS
RE: proposal for concentration in Cartography/GIS

I have read your proposal and can easily support it in the present form. Although the concentration calls for enrollment in two of our courses, EM Database and Design of Database Systems, these are not courses that are generally at capacity so a few seats here and there would not cause us any resource problem. Your proposal sounds exciting. I hope it becomes a reality.

February 23, 1994

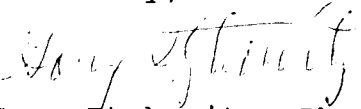
Richard Scott, Ph.D.
Professor and Chair
Dept. of Geography & Anthropology

Dear Professor Scott,

I have looked over your proposal for a multi-disciplinary concentration program in cartography and geographical information systems, and I heartily support it. There is no doubt in my mind that the Mathematics Department can handle the modest additional call for math courses that your concentration would require; with the present resources!

This concentration excites me. It is the kind of program I would have loved to take as an undergraduate, had it been available then. You have my best wishes in this endeavor.

Cordially,


Gary Itzkowitz, Ph.D.
Chair

GI/bc



Rowan College of New Jersey

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Computer Science Department

Memo To: Richard Scott

From: Seth Bergmann

Subject: Proposal for Concentration in Cartography and G.I.S.

Date: February 16, 1994

I have read your proposal for a concentration in Cartography and Geographical Information Systems. It is clear that as technology improves, we will see increasingly sophisticated tools for geographers, with decreasing costs. At the same time we will see improved user interfaces which will enable people without extensive computer expertise to make use of these tools.

I strongly support your proposal and believe it will be a significant enhancement to the college's offerings. It is my hope that my department can contribute to the proposed program.



Rowan College of New Jersey

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Jack Cimprich
Coordinator, Academic Computing

Dr. Dick Scott,
Department of Geography
Robinson Hall

February 17, 1994

Dear Dr. Scott:

I am pleased to write this letter of support for your proposed concentration in cartography and geographical information systems. In particular, these are my reasons:

1. I have recently audited your first course in Geographical Information Systems. I found the material and computer software extremely useful to a wide-range of disciplines. As a chairman of a local planning board as well as the Coordinator of Academic Computing for Rowan College, I could especially appreciate the value of the GIS course to these areas.
2. The high degree of technological involvement makes this program very valuable to students seeking employment. It will teach and reinforce computing skills on state-of-the-art equipment and software, provide training in mapping, and provide a strong competitive edge when our students enter the job market.
3. The program is also attractive to me because of its interdisciplinary nature, both in terms of the courses and departments utilized and the students expected to enroll. In addition to the areas that you indicate students would come from to take this program, I would think that engineering could be added once that school is up and running.
4. And, finally, with respect to resources required, the state has just allocated \$1.9+ million for use by Rowan College to enhance its Academic Computing facilities throughout the campus. Your proposed program will require high-end hardware and software that will be certainly available with the new equipment arriving shortly.

In summary, I completely support your proposed concentration. Let me know if there is anything further I can do to help.

sincerely,

A handwritten signature in cursive script that reads 'Jack R. Cimprich'.

Jack Cimprich
Coordinator, Academic Computing



February 7, 1994

Dr. Richard Scott
Chairperson
Geography Department
Robinson Building

Dear Dr. Scott:

Thank you for the opportunity to review your proposal for a multi-disciplinary concentration program in cartography and geographical information systems. The mathematics courses indicated in the proposal are appropriate choices for such a concentration, providing a solid background for participants in the program. This program will provide an exciting opportunity for Rowan's undergraduates.

Sincerely,

Janet H. Caldwell

MEMO

Mathematics Department

TO: Richard Scott, Geography and Anthropology

FROM: Ron Czocho, Mathematics *RC*

DATE: February 16, 1994

RE: Concentration in Cartography and GIS

Thank you for the opportunity to comment on your proposal for a new concentration in Cartography and GIS. Mathematics majors are often asking what they can do once they have completed the major. It is nice to have concentrations such as this that provide them with a unique vision of applied areas that could be of use to them. It seems to me that a mathematics major with this concentration might go beyond pure description to modeling that might study the eventual evolution of certain geographical regions. She might also explore various measures of distance and clustering that might lead to new mapping techniques.

Your proposal is very thorough and provides a valuable alternative for our majors. The formal approach to advising in this concentration is a very strong component and I think the built in interaction between the concentration advisor and the major department is a great idea. Perhaps an informal relationship between the concentration and major advisors would also be beneficial.

I am very much in favor of this proposal and I strongly support it.