



**LETTER OF INTENT FOR A DUAL/JOINT ASSOCIATE OF  
SCIENCE (A.S.) IN EARTH AND PLANETARY SCIENCES,  
BACHELOR OF ARTS (B.A.) OR BACHELOR OF SCIENCE  
(B.S.) PROGRAM IN GEOLOGY TO BE OFFERED JOINTLY  
BY KINGSBOROUGH COMMUNITY COLLEGE AND  
BROOKLYN COLLEGE**

**THE DEPARTMENT OF PHYSICAL SCIENCES OF  
KINGSBOROUGH COMMUNITY COLLEGE  
PROF. DR. JOHN MIKALOPAS, CHAIRPERSON**

**THE DEPARTMENT OF GEOLOGY OF BROOKLYN  
COLLEGE  
PROF. DR. WAYNE POWELL, CHAIRPERSON**

**Contact Person: Prof. Dr. Harold C. Connolly Jr.**

**Kingsborough Community College Council Approval:**

**Proposed Initiation Date: Spring 2010**

*Attachment D*

## **1. PURPOSE AND GOALS**

The purpose of a new Associate in Science (A.S.) in Earth and Planetary Science is to offer students the opportunity to acquire an outstanding foundation in the geological sciences in preparation for transfer directly into Brooklyn College to complete a Bachelor of Arts (B.A.; 35-41.5 required credits) or Bachelor of Science (B.S.; 48-50.5 required credits) in Geology. The purpose of the proposed joint registration of this new degree with Brooklyn College's B.A. and B.S. in Geology is to establish a clear, unambiguous curricular pathway from Kingsborough Community College to Brooklyn College and prepare them for careers in Environmental Science, Planetary Sciences, Geology, Earth Science Education for secondary school teaching, Atmosphere and Ocean Studies, and for technology related jobs in the Earth and Planetary Sciences such as local Geotechnical firms.

## **2. NEED FOR THE DEGREE**

The Earth and Planetary Sciences (EPS) seeks to understand geological processes on Earth, both physical and historical, and apply our understanding of such processes to other planetary bodies, including but not limited to the formation of the Solar System. EPS draws upon all of the physical sciences and particularly from within the geological sciences and its various disciplines including close relationships with biological sciences (in the case of historical geology and evolutionary theory) and physics and mathematics with such areas as geophysics and general predictive modeling of geological processes. A jointly registered A.S./B.A. or A.S./B.S. offered by KCC and BC will prepare graduates for entry-level positions in any number of growing industries as well as government agencies and secondary education. We are strategically positioning our two colleges and their programs for the future of sciences in a global economy. Of particular influence on future careers are (1) the growing concern for the threat of global warming which will require a significant number of newly trained students in EPS, geology and environmental sciences (of which geology is the backbone). Graduates trained in these areas will be able to address concerns of global warming including waste management, flooding, and erosion. Strengthening natural disaster prevention and relief is of practical interest to world governments and in particular U. S. policy. The Southwestern Asian Tsunami and the increased frequency and force of recent hurricanes in the Gulf of Mexico region including Katrina and Ike are clear wake-up calls for more highly trained professionals working in the EPS disciplines who will study these phenomena and, based on the new knowledge that is gained, contribute greatly to our ability to minimize damage to property and harm to people with the great need to develop more accurate constraints on future predictions.

The White House has placed renewed emphasis on two aspects of EPS making them of national interest. First, the human space program is being revised and second an increase in secondary school science teachers has been earmarked as a priority for the future of U. S. growth. Both KCC and BC are in a position to offer articulated degrees in geosciences to prepare students for jobs that include the various environmental disciplines, careers within the geotechnical professions, city, state and federal careers in related civil service positions in departments responsible for inspections and prevention

and earth science education. Furthermore, we will target returning career persons to help them meet new goals of gaining knowledge and credentials for the purpose of teaching EPS-related sciences within the New York City school system, of which we have had several students pursue such a path in the last few years.

### 3. STUDENTS

We foresee three important sources of students:

(1) Entering Students interested in pursuing a career in EPS. In recent years, KCC students interested in pursuing a degree in EPS have gone on to four-year programs in CUNY and other institutions. For example, Jedež John began her college career at KCC with the intention of entering a program in Meteorology at Florida State University. She took Physical Geology (EPS 33) and Planetology (EPS 36). Several students have taken Introduction to Astronomy and gone on to study astronomy in CUNY and at Cornell University. Of those KCC students who completed EPS courses and are now pursuing four-year degrees in Geology, all are enrolled at Brooklyn College except one who is attending Hofstra University.

(2) Students who take an EPS course to satisfy a general requirement and become excited by the subject matter. More than 300 KCC students enroll in EPS courses each year with at least 10% of them taking more than one EPS course. This was the case for Jamie Nueman, who took Introduction to Earth Science (EPS 38) at KCC, became interested and was motivated to study the earth and planetary sciences further. She subsequently graduated from Brooklyn College and is currently a full-time employee of the American Museum of Natural History as scientific assistant to the curator of minerals.

(3) Students who wish to pursue careers in EPS education. The A.S. in Earth and Planetary Science will prepare students for the Earth Science Teacher program at Brooklyn College by offering Introduction to Astronomy (EPS 35), Planetology (EPS 36), Oceanography (EPS 32) and Meteorology (EPS 31), which are not currently offered at Brooklyn College. In addition, the Geology Department at BC is interested in having KCC faculty teach courses in areas in which they have special expertise.

Table 1. The projected enrollment for the A.S. for 5 years.

	Year 1	Year 2	Year 3	Year 4	Year 5
<b>Full Time</b>	4	8	10	12	14
<b>Part Time</b>	2	4	6	8	10

### 4. CURRICULUM

The curriculum is based on the Geology program at BC and other universities. Transferability to BC will be seamless. Students will complete basic courses in EPS as well as other physical sciences (e.g., Physics and Chemistry), which are necessary for entering any third-year Geology/EPS program leading to a successful career in these fields (Table 1).

*KCC College Requirements:* Passing scores on the CUNY tests in reading, writing and mathematics or developmental course work will be required. If required, ENG 04, ENG 91, ENG 92 and/or ENG 93. If required MAT M1 and MAT M2 or MAT R2. Plus:

Table 2. Listing of course requirements and awarded credits for each course needed for an A. S. degree in EPS within the Physical Sciences Department at KCC.

COURSE	CREDITS
<b>College Requirements</b>	<b>10</b>
ENG 12 English Composition I	4
ENG 24 English Composition II	3
HPE 12 Health Physical Education	3
<b>Departmental Requirements</b>	<b>28</b>
EPS 36 Physical Geology	4
EPS 31 Meteorology	4
EPS 32 Oceanography	4
EPS 35 Astronomy	4
EPS 36 Planetology	4
<b>Both of the following</b>	
PHY 11 General Physics 1	4
CHM 11 General Chemistry 1	4
<b>Math Requirements</b>	<b>8</b>
MAT 15 Calculus I	4
MAT 16 Calculus II	4
<b>Group Requirements</b>	<b>9</b>
Total of 9 credits from groups 1-1V	9
<b>Free Electives</b>	<b>5</b>
<b>Total</b>	<b>60</b>

*BC College Requirements:* Graduates for the A. S. degree in EPS from KCC will have automatically fulfilled essential lower tier core requirements for BC B. A. and B. S. degrees.

Table 3. Courses and awarded credits for B. S. and B. A. degrees offered by the Geology Department at BC. The third column is a comparison of courses taken for the A. S. degree in EPS in the Physical Sciences Department at KCC that will be transferred for the degree at BC.

COURSE	BC CREDITS	BC CREDITS	CREDITS From KCC**
	B. S. Geology Requirements	B. A. Geology Requirement	A. S. EPS Transfer
General Geology I (GEOL 1) <i>Equivalent taken at KCC.</i>	4.5	4.5	4
General Geology II (GEOL 2.2)	4.5	4.5	
Invertebrate Paleontology (GEOLO 31.1)	3		
Mineralogy. (GEOL 17.01)	4	4	
Igneous and Metamorphic Petrology (GEOL 13.53)	4		
Sedimentology and Sedimentary Petrology (GEOL 36.11)	3	3	
Geological Problems and Opportunities in Urban Areas (GEOL 22)	3	3	
Introduction to Geographical Information Systems (GEOL 31.1)	3		
Structural Geology (GEOL 41.1)	3	3	
Field Mapping (GEOL 12)	4		
At least 6 additional credits in courses numbered 10 or above* <i>plus electives transferred from KCC.</i>	6	6	16
<b>Chemistry Requirement</b>			
Chemistry 1 ( <i>Equivalent taken at KCC</i> ) and Geology 32 or 32.5 (Introduction to Geochemistry or Environmental Geochemistry)	8.5	5.5	4
<b>Mathematics Requirement</b>			
Mathematics 3.3 ( <i>Equivalent taken at KCC, MAT 15</i> )	3	3	4
Mathematics 4.3 ( <i>Equivalent taken at KCC, MAT 16</i> )	3		4

<b>Additional Requirements</b>			
Biology 3 or Physics 1 or 1.5 (Equivalent taken at KCC, PHY 11).	5		4
<b>Total</b>	<b>61.5</b>	<b>36.5</b>	<b>36</b>

\* These include the following course, all of which are 3 credits: The History of Life (GEOL14.2), Geology of the National Parks (GEOL 14.3), Concepts in Regional Geography (GEOL 14.4), Earth Materials (GEOL 14.5), Economic Geology and Energy (GEOL 17.21), Medical Geology (GEOL 18), Solid and Hazardous Waste Management (GEOL 19.1), Geological Aspects of Conservations (GEOL 20), Hydrogeology of Water Resources (GEOL 23.1), Geomorphology (GEOL 25.1), Statistics and Data Analysis in Geosciences (GEOL 28.2), History of Geology (GEOL 33.1), Meteorology (GEOL 33.2), General Geophysics (GEOL 43), Special Topic in Geology (GEOL 70.1), Special Topics in Environmental Geology (GEOL 70.2), Independent Research I (GEOL 83.1), Independent Research II (GEOL 83.2), Independent Research III (GEOL 83.3), Seminar I (GEOL 84.1), Seminar I (GEOL 84.2), Seminar I (GEOL 84.3).

\*\* Credits from KCC that will transfer to the degrees offered at BC.

*Kingsborough Community College, Department of Physical Sciences, Earth and Planetary Sciences:*

Dr. Harold C. Connolly Jr., Associate Professor  
 Dr. Cyrena S. Goodrich, Assistant Professor  
 Dr. Michael K. Weisberg, Professor  
 Robert Schenck, College Laboratory Technician

The Department of Physical Sciences currently has three full-time faculty members with an expertise in EPS; Professors Harold C. Connolly Jr., Ph.D. (Associate Professor), Cyrena S. Goodrich, Ph.D. (Assistant Professor) and Michael K. Weisberg, Ph.D. (Professor). Together their accomplishments in cosmochemistry and planetary sciences make them unique among science departments across the country. Very few institutions have three active faculty members teaching and researching within cosmochemistry. Furthermore, all three have consistently received high ratings in student evaluations of their teaching. Also, they are all Principal Investigators on NASA-funded research grants and Co-Investigators on numerous other NASA- and NSF-funded grants. They are well-published in peer-reviewed journals and serve on many national and international committees. Professor Connolly was decorated by the U. S. Congress and Department of Navy with the Antarctic Service Medal for service to his country in Antarctica and holds uncompensated positions at the American Museum of Natural History (Research Associate), the Lunar and Planetary Laboratory of the University of Arizona (Adjunct Associate Professor of Planetary Sciences) and Rutgers University (member of the Graduate Faculty). All three professors are also members of the Earth and Environmental Sciences Department of the Graduate Center of CUNY. Professors

Weisberg and Connolly also participants in the Stardust sample return mission, Professor Weisberg as a member of the Preliminary Examination Team. Stardust was the first mission to successfully bring back samples of a comet. Professor Connolly is currently a member of the science team for another NASA mission that is in the proposal stage, OSIRIS Rex. Professors Connolly and Weisberg are also Co-Is on a NSF grant for Research Experience for Undergraduates (REU), where CUNY is the lead institution and the American Museum of Natural History is a supporting institution. Professors Weisberg and Goodrich also hold uncompensated positions as Research Associates at the American Museum of Natural History.

In addition to the outstanding EPS faculty at KCC, facilities and a well-established infrastructure already exists. KCC needs no additional equipment to establish the joint degree program. Within the Department of Physical Sciences at KCC we have (1) lecture space, (2) laboratory space, (3) all the laboratory equipment we need including mineral and rock samples, petrographic microscopes (twelve of them plus a video system for instruction), computers, etc. Furthermore, we have a new, NASA-funded Secondary Electron Microscopy (SEM) laboratory. This is a cutting-edge technology center devoted to the investigation and instruction of planetary materials. Our students will have hands-on practical experience with this instrument during their studies. Since Kingsborough is the only college in the area with a state-of-the-art SEM, Brooklyn College students will also be given instruction on the equipment for their courses. Clearly, Kingsborough is already equipped to offer the A. S. degree. We are also very fortunate to have Mr. Robert Schenck as a CLT for EPS at KCC, who came to us with a M.S. from Adelphi University and as part of his CLT duties he helps maintain the SEM laboratory. We are also very fortunate in that he does adjunct teach and is an excellent instructor.

*Brooklyn College, Department of Geology:*

Dr. Stephen Aja, Associate Professor  
Dr. Rebecca Boger, Assistant Professor  
Dr. John Chamberlain, Professor  
Dr. Zongqi Cheng, Assistant Professor  
Dr. Nehru Cherukupalli, Professor  
Dr. Constantin Cranganu, Associate Professor  
Dr. John Marra, Professor  
Dr. Wayne Powell, Associate Professor  
Dr. Lynn Savage, Professor  
Dr. David Seidemann, Professor

Brooklyn College has a time-honored Department of Geology with a diverse faculty with strengths in various areas of Geology with a very well established core curriculum and facilities. They are also essentially an NSF-funded center for Earth Science education.

## 6. COST ASSESSMENT

There will be essentially minimal to no costs to the Department and the College to start this program. There are seventeen courses required to complete the degree. General Education requirements for the degree are already available and have strong enrollments. The six EPS courses required by the major run every semester with strong enrollment. Physics and general chemistry run every semester with strong enrollment. Minor costs would be incurred for office supplies such as paper for photocopies, staples, toner for printers, etc., and is anticipated not to exceed \$3000.00 per year. Most of our teaching materials are printed in book form or posted on line through Blackboard or other web resources. Currently, we do not have enough full-time faculty to teach all the EPS courses, thus we must hire at least 4 adjuncts per semester and potentially two for each winter and summer sessions. For the longer term it is projected that we will need to hire another full-time faculty member at the assistant professor level.

Anticipated cumulative costs and anticipated revenues for the first 5 years of the program follow in the appended tables.



**Projected Revenue Related to the A.S. in Earth and Planetary Science**

Revenues*	2010-2011	2011-2012	2012-2013	2013-2014	2014-2015
<i>Tuition Revenue</i> <sup>†</sup>					
01. From Existing Sources <sup>†</sup>	\$ 15,920	\$ 23,880	\$ 31,032	\$ 29,838	\$ 44,330
02. From New Sources <sup>‡</sup>	Ø	\$ 7,960	\$ 11,208	\$ 22,638	\$ 18,092
<b>03. Total</b>	<b>\$ 15,920</b>	<b>\$ 31,840</b>	<b>\$ 42,240</b>	<b>\$ 52,476</b>	<b>\$ 62,422</b>
<i>State Revenue</i> <sup>**</sup>					
04. From Existing Sources	\$ 21,400	\$ 40,125	\$ 51,585	\$ 36,850	\$ 65,160
05. From New Sources	Ø	\$ 13,375	\$ 19,005	\$ 36,850	\$ 24,435
<b>06. Total</b>	<b>\$ 21,400</b>	<b>\$ 53,500</b>	<b>\$ 70,590</b>	<b>\$ 73,700</b>	<b>\$ 89,595</b>
<i>Other Revenue</i> <sup>††</sup>					
07. From Existing Sources	Ø	Ø	Ø	Ø	Ø
08. From New Sources	Ø	Ø	Ø	Ø	Ø
<b>09. Total</b>	<b>Ø</b>	<b>Ø</b>	<b>Ø</b>	<b>Ø</b>	<b>Ø</b>
<i>Grand Total</i> <sup>††</sup>					
10. From Existing Sources	\$ 37,320	\$ 64,005	\$ 82,617	\$ 66,688	\$ 109,490
11. From New Sources	Ø	\$ 21,335	\$ 30,213	\$ 59,488	\$ 42,527
<b>TOTAL</b>	<b>\$37,320</b>	<b>\$ 85,340</b>	<b>\$ 112,830</b>	<b>\$ 126,176</b>	<b>\$ 152,017</b>

\* Beginning in the third year and each subsequent year, an inflation rate of 1.5% was added to the tuition rate and in the fifth year to the State Revenue rate.  
† The tuition was calculated at \$ 1,540 per full-time student per semester and \$120 per credit per part-time students assuming an average of 15 credits were completed each year.  
‡ Existing sources means revenue that would have been received by the institution even if the proposed program were not approved. It is anticipated that this major will enhance retention and graduation for new students who will gain interest in the earth and planetary sciences once enrolled. Less than half of majors will enroll at the outset strictly for this major. Therefore, more majors were categorized as "existing" than "new".  
§ New sources means revenue engendered by the proposed program. The revenue from new sources from the previous year should be carried over to the following year as revenues from new sources with adjustments for inflation, if a continuing source of revenue.  
\*\* The rate applied in Years 1 through 4 is \$2,675 per FTE and \$2,715 (.015 added for inflation) in the fifth year.  
†† Specify what is included in "other" category.  
‡‡ Enter total of Tuition, State and Other Revenue, from Existing or New Sources.

Projected Expenditures for the A.S. in Earth and Planetary Science

Expenditures	2009-2010	2010-2011	2011-2012	2012-2013	2013-2014
<i>Faculty</i>					
New Resources	0	0	\$80,400 <sup>1</sup>	\$81,606 <sup>2</sup>	\$82,830
<i>Equipment</i>					
New Resources	\$3,000	\$3,000	\$3,000	\$3,000	\$3,000
<i>Other</i>					
New Resources	0	0	0	0	0
Total	\$3,000	\$3,000	\$83,400	\$84,606	\$85,830
New Resources					

<sup>1</sup> Cost of one additional full-time assistant professor including cost of fringe benefits.

<sup>2</sup> Inflation of 1.5% added in fourth and fifth years.