



Department of Physics

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To: NESSF Selection Committee

Dear Colleagues,

I am writing to recommend my PhD student, Jacob Parker, for the 2018 NASA Earth and Space Science Fellowship program. Jake is a tremendously versatile and hard working young scientist with unique potential.

I have known Jake for about 6 years, since he was an undergrad at MSU. He is among the best students I have taught and worked with in research. As an undergraduate, he routinely took 18-19 credits of upper division science and engineering courses, managed his time well, and performed admirably. He began working on my sounding rocket program during those undergraduate years, and became experienced with many aspects of our instrument development program, including EUV calibration with a hollow cathode light source, high vacuum, cleanroom, and ESD procedures. He is also adept in the machine shop. Jake is an exemplary team member who identifies what needs to be done and does it. He relates well to everyone on the project, from outside vendors to support staff, machinists, engineers, co-investigators, and NSROC personnel.

Working with graduate student Hans Courier, Jake designed several nontrivial components that flew successfully on the MOSES-II rocket mission in 2015. He also played a major role in developing our EUV radiometric calibration setup. When he would encounter any task he did not know how to accomplish, Jake demonstrated the patience and resourcefulness to figure it out with a minimum of supervision. Jake has high personal standards, but is not impaired by perfectionism or fear of failure.

As a graduate student, Jake has continued the trend of academic success, intellectual and personal growth. He completed a very subtle data analysis that uncovered the influence of a host of weak lines in the MOSES-I sounding rocket data, and presented the results at an SPD meeting.

Jake is experienced, competent and trustworthy in the lab. He led the mechanical design team for our new instrument, ESIS which included managing and mentoring our undergraduate engineers. To take just one example of his contribution to our team: In Fall 2016, Jake uncovered a subtle boundary condition issue with our finite element analyses and thereby saved us from greatly overdesigning our mirror mounts for the EUV Snapshot Imaging Spectrometer (ESIS). Jake's combination of mechanical and electronic skills, leadership, self discipline, and analytic ability make

him perhaps the most versatile graduate student I have ever worked with. *The major progress we have made in preparing for launch during the past year owes much to his talent, resourcefulness, and perseverance.*

In addition to his hardware work and his leadership on my team, Jake completed a theoretical project last year with Prof. Dana Longcope in modeling the tearing mode instability. The effort grew out of an assignment for a plasma physics class, and has been published as a first-author paper in the *Astrophysical Journal*. Jake also serves as a science planner for the IRIS mission, on which I am a co-investigator. This activity has given him familiarity with IRIS data, as well as experience in satellite operations and multi-spacecraft coordinations.

Jake has settled on a thesis topic that will combine explosive event data from the IRIS satellite and our rocket flights. The project will require the careful analysis of a large number of events. He launched this project, mentoring his own REU student, last summer; they began with a large explosive event database developed by my former REU student Hannah Alpert and postdoc Sarah Jaeggli, and greatly extended the database coverage and added significant new analysis capabilities to the software suite. Jake's work is likely to shed new light on the reconnection process, influencing our understanding not only of the transition region, but of flares and CMEs. In the context of major coronal events, the reconnection region is difficult to observe because of low emission measure, background, and line of sight confusion. Thanks to IRIS, MOSES, and our new instrument ESIS, explosive events and related signatures of reconnection in the transition region and chromosphere are becoming a new laboratory for exploration of the initiation and evolution of the reconnection process in a solar context.

Of the students I have worked with over the past 20 years, Jake stands out as the best suited to become a principal investigator. He has taken on and completed a range of projects, demonstrating both theoretical and experimental ability. He has proven himself repeatedly as a good mentor to younger students in both physics and engineering disciplines. He has taken on a great deal of responsibility as a graduate student, in part because he possesses extraordinary self discipline, time management, and leadership skills. However, he deserves and will benefit from the NESSF fellowship that allows him to pursue wholeheartedly the scientific ideas that are driving him. The project that he has proposed is well conceived, and will establish him as a member of our solar physics community. I am absolutely confident that he will succeed, and will lead a distinguished

career. I recommend him in the strongest possible terms for the NESSF Fellowship.

Sincerely,

A handwritten signature in dark ink, reading "Charles C. Kankelborg". The signature is fluid and cursive, with the first name "Charles" and last name "Kankelborg" clearly legible.

Charles C. Kankelborg
Professor of Physics