Deliverables for BNL Internships – 2018

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Required deliverables

1. **DOE Pre-Survey** (SULI, CCI, and VFP interns only)
2. **Abstract for General Audience – 300 word limit**
3. **Project Report Paper – Length between 1500 and 3000 words, excluding this report's abstract (approx. 5% of total), footnotes, appendices (< 3 pages), the bibliography, and similar items.**
4. **Poster, including an abstract – 150 word limit for abstract**
5. **Peer Review of Presentations**
6. **BNL Departure Survey (complete before leaving)**
7. **DOE Post-Survey** (SULI, CCI, and VFP interns only)

FOR DOE interns: With the exception of the three surveys (two for DOE and one for BNL), ALL materials MUST be uploaded via WDTS site as PDF files ONLY, no exceptions.

FOR ALL interns: Attach and send all deliverables (excluding all surveys) to scienceinterns.com mailboxes in original (non-PDF) format; e. g., Word doc or Powerpoint.

Collaborating?

- DELIVERABLES
  - If you are part of a collaborative team, you only need to complete ONE abstract for a general audience, ONE report, and ONE poster.
  - List all collaborative authors and simply swap the order for each deliverable when you submit your individual copy of a deliverable.
- WRITING CONFERENCES.
  - Sign up as a team. Select ONE member of the team to make ONE appointment and indicate that there are others, including their names. EVERYONE on the team attends the conference.

Deadlines

• All FRIDAYS	Weekly Report (except 8/10)
• 6/8	DOE Pre-survey (SULI, CCI, and VFP interns only)
• 6/8	New Appointment Checklist
• 6/29	Abstract for a General Audience (Draft 1)
• 7/5 – 7/13	Writing Conferences
• 7/19	Abstract for a General Audience (Departmental Draft)
• 7/23 – 7/27	Writing Conferences
• TBD	Report title submitted
• 7/31	Poster printing deadline
• 7/31	Abstract for a General Audience (Draft 3)
• 8/7 noon	Symposium PowerPoint Presentations submitted
• 8/8	All Deliverables, including BNL Exit Survey
• 8/8	DOE Post-survey (SULI, CCI, and VFP interns only)

Document Naming Convention

- **All document names must begin using the following template:**
  - **ALL CAPS followed by type of deliverable in lower case**
  - **LASTNAME_FIRSTINITIAL_deliverabletype**
    - **STEGMAN_M_abstract**

use_underscores_not_spaces

General types: Abstract for a general Audience, Project Report, Poster

- I – M – R – A – D

  Introduction, Methods, Results, And Discussion

- Narrative, Process, et al.

Abstract for a General Audience

- Length: <300 words
- This summary should highlight research accomplishment(s), be written at a level approachable by a broad and largely non-subject matter expert audience (*Scientific American* level of sophistication), describe Department of Energy programmatic or mission relevance of your activities, define the institutional setting, and generally discuss activities, outcomes, impacts, lessons learned, and professional growth and development resulting from your appointment.

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Abstract for a General Audience

A summary of your BNL experience OR a research paper abstract

- **DOE format for Abstract for a General Audience**
- While you should touch on each of the following topics in this checklist, you need not organize them in this sequence.
  - Discuss your **activities** including a definition of the institutional setting (BNL, NSLS II, RHIC, etc.);
  - Highlight **accomplishments;**
  - Discuss **impact**(s) on BNL research of your research ;
  - Describe **relevance** of your research activities to DOE program(s) or mission;
  - Highlight **lessons learned;**
  - Discuss the **professional growth and development** resulting from your appointment.

Abstract for a General Audience, Sample

The Relativistic Heavy Ion Collider (RHIC) at Brookhaven National Laboratory requires a highly polarized proton beam for spin-polarization studies. During each experimental run, 250 GeV protons are elastically scattered from a carbon micro-ribbon target 10 µm wide and 50 nm thick to monitor the degree of proton beam polarization. Experiments have shown that the amorphous carbon targets have poor electrical conductivity, limiting their lifetime. Since RHIC operates continuously for several months at a time under ultra-high vacuum, it is costly and inefficient to use carbon targets with short lifetimes. Our study has examined the few micro-ribbons that serendipitously survived a recent RHIC experimental run. Transmission electron microscopy diffraction pattern analysis of the micro-ribbons shows that heating from the RHIC beam has crystallized the amorphous carbon into graphite. In addition to examining micro-ribbons fabricated by Collider-Accelerator Department staff, we are exploring new methods of micro-ribbon fabrication that will have superior material properties. One possible approach consists of depositing thin films of nickel and carbon on a silicon wafer through an anisotropically-etched silicon wafer mask. By annealing amorphous carbon micro-ribbons, we consistently achieve conductivity and crystallinity results similar to those found in the surviving RHIC micro-ribbons. When annealed at 700 °C, a 10 nm thick amorphous carbon layer forms a solid solution within the 50 nm thick nickel layer before recrystallizing as graphene on the surface of the nickel. Graphene is well known to have superior electrical conductivity and tensile strength, and may well prove to be an ideal material for the next generation of micro-ribbon targets for RHIC during its next proton polarimetry experiments in 2015. As a result of this summer, I have added electron microscopy to my repertoire of materials characterization techniques. Additionally, I am now familiar with microfabrication processes and several software programs including DesignCAD, NPGS, MathCAD, and Scandium.

Activities (inc. institutional setting)

The Relativistic Heavy Ion Collider (RHIC) at Brookhaven National Laboratory requires a highly polarized proton beam for spin-polarization studies. During each experimental run, 250 GeV protons are elastically scattered from a carbon micro-ribbon target 10 μm wide and 50 nm thick to monitor the degree of proton beam polarization. Experiments have shown that the amorphous carbon targets have poor electrical conductivity, limiting their lifetime. Since RHIC operates continuously for several months at a time under ultra-high vacuum, it is costly and inefficient to use carbon targets with short lifetimes. Our study has examined the few micro-ribbons that serendipitously survived a recent RHIC experimental run. Transmission electron microscopy diffraction pattern analysis of the micro-ribbons shows that heating from the RHIC beam has crystallized the amorphous carbon into graphite. In addition to examining micro-ribbowe are exploring new methods of micro-ribbon fabrication that will have superior material properties. One ns fabricated by Collider-Accelerator Department staff, possible approach consists of depositing thin films of nickel and carbon on a silicon wafer through an anisotropically-etched silicon wafer mask. By annealing amorphous carbon micro-ribbons, we consistently achieve conductivity and crystallinity results similar to those found in the surviving RHIC micro-ribbons. When annealed at 700 °C, a 10 nm thick amorphous carbon layer forms a solid solution within the 50 nm thick nickel layer before recrystallizing as graphene on the surface of the nickel. Graphene is well known to have superior electrical conductivity and tensile strength, and may well prove to be an ideal material for the next generation of micro-ribbon targets for RHIC during its next proton polarimetry experiments in 2015. As a result of this summer, I have added electron microscopy to my repertoire of materials characterization techniques. Additionally, I am now familiar with microfabrication processes and several software programs including DesignCAD, NPGS, MathCAD, and Scandium.

Accomplishments

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Impact on BNL research

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Relevance (e. g., emerging technologies)

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Lessons learned

The Relativistic Heavy Ion Collider (RHIC) at Brookhaven National Laboratory requires a highly polarized proton beam for spin-polarization studies. During each experimental run, 250 GeV protons are elastically scattered from a carbon micro-ribbon target 10 µm wide and 50 nm thick to monitor the degree of proton beam polarization. Experiments have shown that the amorphous carbon targets have poor electrical conductivity, limiting their lifetime. Since RHIC operates continuously for several months at a time under ultra-high vacuum, it is costly and inefficient to use carbon targets with short lifetimes. Our study has examined the few micro-ribbons that serendipitously survived a recent RHIC experimental run. Transmission electron microscopy diffraction pattern analysis of the micro-ribbons shows that heating from the RHIC beam has crystallized the amorphous carbon into graphite. In addition to examining micro-ribbons fabricated by Collider-Accelerator Department staff, we are exploring new methods of micro-ribbon fabrication that will have superior material properties. One possible approach consists of depositing thin films of nickel and carbon on a silicon wafer through an anisotropically-etched silicon wafer mask. By annealing amorphous carbon micro-ribbons, we consistently achieve conductivity and crystallinity results similar to those found in the surviving RHIC micro-ribbons. When annealed at 700 °C, a 10 nm thick amorphous carbon layer forms a solid solution within the 50 nm thick nickel layer before recrystallizing as graphene on the surface of the nickel. **Graphene is well known to have superior electrical conductivity and tensile strength, and may well prove to be an ideal material for the next generation of micro-ribbon targets** for RHIC during its next proton polarimetry experiments in 2015. As a result of this summer, I have added electron microscopy to my repertoire of materials characterization techniques. Additionally, I am now familiar with microfabrication processes and several software programs including DesignCAD, NPGS, MathCAD, and Scandium.

Professional development

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Abstract for a General Audience

A summary of your BNL experience OR a research paper abstract

- **Alternate format for Abstract for a General Audience using a scientific research paper outline**
  - An **introduction** that succinctly describes and appropriately connects the subject and context/ background to the purpose of the investigation;
  - A **methods** section that succinctly identifies the methods used to study the subject of the investigation;
  - A **results** section that provides a succinct and specific explanation of what was discovered, accomplished, collected or produced;
  - A **discussion** that provides a succinct interpretation of the results and evaluates what the results mean to the investigation, or when results were not obtained evaluates what the completion of the investigation could mean within a larger field.

Abstract for a General Audience, Sample

The Relativistic Heavy Ion Collider (RHIC) at Brookhaven National Laboratory requires a highly polarized proton beam for spin-polarization studies. During each experimental run, 250 GeV protons are elastically scattered from a carbon micro-ribbon target 10 μm wide and 50 nm thick to monitor the degree of proton beam polarization. Experiments have shown that the amorphous carbon targets have poor electrical conductivity, limiting their lifetime. Since RHIC operates continuously for several months at a time under ultra-high vacuum, it is costly and inefficient to use carbon targets with short lifetimes. Our study has examined the few micro-ribbons that serendipitously survived a recent RHIC experimental run. Transmission electron microscopy diffraction pattern analysis of the micro-ribbons shows that heating from the RHIC beam has crystallized the amorphous carbon into graphite. In addition to examining micro-ribbons fabricated by Collider-Accelerator Department staff, we are exploring new methods of micro-ribbon fabrication that will have superior material properties. One possible approach consists of depositing thin films of nickel and carbon on a silicon wafer through an anisotropically-etched silicon wafer mask. By annealing amorphous carbon micro-ribbons, we consistently achieve conductivity and crystallinity results similar to those found in the surviving RHIC micro-ribbons. When annealed at 700 °C, a 10 nm thick amorphous carbon layer forms a solid solution within the 50 nm thick nickel layer before recrystallizing as graphene on the surface of the nickel. Graphene is well known to have superior electrical conductivity and tensile strength, and may well prove to be an ideal material for the next generation of micro-ribbon targets for RHIC during its next proton polarimetry experiments in 2015. As a result of this summer, I have added electron microscopy to my repertoire of materials characterization techniques. Additionally, I am now familiar with microfabrication processes and several software programs including DesignCAD, NPGS, MathCAD, and Scandium.

Format for the Abstract for a General Audience

DEPARTMENT (Physics, Chemistry, Life Sciences, Engineering et al.)

- **TITLE**
  - Skip a line and then include your title here, even if it is not the final version. Be sure to capitalize **ONLY** the first word; no acronyms.
- **AUTHORS**
  - Skip a line and then begin with yourself are the first author; include your school information. You mentor is the last author; include his/her BNL information. See program deliverables or writing workshop PDF for more information on author format.
- **TEXT**
  - Skip a line. Indent paragraph, double-space, 12 point Times Roman, flush left. Define all acronyms used more than once in this abstract. ONE paragraph only. 300 word limit, excluding title and authors.

Format for the Abstract for a General Audience

"Department"

One, double-spaced paragraph (< 300 words), indent first line, no justification.

The title of your report; not a label

Your author information

Your mentor's information

PHYSICS

Your title goes here with only the first word capitalized
Your Name, Your Department, Your School, City, State ZIP
Your Mentor, Department, Brookhaven National Laboratory, Upton, NY 11973

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Aenean facilisis luctus erat sed blandit. Nullam varius elit a mi vestibulum, quis scelerisque dui hendrerit. Nullam convallis augue id ullamcorper semper. Phasellus sed lacus pulvinar, placerat magna vehicula, scelerisque velit. Quisque magna mi, suscipit non velit a, viverra condimentum dolor. Duis tempus convallis gravida. Phasellus pharetra sit amet neque eget pretium. Cras consectetur tortor at ligula vulputate, sed malesuada elit volutpat. Fusce scelerisque, est non ornare fermentum, quam nisi imperdiet mauris, at tristique purus dolor in lorem. Fusce scelerisque odio vitae lorem iaculis rhoncus. Vestibulum ante ipsum primis in faucibus orci luctus et ultrices posuere cubilia Curae; Etiam cursus tempor condimentum. Integer tempus adipiscing viverra. Aliquam erat volutpat. Suspendisse potenti. Maecenas mollis suscipit nisl, vel egestas nisi tincidunt non. Proin lobortis nisl vitae fringilla convallis. Morbi varius laoreet risus, eu tincidunt leo iaculis aliquet. Aliquam et orci metus. Nulla posuere, quam sit amet porta iaculis, turpis justo dignissim arcu, vel adipiscing arcu nunc at sapien. In vitae libero in eros accumsan scelerisque. Curabitur congue commodo dui a consectetur. Nam luctus dolor non est posuere vulputate. Nullam ipsum ipsum, elementum a tristique vel, congue eget est. Aliquam non sem eros. Nullam urna neque, hendrerit vel sem vestibulum, faucibus vehicula libero. Maecenas eleifend mauris purus, eget aliquet nunc dapibus in. Vivamus non nibh nisl. Cras condimentum gravida dui, a imperdiet nibh consequat eget.

An Abstract in only 4 Weeks? Really?!

- How can I write a complete abstract after only 4 weeks?
- One idea: wireframe
- Another: Sketch all of the components
- Indicate missing info
- Be speculative if necessary
- Get real by the end of the summer

Submitting abstracts and scheduling a conference

- Collaborative Projects: Submit ONLY ONE copy of each draft
- Attach to an email and send to abstracts@scienceinterns.com
- Email Subject: Abstract + draft #
- Drop-dead Deadline: 5pm
- Writing Conference sign-up: WAIT
- I'll indicate that I wish you to schedule a conference.

Project Report Paper

- The main text of the paper is to be between 1500 and 3000 words. The word count does not include footnotes, appendices, the bibliography and similar items. All appendices together must be three pages or less. The form of the paper should follow the guidelines of the appropriate portions of the *Style Manual from the American Institute of Physics.* The final paper that you submit should be in "publication" form. Submission must be made using the online WDTS web site, as an Adobe Acrobat (.pdf) file, prior to the end of your appointment.

Project Report Paper

- **I. General instructions**
  - Submit manuscripts in English only (American spelling).
  - Use subheadings for each section
  - Double space (1 inch margins), minimum 12 point font
  - Indent paragraphs so that the start of a new paragraph is clearly distinguished, especially where there is a continuation of an existing paragraph after a displayed equation.
  - Number all pages in sequence, beginning with the title and abstract pages.

Project Report Paper

- **II. Title**
  - Place the title about a third of the way down from the top of the first page.
  - Begin the first word with a capital letter; thereafter capitalize only proper names and acronyms.
  - Author(s): You as the first author, your mentor as concluding author. Identify affiliated institutions.

Project Report Paper

- Authors’ names and affiliations
  - Type the authors’ names above their affiliations
  - Omit titles such as Professor, Doctor, etc.
  - In the affiliation, use no abbreviations. Give an adequate postal address including the ZIP.
  - See page 6 and 7 of AIP Style Manual for examples of how to format authors’ names.

Title/Author format example

Drag on an axially symmetric body in the Stokes flow of micropolar fluids

John J. Doe and James G. Smith

Department of Physics, Massachusetts Institute of Technology, Cambridge, Masssachusetts 02139

You, Your School's Department, Your College, City, State ZIP

Your mentor, BNL Department, Brookhaven National Laboratory, Upton, NY 11973

Title/Author format

pp interactions at 300 GeV/*c*: Measurement of the charged-particle multiplicity and the total and elastic cross sections

J. I. Herman

Department of Physics and Lawrence Berkeley Laboratory, University of California, Berkeley, California 94720, and Blackett Laboratory of Physics, Imperial College, London SW7 2BZ, England

Alfred E. Schmidt and Kurt Schwarz

Fakultät für Physik, Universität Bielefeld, 48 Bielefeld, Federal Republic of Germany

You, Your School’s Department, Your College, City, State ZIP

Your mentor, BNL Department, Brookhaven National Laboratory, Upton, NY 11973

Project Report Paper

- **III. Abstract**
  - Begin the abstract on a new line.
  - Use wider side margins for the abstract than for the rest of the manuscript, so that it will be clear where the abstract ends and the main text begins.
  - Type or print the abstract double spaced, preferably as one paragraph of continuous text. Avoid displayed mathematical expressions, figures, and tables.
  - If a reference to the literature is needed, write it out within square brackets in the text of the abstract rather than referring to the list at the end of the paper. For example: The measurement of hydrogen permeation into iron reported by W. R. Wampler [J. Appl. Phys. 65, 4040 (1989)], who used a new method based on ion beam analysis,...
  - Define all nonstandard symbols, abbreviations, and acronyms.

Project Report Paper

- **IV. Introduction**
  - Make the precise subject of the paper clear early in the introduction. As soon as possible, inform the reader what the paper is about. Depending on what you expect your typical reader already knows on the subject, you may or may not find it necessary to include **historical background**, for example. Include such information only to the extent necessary for the reader to understand your statement of the subject of the paper. As part of the background, you may also wish to include a **review of the relevant literature**.

Project Report Paper

- Introduction, continued
  - Indicate the **scope of coverage of the subject**. Somewhere in the introduction state the limits within which you treat the subject. This definition of scope may include such things as the ranges of parameters dealt with, any restrictions made upon the general subject covered by the paper, and whether the work is theoretical or experimental.

Project Report Paper

- Introduction, continued
  - State **the purpose of the paper**. Every legitimate scientific paper has a purpose that distinguishes it from other papers on the same general subject. Make clear in the introduction just what this purpose is. The reader should know what the point of view and emphasis of the paper will be, and what you intend to accomplish with it.

Project Report Paper

- **V. Main body of the paper**
  - The discussion of your project and its outcomes. Include **scope and objectives, methods, results**, and other significant items in this section
- **VI. Conclusion**
  - Typical functions of the conclusion of a scientific paper include (1) summing up, (2) a statement of conclusions, (3) a statement of recommendations, and (4) a graceful termination. Any one of these, or any combination, may be appropriate for a particular paper.

Project Report Paper

- **VII. Footnotes and references**
  - Place all footnotes (including references) in order of citation as a separate, double-spaced list at the end of the manuscript, before the tables and figures.
  - Type or print each footnote as a separate indented paragraph beginning with the appropriate superscript indicator.
  - For references cited in the text use superscript numerals running consecutively through the text: 1, 2, 3, etc. Place citation indicators *after* commas, periods, quotation marks, colons, and semicolons

Project Report Paper

- **Acknowledgements**
  - As a part of the acknowledgements for both your report and poster, you must include the following statement, depending on your program(s):
    - **Science Undergraduate Laboratory Internships (SULI)**
      "This project was supported in part by the U.S. Department of Energy, Office of Science, Office of Workforce Development for Teachers and Scientists (WDTS) under the Science Undergraduate Laboratory Internships Program (SULI)."
    - **Community College Internships (CCI)**
      "This project was supported in part by the U.S. Department of Energy, Office of Science, Office of Workforce Development for Teachers and Scientists (WDTS) under the Community College Internships Program (CCI)."
    - **Visiting Faculty Program (VFP)**
      "This project was supported in part by the U.S. Department of Energy, Office of Science, Office of Workforce Development for Teachers and Scientists (WDTS) under the Visiting Faculty Program (VFP)."
    - **Collegiate Science and Technology Entry Program (CSTEP)**
      "This project was supported in part by the New York State Collegiate Science and Technology Entry Program (CSTEP) at (Name of school), under the CSTEP-Supplemental Undergraduate Research Program (SURP) at Brookhaven National Laboratory."
    - **Louis Stokes Alliance(s) for Minority Participation (LSAMP)**
      "This project was supported in part by the National Science Foundation, Louis Stokes Alliance(s) for Minority Participation (LSAMP) at (Name of school), under the LSAMP Internship Program at Brookhaven National Laboratory."
    - **Brookhaven National Laboratory Supplemental Undergraduate Research Program (SURP)**
      "This project was supported in part by the Brookhaven National Laboratory (BNL), (Name of Department) , under the BNL Supplemental Undergraduate Research Program (SURP) ."
    - **Brookhaven National Laboratory-Virginia Pond Scholarship Program (VPSP)**
      "This project was supported in part by the Brookhaven National Laboratory-Virginia Pond Scholarship Program, under the VPSP-Supplemental Undergraduate Research Program (SURP)."

    NOTE: Wherever you see the parenthetic comment either Name of School or Name of Department in the above statements, please replace the parentheses with the formal name of your school or BNL department.
- Appendixes
  - As needed. All graphics, tables, etc. should EACH have a caption identifying the information displayed.

Poster plus abstract

- See http://www.bnl.gov/education/info.asp for more information and details on dimensions, etc.
- Each poster must include an abstract of no more than 150 words

Poster ideas

- Use PowerPoint
- ONE page
- Dimensions: Custom, 30w X 40h
- White background ONLY
- Include LOGOS: DOE, BNL, your school, and funding (NSF)
  - http://www.bnl.gov/education/StudentInfo/logos.html
- Limit font choices
- Include: Abstract plus the conventional divisions:
  - Introduction, Methods, Results, Discussion, Conclusions, Acknowledgements
  - Introduction, Resources, Outcomes, Discussion, Acknowledgements
- Consider: OBJECTIVES as a bulleted list
- Use layout grid for organization
- Include graphs, charts, photos, etc.

See http://www.bnl.gov/education/info.asp OR the scienceinterns.com FAQ page for more information.

Peer Review of Presentations

- Download form from scienceinterns.com
- Topics to be covered in review:
- When preparing the one-page written peer review of the presentation, please include an assessment of the following:
  - **Content**. Was the presentation informative? Did it have a clear focus? Was it well researched?
  - **Organization/Clarity**. Was it easy to follow? Was there a clear introduction and conclusion?
  - **Visual aids**. Did the presenter make effective use of visual resources, image design, layout, etc.? Was the text large enough to be easily seen?

“I,” “we,” and impersonal constructions (1)

--AIP Style Manual, pp. 14-15

- The old taboo against using the first person in formal prose has long been deplored by the best authorities and ignored by some of the best writers. "We" may be used naturally by two or more authors in referring to themselves; "we" may also be used to refer to a single author and the author's associates. A single author should also use "we" in the common construction that politely includes the reader: "We have already seen .... "But never use "we" as a mere substitute for "I," as in, for example, "In our opinion ... ," which attempts modesty and achieves the reverse; either write "my" or resort to a genuinely impersonal construction.

“I,” “we,” and impersonal constructions (2)

- The passive is often the most natural way to give prominence to the essential facts:

  Air was admitted to the chamber.

  (Who cares who turned the valve?) But avoid the passive if it makes the syntax inelegant or obscure. A long sentence with the structure

  The values of ... have been calculated.

  is clumsy and anticlimactic; begin instead with I [We] have calculated ...

“I,” “we,” and impersonal constructions (3)

- The author(s)" may be used as a substitute for "I [we]," but use another construction if you have mentioned any other authors very recently, or write "the present author(s)."

“I,” “we,” and impersonal constructions (4)

- Special standards for usage apply in two sections of a paper: (i) Since the abstract may appear in abstract journals in the company of abstracts by many different authors, avoid the use of "I" or "we" in the abstract; use "the author(s)" or passives instead, if that can be done without sacrificing clarity and brevity. (ii) Even those who prefer impersonal language in the main text may well switch to "I" or "we" in the acknowledgments, which are, by nature, personal.

Questions?

- This presentation will be posted at scienceinterns.com.