Name: Gabriel Casabona   **Year 1 of 4**

Student Data

First name

Gabriel

Middle name   *Last name*

Oscar   **Casabona**

Preferred first name:

Gabriel

University

Northwestern University

University User ID

GCE7806

Department

Physics

Academic field

Computational Astrophysics

Current Mailing Address

Street address 1

1915 Maple Avenue

Street address 2

Apt 618

City

Evanston

State

IL

Zip code

60201

E-mail

gcasabona1@gmail.com

Personal web site (URL)

https://gcasabona.github.io

Work phone   *Home phone*   *Cell phone*

9739310297

Address effective through (m/d/y): **9/1/2019**

After this date, all correspondence will be sent to the permanent address listed below unless otherwise requested.

Permanent Address

Street address

1915 Maple Avenue, Apt 618

City

Evanston

State

IL

Zip code

60201

Phone

9739310297

Verification of
Fellowship and Dissertation Calendar and Publication Information

Fellowship Completion Schedule	Date
Date Fellowship Began	**2019**
Date to Identify M.S. Thesis Topic *	
Date to Finish M.S. Thesis Research *	
Date to Receive M.S. Degree *	
Date of Ph.D. Candidacy Exams	
Date to Identify Ph.D. Dissertation Topic	
Date to Dissertation Defense	
Date Ph.D. Dissertation Final Submission	
Date to Receive Ph.D. Degree	

M.S. Thesis Topic *

Ph.D. Thesis Area

Ph.D. Dissertation Topic

Publications

Mozumdar, P., Fisher, R., & Casabona, G (Jul 2018). Carbon Detonation Initiation in Turbulent Electron-Degenerate Matter. arXiv:1807.03786 (in submission to ApJ)

Casabona, G (Mar 2019). Detonation Initiation in Type Ia Supernovae.
APS March 2019. Boston, Massachusetts

Casabona, G (Nov 2018). Carbon Detonation Initiation in Turbulent Electron-Degenerate Matter. APS New England 2018. University of Massachusetts Dartmouth

Casabona, G (Apr 2018). Carbon Detonation Initiation in Turbulent Electron-Degenerate Matter. APS April 2018. Columbus, Ohio

Casabona, G (Jan 2019). Detonation Initiation in Type Ia Supernovae.
223 rd Meeting of the AAS. Seattle, Washington

Casabona, G (Nov 2018). Carbon Detonation Initiation in Turbulent Electron-Degenerate Matter. APS Bridge/NMC Conference 2018. Stanford University

Casabona, G (Jul 2018). Carbon Detonation Initiation in Turbulent Electron-Degenerate Matter. IHPCSS. Technical University of Ostrava, Czech Republic

Awards and honors

FIU Dean's List: Spring 2013, Spring 2016

I have completed this dissertation calendar and publication information form and affirm that to the best of my knowledge it accurately reflects my expected plans.

Signature of Fellow _____ Date _____

Signature of Academic Advisor _____ Date _____

Signature of Krell Institute _____ Date _____

Please send the signed page to the following address:

DOE Computational Science Graduate Fellowship Program
Krell Institute
Attn: DOE CSGF Coordinator
1609 Golden Aspen Drive, Suite 101
Ames, IA 50010
Phone: 515-956-3696
Fax: 515-956-3699
csgf@krellinst.org

* If Applicable

Practicum Proposal Information

Fellow Information

Fellow **Gabriel Casabona**	*Department* **Physics**
University **Northwestern University**	*Work Phone*
Email **gcasabona1@gmail.com**	
Current Mailing Address **1915 Maple Avenue** **Apt 618** **Evanston, IL 60201**	

Site Information

Participating center for practicum **Sandia National Laboratories, California**

Proposed dates at center (minimum 12 weeks) **06/15/2020 - 09/18/2020**

Practicum coordinator **Andy Stershic**

Has the center coordinator given tentative approval for the proposed dates and area of research? **No**

Practicum Supervisor for Project (the person to whom you will be reporting).

Name **Jacqueline H. Chen**	*Title* **Distinguished Member of Technical Staff**
Division **Combustion Research Facility**	
Address **Sandia National Laboratories California P.O. Box 9** **Livermore, CA 94551-0969**	
E-mail **jhchen@sandia.gov**	
Phone **925-294-2586**	*Fax*

Practicum Proposal

Provide a description of your proposed practicum project:

How will your practicum research broaden your perspective beyond your thesis research?

List computational resources required for practicum project, if any:

Are you planning on utilizing any of the HPC resources at the lab?

Signature of Fellow _____ Date _____

Fellow's University Advisor: Alexander Tchekhovskoy

 I have read and approved the above request.

 Advisor's Signature _____ Date _____

Send completed form to the following address:

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Ames, IA 50010
Phone: 515-956-3696
Fax: 515-956-3699
csgf@krellinst.org

Practicum Proposal Information

Fellow Information

Fellow	*Department*
Gabriel Casabona	**Physics**
University	*Work Phone*
Northwestern University	
Email	
gcasabona1@gmail.com	
Current Mailing Address	
1915 Maple Avenue **Apt 618** **Evanston, IL 60201**	

Site Information

Participating center for practicum: **Sandia National Laboratories, California**

Proposed dates at center *(minimum 12 weeks)*: **06/15/2020 - 09/18/2020**

Practicum Coordinator: **Andy Stershic**

Has the center coordinator given tentative approval for the proposed dates and area of research? **No**

Practicum Supervisor for Project (the person to whom you will be reporting).

Name	*Title*
Jacqueline H. Chen	**Distinguished Member of Technical Staff**
Division	
Combustion Research Facility	
Address	
Sandia National Laboratories California P.O. Box 9 **Livermore, CA 94551-0969**	
Email	
jhchen@sandia.gov	
Phone	*Fax*
925-294-2586	

Fellow's Signature

Name: Gabriel Casabona

Fellow's Signature _____ Date _____

University Approvals

Fellow's University Fellowship Coordinator: Laura Soria

I have read and approved the above request.

Coordinator's Signature _____ Date _____

The signatures below will be obtained by Krell Institute

Practicum Facility Approvals

Practicum Coordinator: Andy Stershic

I have read and approved the above request.

Practicum Coordinator's Signature _____ Date _____

Send completed form to the following address:

DOE Computational Science Graduate Fellowship Program
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Phone: 515-956-3696
Fax: 515-956-3699
csgf@krellinst.org

Practicum Evaluation Information

Site Information

Practicum Dates: 06/15/2020 - 09/18/2020

Practicum Location: Sandia National Laboratories, California

Practicum Supervisor: Jacqueline H. Chen

Fellow's Practicum Evaluation

Project title

1. Please provide a brief summary of the project. This information may be used in publicizing future practicums.

2. Describe your specific contribution to the project.

3. Was your involvement in this project appropriate to your research interests, skills and knowledge? Please give specific examples.

4. Would you have been able to participate in this type of work had you not received the fellowship?

5. List any contributions to publications or reports you made during the practicum.

6. List and describe any presentations which resulted from your practicum work.

7. In retrospect, what value did the experiences of your practicum have for you?

8. In what ways has the practicum influenced your career planning?

9. Will your practicum be a basis for your thesis? Please note the specific area(s).

10. How can the practicum be improved? Please comment on your overall impression of this experience.

Accomplishments

Please write a brief synopsis of your accomplishments over the preceding year.

If applicable, please include a listing of publications, talks, posters, etc. that were completed throughout the year.

*For second year graduate students and beyond, this area should be more extensive in nature. One to two sentences will not suffice. If only a short description is provided, you will be asked to revise.

> **Since starting at my current institution, I have been progressing in my knowledge in one of the base codes of my group. Called harmpi, it solves the coupled partial differential equations of GRMHD, using MPI and OpenMP as the main sources of parallelization. My current task is taking an updated version of this code, H-AMR, which is harmpi with adaptive mesh refinement (AMR), and incorporating the physics of r-process nucleosynthesis. It is an endeavour that has not been done before, so I have been trying to learn the skills needed to solve these two unique problems, mostly in integrating the matrix solvers needed for both. Since I am in my first year, my primary goal now is with classes, allowing me to improve my foundation in math and physics.**

Research Statements

Please describe concisely what you regard as the most interesting and innovative aspects of your current research.

*For second year graduate students and beyond, this area should be more extensive in nature. One to two sentences will not suffice. If only a short description is provided, you will be asked to revise.

> **The most interesting aspect of my current research is that, if successful, it will be the first code that can solve the equations of general relativistic magnetohydrodynamics while incorporating a nuclear reaction network which is vast enough to properly calculate the energy emitted from the r-process. Most of my group is working on some form of code development like myself, focusing on different pieces of physics. We are also working on scaling this code to work more efficiently on GPU machines, SUMMIT being the super-computer that we have allocation time, and later to exa-scale machines.**

What was your exposure to high-performance computing this year?

> **My first exposure was in fixing some bugs in our code to properly run on CPU machines using OpenMP and MPI with AMR. With scientific computing, I have been learning about different matrix solvers and am currently trying to develop a scheme to solve a large-scale system on a POWER9 architecture, which SUMMIT is currently using.**

University Endorsements

Student Name: **Gabriel Casabona**

Fellowship Coordinator comments:

Disclosure of information in this renewal application is made subject to Public Law 93-579 (the Privacy Act of 1974) and U.S. Department of Energy regulations as published in the Federal Register on September 30, 1977, ff.

I support this request for renewal from September 1, 2020 to August 31, 2021. During the current appointment period, **Gabriel Casabona** is making satisfactory progress toward the fellowship's requirements.

Signature of Coordinator_____ Date_____

Laura Soria, Associate Director of Graduate Student Funding and Operations

typed or printed name and title

Return the completed application and address any correspondence to:

Computational Science Graduate Fellowship Program
Krell Institute
Attn: DOE CSGF Coordinator
1609 Golden Aspen Drive, Suite 101
Ames, IA 50010

DEADLINE DECEMBER 1, 2019

Program of Study

Listed are the courses in science and engineering, applied mathematics, and computer science that you agreed to take on your most recent proposed Program of Study. Please sign this page and return it to the address below.

University: Northwestern University

Course number	Course Title	Credit hours	Term and Year	Grade	Academic Level	Fulfill POS
Science/Engineering						
PHY 411-0	Classical Mechanics, Physics	3Q	Fall 2019		G	Fulfill
PHY 416	Introduction to Statistical Mechanics	3Q	Winter 2020		G	Fulfill
PHY 510-01	Special Topics in Physics: Intro Quantum Field Theory	3S	Spring 2018		G	Fulfill
Mathematics and Statistics						
ES_APPM 446-1	Numerical Solution of Partial Differential Equations	3Q	Fall 2020		G	Fulfill
MATH 420	Partial Differential Equations	3Q	Fall 2020		G	Fulfill
MTH 551	Differential Geometry	3S	Spring 2019		G	Fulfill
Computer Science						
COMP_ENG 468	Programming Massively Parallel Processors with CUDA	3Q	Winter 2020		G	Fulfill
COMP_SCI 496	Graduate Algorithms	3Q	Spring 2021		G	Fulfill
EAS 520	High Performance Scientific Computing	3S	Fall 2018		G	Fulfill

I have read this program of study and affirm that, in my opinion, it satisfies the fellowship program requirements.

Fellow's signature _____ Date _____

Graduate Advisor: **Alexander Tchekhovskoy**
Graduate Advisor's Institute: **Northwestern University**
Graduate Advisor signature _____ Date _____

Krell Institute (Office use only) _____ Date _____
Krell Institute, Attn: DOE CSGF Coordinator
1609 Golden Aspen Drive, Suite 101, Ames, IA 50010
Phone: 515-956-3696, Fax: 515-956-3699, csgf@krellinst.org