Project Abstract for a General Audience Guidelines for All Programs

(**NOTE:** GRIP interns do NOT need to complete this deliverable. CCI interns *must* complete this deliverable and submit it to BNL-OEP only via the weekly report email address.)

Topics

- **DOE descriptor of project abstract for a general audience requirement and the online location of DOE guidelines**
- **Document naming convention**
- **Abstract for a General Audience guidelines, summary form**
- **"I," "we," vs. impersonal constructions**

DOE descriptor of project abstract for a general audience requirement and the online location of DOE guidelines

All participants are required to complete and submit an abstract (300 word limit) summarizing their research experience at a level appropriate for a general audience (non-expert, *Scientific American* level). Submission of general audience abstract must be made prior to the end of their appointment and as directed by the host laboratory.

Development of the materials required to fulfill the deliverables may be performed using word processing and/or graphics design/presentation software of your choice, but all final copies must be made available in an Adobe Acrobat (.pdf) file format, and submitted using your account on the WDTS Application and Review System (WARS) online system, via the Deliverables tab. Non-DOE interns submit this deliverable via the email address used for weekly reports.

Guidelines, requirements, and instructions for preparing the program deliverables are contained in this DOE pdf document: Science Undergraduate Laboratory Internships (SULI) Program Deliverables Requirements and Guidelines, p. 5.

Document naming convention

- All document names must begin using the following template:
  - ALL CAPS followed by type of deliverable in lower case, underscores separate words not spaces
  - LASTNAME_FIRSTINITIAL_deliverabletype
    - e. g., STEGMAN_M_abstract

Note: Use_underscores_not_spaces.

Abstract for a General Audience guidelines, summary form

- 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.

- **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.

  While these topics should be incorporated in the abstract, you can also achieve the same result by following the traditional organization and topics for an abstract (i. e., introduction, methods, outcomes, and discussion). The only change you need to make to turn the standard abstract into on that satisfies the DOE's requirement for an abstract for a general audience is to include a statement of your own professional growth at the end.

  The following example highlights each of the DOE's topics.

Key:

Activities, including institutional setting
Accomplishments
Impact, Relevance (e.g., emerging technologies), Lessons Learned
Professional development

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.

While the DOE has indicated the desired topics to be included in this abstract, you can still consider the abstract's organization as one that follows the standard format as shown below using the same text for the abstrasct, but highlighting instead the traditional organizational elements:

Key:

Introduction
Methods
Outcomes
Discussion
Professional development

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.

- **Formatting the abstract**

TITLE*

- Include your title first, even if it is not the final version. Be sure to capitalize **ONLY** the first word; no acronyms.

AUTHORS*

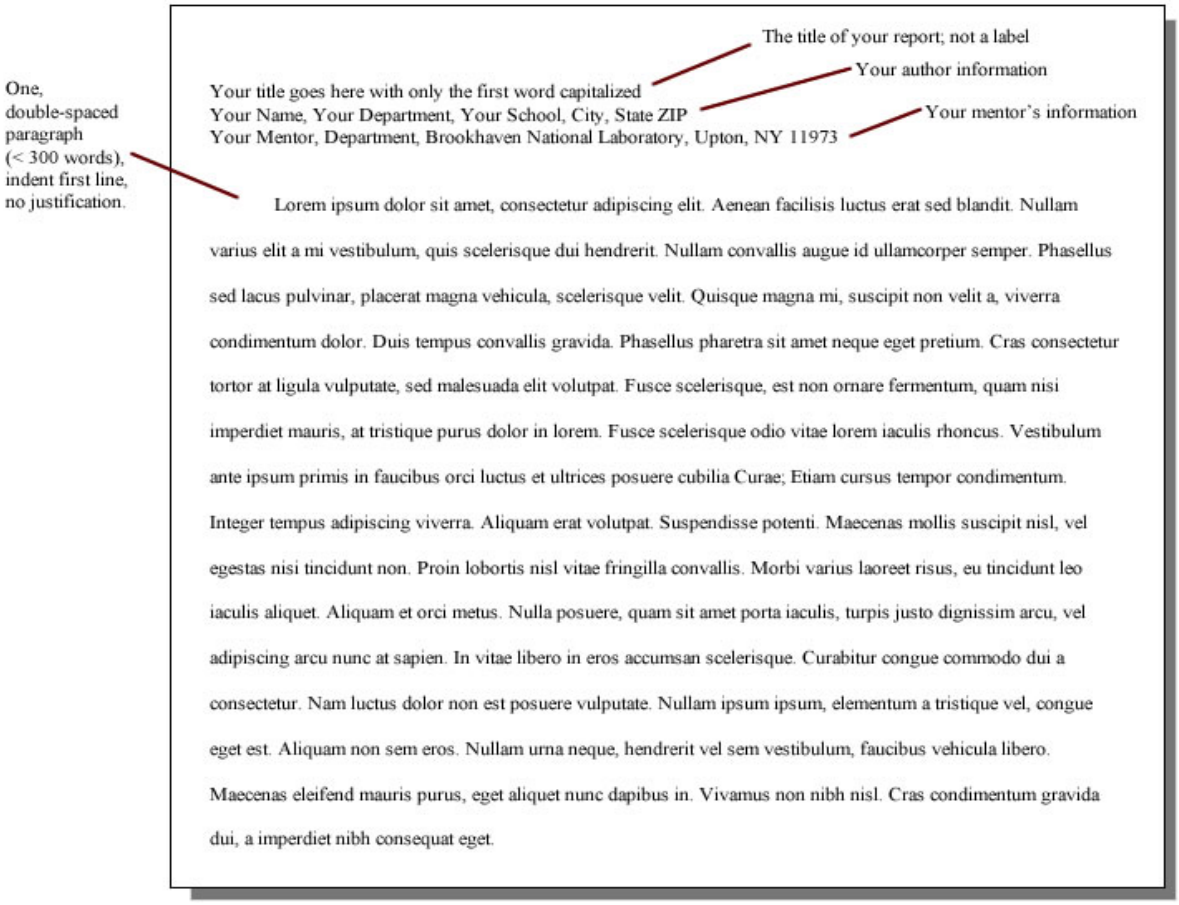
- Skip a line and then begin with yourself are the first author; include your school information. You mentor is the last author; include his/her BNL information. See program deliverables or writing workshop PDF for more information on author format.

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.

*For more information on the format and contents of your title and author listing, consult the Project Report information.

An example of a properly formatted abstract for a general audience:



"I," "we," vs. impersonal constructions

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.

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. For example, a long sentence with the structure

The values of ... have been calculated.

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

"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)."

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 "l" 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.

--from *The AP Style Manual*, pp. 14-15