Annual Report: Youth Internships

State Submission Annual Reporting Period: October 2015 - September 2016

- BRAINYAC Information Session Date: October 24, 2015
- Engineering the Next Generation Information Session Dates: March 15, 2016 and March 31, 2016
- BRAINYAC Application Deadlines: November 20, 2015 (Lang Program and Columbia Secondary School) and November 23, 2015 (State Pre-College Enrichment Program and Double Discovery Center)
- Engineering the Next Generation Application Deadline: April 15, 2016

Following the initial five year Summer Internship Program and in coordination with Columbia Secondary School’s leadership, CUMODified the internship program to provide a more selective internship to focus on at least one aspect of Science, Technology, Engineering, Environment, Arts and/or Math (STEAM).

The BRAINYAC program (Brain Research Apprenticeships In New York At Columbia) admits students with a stated interest in biomedical and specifically neuroscience research and provides immersive science research experience with Zuckerman Institute scientists. The program prepares students for laboratory research through training sessions, which run from January through May, followed by a 6-week period of intensive research during the summer. Upon completing the program, students come away with an increased understanding of how research in the lab leads to transformative discoveries. The program admits from four partner programs; Lang Youth Medical Program, State Pre-College Enrichment Program (S-PREP), Columbia Secondary School and the Double Discovery Center.

The Engineering the Next Generation (ENG) Program is a 6-week long intensive summer program at Columbia Engineering for academically competitive high school students. Rising high school seniors are placed in engineering labs, matched with research mentors, and supervised by faculty members Program components include research, mentoring, college preparation, presentation skills, as well as academic and professional workshops. Students are challenged with high-level academic expectations of both the researchers and undergraduate mentors. The program admits from three partner schools; Columbia Secondary School, The High School for Math, Science and Engineering (HSMSE) at the City College of New York, and ELLIS Preparatory Academy.

For both BRAINYAC and Engineering the Next Generation, participants must be at least 16 years of age in order to participate and are granted a stipend for their time in the program.

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<tr>
<th>Program</th>
<th>Intern Name</th>
<th>Zip Code</th>
<th>High School</th>
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<tbody>
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Additional Supporting Documentation

- BRAINYAC Brochure
- BRAINYAC Partner Program Recruitment Letter
- BRAINYAC 2016 Application Packet
- BRAINYAC 2016 Poster Presentation Program
- ENG Outreach and Application Process
- ENG 2016 Application Packet
Student Eligibility

BRAINYAC admits students from four local youth-serving programs and schools who have a stated interest in biomedical research and related careers. Students commit to Saturday afternoon classes from January through April and a full-time, six-week summer internship that runs from July through August.

Applicants must be:

- current sophomores or juniors;
- 16 years of age or older by the start of the summer session; and
- currently enrolled in one of the following: Lang Youth Medical Program; State Pre-College Enrichment Program (S-PREP); Double Discovery Center at Columbia College; or the Columbia Secondary School for Math Science and Engineering.

Applicants to BRAINYAC:

- are genuinely interested in the biomedical sciences;
- demonstrate the maturity needed to work in a sophisticated high-tech lab environment; and
- are willing to commit to completing the entire program.

Preference is given to students residing in northern Manhattan and the South Bronx.

Applications are distributed to partner programs and schools in the fall before BRAINYAC begins.

BRAINYAC scholars participate in a science communication and networking workshop.

Funding provided by

The Zuckerman Institute’s BRAINYAC program pairs high school students with scientists for intensive lab apprenticeships.
**Program Overview**

The Zuckerman Institute’s Brain Research Apprenticeships in New York at Columbia (BRAINYAC) program is an immersive science research experience, where our scientists open their doors to high school students, who in turn bring their talents and perspectives to the lab.

The program aims to:

- introduce high school students to an academic scientific research environment;
- develop their laboratory and technical skills;
- boost their understanding of science as it is practiced; and
- build their science communication and presentation skills.

**What’s Involved**

The BRAINYAC program starts in January through with Saturday training sessions which run through April at Columbia University Medical Center. During this time, students are prepared for laboratory research and focus on neuroscience content and basic laboratory skills.

Beginning in July, students are matched with scientists in neuroscience laboratories at Columbia University for six weeks of one-on-one mentored research.

Student employ techniques that scientist use everyday such as DNA editing, functional imaging and computer modeling.

BRAINYAC scholars also meet weekly as a group to build their science communication and presentation skills.

**Outcomes**

Students come away from the program with an enhanced understanding of how lab research can lead to transformative discoveries, as well as exposure to a professional and academic environment and a heightened connection to science as a career.

At the end of the program, students present their research to a diverse audience—friends, family, researchers, mentors and the broader community—during a poster presentation.

Students are paid a stipend upon successful completion of the program.
Dear [Mr./Ms./Dr.] [name]:

The Brain Research Apprenticeship in New York at Columbia (BRAINYAC) is a mentored science research program for high school students. We are recruiting students for the BRAINYAC program and will like to invite you to nominate students whom you feel will benefit from the BRAINYAC program to apply. The program, run by Columbia University’s Mortimer B. Zuckerman Institute, is designed to introduce high school students to an academic scientific research environment, develop student’s laboratory and technical skills, boost student’s understanding of science practice and build student’s science communication and presentation skills.

The BRAINYAC program’s spring session runs from January through April and summer laboratory internship runs from June through August. During the spring students attend Saturday training sessions during which they learn neuroscience fundamentals and common laboratory techniques in preparation for their summer laboratory internships. Students are matched to scientist mentors in neuroscience laboratories in Columbia University for a six-week one-on-one mentored research.

We ask our select partner programs to nominate students who: are genuinely interested in biomedical sciences; have a high level of maturity needed to work in a sophisticated high-tech laboratory environment; are 16 years of age by the beginning of the summer laboratory internship on June 27, 2016; and are willing to commit to the entirety of the program.

Nominated students are required to attend a recruitment information session on Saturday, October 24, 2015 from 11am to 12pm. The information session will be held at Hammer Building Room LL210, located at 701W 168th street, New York, NY 10032. More information about the program will be shared with the students during the session.

Please feel free to contact me if you have any questions regarding the program or the application process. I can be reached via email at cp2879@columbia.edu or via phone at 212.851.9612.

Yours sincerely,

[Signature]
Education Program Manager
Mortimer B. Zuckerman Mind, Brain Behavior Institute
Columbia University
Invitation to attend

BRAINYAC Program

Information Session
Saturday, October 24, 2015
11am to 12pm

Hammer Building
701 W 168th Street,
Room LL210,
New York, NY 10032

COLUMBIA | ZUCKERMAN INSTITUTE
Mortimer B. Zuckerman Mind Brain Behavior Institute
Welcome to the online application for Brain Research Apprenticeships in New York at Columbia (BRAINYAC). This application consists of five parts: personal information, parent/guardian information, education, short answer, and essay questions. We recommend that you compose your answers to the short answer and essay questions before beginning the application. You will be able to copy and paste your answers into the boxes provided. By applying to the program, you admit that you will: attend all program sessions and be accompanied by a parent or guardian to the parent-student orientation on January 9, 2016.

Short answer questions:

Describe any extracurricular activities (organizations, athletics, student government, etc.) in which you have participated. Include community service, if applicable. What special recognition have you received for excellence in school?

Essay questions:

Describe what makes you a good candidate for the BRAINYAC program. What interests you about the brain and neuroscience? (Max 300 words) How would being in the BRAINYAC program help your education and career goals? (Max 200 words) Working in a professional research lab as potentially its youngest and least experienced member can be a challenge for some people. What experiences have prepared you for being in a professional environment surrounded by adults? (Max 200 words)

Please direct any questions to the BRAINYAC program director, Chidi Paige, cp2879@columbia.edu

First Name

Middle Name

Last Name

Which of the BRAINYAC partner programs or school are you enrolled in

- Lang Youth Program (1)
- S-PREP (2)
- Double Discovery Center (3)
- Columbia Secondary School for Science Math & Engineering (4)

Mailing Address Line 1 (Number, Street, Apt. #)

Mailing Address Line 2 (City, State)

Zip Code

Cellphone Number (If available)

Email Address

Re-type email address
Gender
- Male (1)
- Female (2)

Date of Birth

Will you be 16 years of age on or before June 30, 2016? (If you have not turned 16 years old by the start of the lab portion of BRAINYAC, you are ineligible to apply.)
- Yes (1)
- No (2)

Parent/ Guardian name (First and Last)

Parent/ Guardian Email Address

Home Telephone Number

Additional Parent/ Guardian Name (Optional)

Additional Parent/ Guardian Email Address (Optional)

Name of high school

Address of high school (Street number, street name, City, State, and zip code)

Current grade in school
- 10th grade (1)
- 11th grade (2)

Do you commit to attending the BRAINYAC training sessions from 1:15 to 3:15pm on the following Saturdays? January 9, January 16, January 23, January 30, February 6, February 13, February 27, March 5, March 12, April 2, and April 16, 2016
- Yes (1)
- No (2)

Does your parent commit to attend the parent-student orientation on January 9, 2016 from 1:15pm to 3:15pm?
- Yes (1)
- No (2)
Do you commit to participating in a scientific research laboratory internship and BRAINYAC advisory sessions from June 30 to August 12, 2016?
- Yes (1)
- No (2)

Describe any extracurricular activities (organizations, athletics, student government, etc.) in which you have participated. Include community service, if applicable.

What kind of laboratory experience do you have (in school or extracurricular)? (No previous lab experience outside of the typical high school classes is necessary for this program.)

What special recognition have you received for excellence in school?

We will be conducting interviews on the following days and times. Please indicate your availability on at least 3 separate dates, selecting as many time slots possible on each day. Interviews will be approximately 20 minutes and be conducted at Columbia University (Studebaker Building, 615 131st Street, New York). Further details will be provided to applicants invited to interview. Due to on going constructions, please enter the building at 622 132nd Street entrance. Please hold dates you indicate below on your calendar until the week of November 24, 2015 when we will confirm your interview date.

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<th>Date</th>
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Describe what makes you a good candidate for the BRAINYAC program. What interests you about the brain and neuroscience? (Max 300 words)

How would being in BRAINYAC program help your career goals? (Max 200 words)
Working in a professional research lab as potentially its youngest and least experienced member can be a challenge for some people. What experiences have prepared you for being in a professional environment surrounded by adults? (Max 200 words)

The information submitted above is true and correct to the best of my knowledge.
- I agree (1)
- I disagree (2)

I hereby submit my application to BRAINYAC program. (Name, date)

Contact Information: Education Program Manager Mortimer B. Zuckerman Mind Brain Behavior Institute615 West 131st Street, 6th Floor New York, NY 10027 Phone: Email:
BRAINYAC Research Poster Presentation & Reception

Celebrating achievements of the 2016 BRAINYAC graduates

at

Riverview Lounge, 4th Floor
Hammer Health Science Building
701 W 168th St. New York, NY 10032

Friday, August 12, 2016
2:00pm to 4:00pm

The Zuckerman Institute’s BRAINYAC (Brain Research Apprenticeships in New York at Columbia) program is an immersive science research experience for high school students to work in neuroscience laboratories at Columbia University.
Brain Research Apprenticeships In New York At Columbia (BRAINYAC) is a mentored science research program for high school students run by the Zuckerman Institute. The program aims to introduce high school students to the academic scientific research environment, develop laboratory and technical skills, boost their understanding of science as it is practiced and build their communication and presentation skills.

Students are prepared for laboratory research during eight training sessions from January to April that focus on neuroscience content and basic laboratory skills. Starting in June, students spend six weeks doing mentored research in Neuroscience laboratories at Columbia. Students come away from the program with an increased understanding of science as a career.

BRAINYAC receives generous support from the Pinkerton Foundation and the Stavros Niarchos Foundation.

**PROGRAM Agenda**

- 2:00pm  
  - Guest Arrival
  - Opening Remarks
  - Mentor Appreciation
  - Presentation of Certificates

- 3:00pm—4:00pm  
  - Refreshments and Research Poster Presentations

- 4:00pm  
  - Departure

**BRAINYAC Program Description**

Brain Research Apprenticeships In New York At Columbia (BRAINYAC) is a mentored science research program for high school students run by the Zuckerman Institute. The program aims to introduce high school students to the academic scientific research environment, develop laboratory and technical skills, boost their understanding of science as it is practiced and build their communication and presentation skills.

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**BRAINYAC Students**

- The effect of social ascent on the levels of cFos in various regions of the brain
- The characterization of PARP expression in neural progenitor cells of the human hippocampus
- The role of ATRX and HDAC2 in olfactory receptor choice
- Investigating patterns in axon guidance in the larva of fruit flies using optogenetics
- Does social status affect orexin expression in the mouse brain?
- Understanding and explaining autistic behaviors by testing the learning style theory
- Investigating the functions of visceral second-order neurons
- Developing specific connections between MN and muscles
- Investigating the role of adult hippocampal neurogenesis and ketamine in buffering the stress response
- Function and expression of dopamine transporter in HEK and CHO cells through direct transfecting and viral transfecting
- Creating a cell culture system to study regulation of olfactory receptor choice
- Retromer degeneration in ALS astrocytes
- Characterizing tagged versions of death receptor 6
ENG Outreach and Application Process

The ENG program was advertised primarily through in-person information sessions and presentations at partner schools in junior (11th grade) STEM classes and after-school programs. The program was also advertised on the Columbia Engineering Outreach website, but applications were only distributed through STEM teachers at our partner schools. All students with junior standing at our partner schools were eligible to apply, and teachers of junior level STEM classes were asked to encourage exceptional students in their classes to apply.

The applications were opened on March 31st, 2016 and closed on April 15th, 2016, giving students over two weeks to complete the application. The application packet (attached) included a personal information form, two essay responses, an extracurricular activities form, a teacher recommendation letter, and a high school transcript. Students submitted their applications to their STEM teachers, who then forwarded the application materials to Emily Ford by the application deadline.

Applications were evaluated by [redacted] with additional input from partner school teachers, as well as SEAS faculty members. Students were evaluated for academic excellence and interest in STEM. The high school transcripts and teacher recommendation letters were used to evaluate academic excellence, and interest in STEM was assessed with the essay responses, extracurricular activities form, and teacher recommendation letters. Students were notified of their acceptance to the program or waitlist placement at the beginning of May 2016.
Program Description
The ENG Program is a 6-week academic summer program at Columbia Engineering for academically competitive high school students. Rising high school seniors will be placed in engineering labs, matched with research mentors, and supervised by faculty members. This program has rigorous demands and will prepare students for the caliber of work expected of college students.

Program components include research, mentoring, college preparation, presentation skills, as well as technical, academic, and professional development workshops. Students will also learn time management, communication, and teamwork skills, which are all increasingly important for success in STEM fields and in higher education. Possible extensions of the program include continuing research throughout the academic year, publication in the Columbia Undergraduate Science Journal, and a letter of recommendation from the research lab’s supervising professor and Principal Investigator.

Eligibility
Students should be current high school juniors to apply. While there is no minimum GPA, students should excel academically overall. Ideally, applicants will have demonstrated interest in STEM subjects, for example by seeking out advanced classes and extra curricular activities.

Students must be free for the entire duration of the program. Students are required to present their project at the research master class, write a summary of the research project, and prepare a poster to present at the undergraduate symposium in September 2016. The program also requires students to attend a lab safety training as well as relevant workshops. Students will be awarded a stipend upon successful completion of the program.

Dates and Duration
The program runs from Tuesday July 5th through Friday August 12, 2016. Students will work about 35 hours a week, Monday – Friday from 9am – 5pm.

Application Deadline:
Please print out all materials and submit them to your teacher by April 15th 2016 by 5:00pm EST.
Application Checklist

Please use the following checklist to verify that your application is complete prior to submitting your application. All materials, including the letter of recommendation, are due on April 15th.

- **Personal Information Form**
  - Student and parent signatures are required.

- **Two (2) Essay Responses**
  - Responses should be limited to 300 words maximum per question. For question 3, additional drawings are allowed.
  - Do NOT answer all three questions. Only two essay responses will be evaluated when reviewing your application.
  - Essay responses should be written/typed on a separate document attached to the completed application. Please label each page with the question you are answering.

- **Extracurricular Responses**
  - Please describe up to three (3) of your most important extracurricular activities on the form included.

- **Recommendation Letter**
  - Please ask either your current science or math teacher to submit a recommendation on your behalf. **Important:** Please notify your teacher well in advance of the April 15th deadline to give your teacher ample time to prepare a letter of recommendation.
  - Teachers: Please email your letters of recommendation directly to the Director of Outreach Programs at Columbia Engineering at [email].

- **High School Transcript**
Personal Information Form

Applicant Information
First Name: ___________________________ M.I.: _____ Last Name: ___________________________
Home Address: _____________________________________________________________
City: ______________ State: _______ Zip: _______ Phone Number: ______________________
Email Address: _____________________________________________________________

Parent/Guardian Information
Parent/Guardian 1: First Name: ___________________________ Last Name: ___________________________
   Email Address: ___________________________________ Phone Number: ______________________
Parent/Guardian 2: First Name: ___________________________ Last Name: ___________________________
   Email Address: ___________________________________ Phone Number: ______________________

Emergency Contact
First Name: ___________________________ Last Name: ___________________________
Email Address: ___________________________________ Cell Phone Number: ______________________

School Information
Name of School: __________________________________________ Current Grade: _________
Name of teacher providing recommendation: _____________________________________________
Teacher’s subject: _________________________________________________________________

Signatures
By signing below, I verify that all information provided in the application is accurate. Please submit this form along with all the required material detailed in the checklist.

Applicant Signature: ___________________________________ Date: ______________________

Parent/Guardian Signature: ___________________________________ Date: ______________________
Essays

Please choose 2 out of the three essay questions to answer, and limit your responses to 300 words or less. There are no “right” answers to any of these questions; essays will be judged for creativity, innovation, and your ability to convey your ideas clearly and concisely. Submit your responses in a separate document along with the rest of your application, and clearly label each page with the question that you are answering.

1) What do you think has been the greatest scientific or technological discovery in the past 50 years? Why?

2) Describe a social, personal, or academic challenge that you have faced and how you overcame it.

3) Imagine that you are a product engineer for a rehabilitation clinic. Many of the clinic’s patients suffer from arthritis and have difficulty doing daily tasks with their hands, such as turning a doorknob, typing on a keyboard, or opening containers. The clinic has asked you to design a product that will allow arthritis patients to do some of these tasks more easily.

Describe your plan on how you will design your solution from start to finish. To help you get started, here are a couple questions to help you begin your design plan:

- Arthritis makes numerous daily activities difficult. Which specific activity will your product make easier for arthritis patients, and why did you choose this activity?
- How will you brainstorm possible solutions?
- How will you make your product economically feasible?
- How will you test your product?

Please note that we are NOT looking for a specific solution, and you do not need to design or sketch a possible solution unless you wish. We are more interested in your approach to problem solving and design planning rather than a “correct” solution.
Extracurricular Information Form

Please list up to three (3) extracurricular activities in order of importance.

**Extracurricular Activity 1**
Organization: ___________________________ Position/Role: ___________________________
Hours Per Week: _________ Start and End Date (list Present if ongoing): ___________________________
Describe your involvement and why it is important to you (100 words max):

**Extracurricular Activity 2**
Organization: ___________________________ Position/Role: ___________________________
Hours Per Week: _________ Start and End Date (list Present if ongoing): ___________________________
Describe your involvement and why it is important to you (100 words max):

**Extracurricular Activity 3**
Organization: ___________________________ Position/Role: ___________________________
Hours Per Week: _________ Start and End Date (list Present if ongoing): ___________________________
Describe your involvement and why it is important to you (100 words max):