EVIDENCE OF PERFORMANCE

YEAR: 2021

Name: David C. Collins Rank: Associate Professor

A. YOUR MOST SIGNIFICANT CONTRIBUTIONS FOR THIS YEAR. Please select from this document what you consider were your most significant contributions (i.e. bragging points) in each of the areas of teaching, research and service. PLEASE LIST THEM IN BULLET FORM AND ICLUDE A BRIEF DESCRIPTION AND/OR SUPPORTIVE INFORMATION AS SUB-BULLETS. If there is something important that you would like to mention which lies outside these categories, please place it in a category named "Other" at the bottom of this page.

To assist in evaluating faculty accomplishments, faculty may include pandemic impact statements in their evidence of performance reports. **Additional detail and guidance is provided in the University Memorandum on the Guidelines for 2021 *Annual Performance Evaluations*.**

Teaching:

- AST-4419/AST-5418 Extragalactic Astronomy (Spring 2021)
- 2053 Recitation (Fall 2021)
- Four PhD students, one undergraduate, one postdoc,
- Departmental advisor for one PhD student in Engineering.

Research:

- Star Formation: Four papers forthcoming. Grant supported.
    1. Luz Jimenez Vela and Dan Le are working on this.
    2. We have simulated clouds of gas collapsing under their own gravity to understand how stars form.
- Supernovae: One paper published. Grant supported.
    1. Boyan Hristov was working on this.

2. We have simulated exploding white dwarf stars with magnetic fields. We have shown that large magnetic fields are necessary to reproduce observed decline in brightness over several hundred days of Type Ia Supernovae.

- CMB Foregrounds: One paper forthcoming. Grant supported.

  1. Kye Stalpes is on this.
  2. Seeing the impact of inflation on the CMB requires understanding the polarized light from the galaxy that is in the way. This work explores the polarization of magnetized turbulence to understand the interstellar medium
  3. One proposal submitted (rejected) to NASA.

- Star Formation with the National Ignition Facility: Shots July 13th 2022. Two papers submitted.

  1. Luz Jimenez Vela is working on this.
  2. My entry into experimental physics! We have been awarded two shot days (July 13, 2022 and undetermined date in 2023) at the National Ignition Facility, which houses the most powerful laser in the world, to experimentally validate an important relation that is used in star formation theory.

- Galactic Magnetic Fields.

  1. Jacob Strack is working on this.
  2. We are simulating the growth of the magnetic field in the galaxy.
  3. One proposal submitted to NSF to support Galactic Magnetic Fields (pending, very promising)

Service:

- Qual Committee

  1. Writing and grading both exams
  2. Planning the future of the exam in the department

- Web committee (chair)

  1. Organize the maintenance and upkeep of the department website.

2. Ensure the website is attractive and useful for current and prospective students, staff, and faculty.

- Saturday Morning Physics

1. Presentations about astronomy to area middle school students. Reaches about 150 students.

- PAI committee (chair)

1. Organize collecting nominations and selecting of the winner of the annual PAI award for faculty members.

B. PAPERS PUBLISHED THIS YEAR. Please list by citation all papers of which you were an author that appeared during 2021. (Designate whether refereed, conference proceeding, abstract etc.)

- "Physics of Thermonuclear Explosions: Magnetic Field Effects on Deflagration Fronts and Observable Consequences", Hristov, Boyan; Hoeflich, Peter; Collins, David C., ApJ, 2021, 923, 210, 21

- "Measuring an Off-center Detonation through Infrared Line Profiles: The Peculiar Type Ia Supernova SN 2020qxp/ASASSN-20jq" P. Hoeflich, C. Ashall, S. Bose , E. Baron , M. D. Stritzinger , S. Davis , M. Shahbandeh , G. S. Anand , D. Baade , C. R. Burns , D. C. Collins , T. R. Diamond , A. Fisher , L. Galbany , B. A. Hristov , E. Y. Hsiao, M. M. Phillips, B. Shappee, N. B. Suntzeff, and M. Tucker. ApJ, 2021, 922, 2, 21

C. PAPERS IN PRESS. Please list by citation all such papers that were accepted but did not appear during 2021.

- "The driving mode of shock-driven turbulence", Saee Dhawalikar, Christoph Federrath, Seth Davidovits, Romain Teyssier, Sabrina R. Nagel, Bruce A. Remington, and David C. Collins (Submitted to Monthly Notices of the Royal Astronomical Society)

- "Turbulence generation by shock interaction with a highly non-uniform medium", Seth Davidovits, Christoph Federrath, Romain Teyssier, Kumar S. Raman, David C. Collins, and Sabrina R. Nagel (submitted to Physical Review E)

D. PAPERS SUBMITTED. Please list all papers that were submitted by you but were not yet accepted during 2021.

E. INDIVIDUAL TALKS. Please list all conference, symposia, colloquia, seminar and other individual talks that you gave during 2021. (Designate invited talks.)

- "Letting Anxiety Work For You: Lessons from Outer Space" Highway Safety Toastmasters, 2021-09-27

F. GRANT FUNDING. Please indicate your research funding for 2021. Include any submitted (even if not funded) or pending proposals. **Include the FSU Project Number.**

- "Signatures of Type Ia Supernovae Explosions and their Cosmological Implications" NSF AAG, (current) $421,215 10/1/2017-9/21/2022
- "CMB Polarization Foreground Effects on B-modes and Lensing" NSF AAG, (current) $533,715 8/1/2020-7/31/2023
- "Modeling CMB polarization foregrounds and their isotropy violation" NASA (current) $421,215 1/8/2017-2/2/22
- "A Study of Magnetic Fields in the Formation of Molecular Clouds and Stars" NSF AAG (current) $298,420 9/1/2016-8/31/2022
- "Laser Experiements on the Turbulent Formation of Stars", two shot days awarded at the National Ignition Facility for FY2022 and FY2023.
- "Collaborative research: Galactic and circumgalactic magnetic fields in Milky Way-like galaxies" NSF AAG (pending) $425,000

G. DEPARTMENTAL COMMITTEE SERVICE. Please list all departmental committees on which you served during 2021. Also please indicate your committee assignment for this (spring) semester.

- Qual Committee
- Web Committee (chair)
- PAI Committee (chair)
- Saturday Morning Physics

H. UNIVERSITY AND SUS SERVICE. Please list all University and SUS committees, task forces, and governing bodies on which you served during 2021.

I. INTERNATIONAL, NATIONAL, AND REGIONAL SERVICE. Please list all international, national, and regional bodies on which you served, together with any reviewing activities (journals, proposals), during 2021.

- Support and development for the open-source community astrophysics simulation software, Enzo.
- NASA Astrophysics Theory proposal panel review
- Refereed papers for astrophysics journals.

J. OFFICES HELD. Please list all offices in organizations related to your activity as a professional faculty member held by you during 2021.

K. HONORS RECEIVED. Please list all professional honors received by you during 2021.

L. GRADUATE DEGREES AWARDED. Please list all graduate students who received degrees under your direction during 2021.

M. GRADUATE STUDENT DIRECTION. Please list all graduate students whose work you directed during 2021 but who did not receive degrees. **Include date joined group, prospectus (expected/passed) date, and expected graduation date.**

1. Dan Le. Joined Jan 2015. Prospectus Dec 2019. Graduation Summer 2022.
2. Kye Stalpes. Joined Jan 2016. Prospectus Dec 2019. Graduation Summer 2022.
3. Luz Jimenez Vela. Joined July 2016 via the Bridge program. Prospectus TBD, Spring 2022. Expected graduation 2025.
4. Brano Rabatin. Joined Spring 2019. Prospectus TBD, Spring 2022. Expected graduation 2025.
5. Toshiaki Kanai. Major Professor is Wei Guo in Engineering. Joined Fall 2020. Prospectus March 2021.

N. GRADUATE STUDENT COMMITTEES. Please list all graduate students on whose supervisory committees you served but for whom you were not Major Professor during 2021. **Include name of Major Professor and department if outside of Physics.**

1. Alec Fisher
2. Carlos Garcia
3. Erica Bloor
4. Erica Knorr (Chemistry, Ken Hanson)
5. Yavuz Oz
6. Paudel Nawaraj
7. Shu Liu

O. UNDERGRADUATE SUPERVISION. Please list all undergraduate students whose research activities you directed during 2021. **Include a research title or brief description.**

1. Douglas Schoedel. Properties of the Interstellar Medium.

P. CLASSES TAUGHT. Please list all classes you taught during 2021 and what you are teaching this semester. Include the number of students in each class.

- AST-4419/AST-5418 Extragalactic Astronomy (Spring 2021)
- 2053 Recitation (Fall 2021)

Q. DIS SUPERVISION. Please list all DIS (Directed Individual Study) students you directed during 2021.

- Morgan Adams
- Luz Jimenez Vela
- Brano Rabatin

R. **POSTDOCTORAL SCHOLAR SUPERVISION**. Please list all postdoctoral scholars whose work you directed during 2021. **Include name, date joined group, residency**(i.e. PHYSICS, MAGLAB, CERN, POINT NEMO)**, and current status.**

- Boyan Hristov

S. OUTREACH ACTIVITIES. Please list all outreach activities that you have participated in during 2021.

- Ask A Scientist (Organizer); Monthly public event where people can ask questions of professional scientists. Covid disrupted activities for 2021, but will resume in 2022.
- Saturday Morning Physics
- Toastmasters; I participated in a Toastmasters event, where I presented my experience working around anxiety when giving talks.

T. OTHER ITEMS. Please detail any other items that you feel will help give an adequate picture of your performance during 2021.

U. SPCI EVALUATIONS. Please attach a copy of all student evaluation SPCI form summary pages for your teaching during 2021.