

January 31, 2018

President Waded Cruzado  
Montana State University  
Bozeman, MT 59717

Dear President Cruzado:

We are very pleased to have this opportunity to nominate **Professor Neil Cornish**, of the Department of Physics at Montana State University, for the distinguished honor of Regents Professor. Such a distinction is properly reserved for a very small number of faculty members who have demonstrated outstanding scholarship of truly international caliber, a true commitment to teaching and mentoring, and service at many levels both within and outside the University. Professor Cornish's record as a faculty member at MSU more than meets these criteria, and we strongly believe that this internationally renowned scientist is worthy of a Regents Professorship.

### **Scholarship that is recognized internationally**

In February of 2016, the physics community, and the world, heard of the first observation of gravitational waves at the LIGO detectors (Laser Interferometric Gravitational Observatory). That singular event not only represents the first direct confirmation of the existence of black holes and the wavelike nature of gravity, but is now seen as the beginning of an entirely new type of observational astronomy. MSU Professor Neil Cornish played a major role in that first discovery, contributing the theoretical modelling to confirm both the position and source of the gravitational waves. The modelling identified that the source was the merger of two black holes, one with a mass 40 times that of our sun and one with a mass 30 times that of our sun, that occurred in a galaxy 1.2 billion light-years from earth (a light-year is the distance that light travels in one year). The paper that described this event, co-authored by Professor Cornish, was part of the 2017 Nobel Prize in Physics for the discovery of gravitational waves and has already garnered 1200 citations! Since that first event, Professor Cornish has been involved in three other gravitational source merger events, including the first merger of a neutron star.

Professor Cornish earned his Ph.D. at the University of Toronto (Canada) in 1996. He served as a Postdoctoral Fellow in the Hawking's Relativity and Cosmology Group at Cambridge University (England) from 1996-1998 and as a Postdoctoral Associate in the WMAP Satellite Mission at Princeton University from 1998-1999. He joined the MSU Physics Department as an Assistant Professor in 1999, was promoted to Associate Professor in 2005, and to Professor in 2010. He currently serves as the Director of the recently established eXtreme Gravity Institute (XGI) at MSU. During his career to date, Professor Cornish published **338** refereed scientific papers in the most prestigious journals worldwide and has given **over 60** Invited presentations at universities and international meetings. Amazingly, he has given **29** public lectures in the past dozen years. Professor Cornish publishes on average 20 articles per year (over the last 4 years), and has 75 publications which have been cited 75 times or more (an h-index of 75). This high publication and citation rate is accomplished, in part, through his collaborations with other large groups. Identifying those publications that MSU is the lead author on, results in 6-8 publications per year.

### **Office of the Dean**

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Professor Cornish is recognized by his peers as one of the most respected theoretical gravitational physicists in the world. His research is concerned with understanding the sources of gravity, especially exotic sources such as black holes and the dynamics associated with their growth and mergers. In the past, this work has been largely theoretical, but new observational platforms allow testing of these theoretical ideas. Involved in the development of LIGO and LISA (the space-based analog of LIGO), Professor Cornish has assisted both in optimizing the design of these large instruments and in generating a catalog of anticipated signals to be detected. He has helped establish the sensitivity limits and has predicted the rate at which we can expect these signals to be detected, given our current understanding of the possible sources. Recently, he was named as one of the four US representatives of the LISA Collaboration Board, another indicator of the international respect he has garnered from his peers.

Professor Cornish's research goes beyond gravitation theory and has concerned itself with the underlying symmetry of the universe through his earlier work with the Wilkinson Microwave Anisotropy Probe (WMAP) satellite. The WMAP is a NASA Explorer mission that launched June 2001 to make fundamental measurements of cosmology - the study of the properties of our universe as a whole. WMAP has been stunningly successful, producing our new Standard Model of Cosmology. The WMAP team was awarded the 2012 Gruber Cosmology Prize for *"their exquisite measurements of anisotropies in the relic radiation from the Big Bang - the Cosmic Microwave Background. These measurements have helped to secure rigorous constraints on the origin, content, age, and geometry of the Universe, transforming our current paradigm of structure formation from appealing scenario into precise science."*

One of the best indicators of peer recognition is in the international **awards** that Professor Cornish has garnered. His research has received numerous awards including the 2017 Nobel Prize in Physics, the 2016 Breakthrough Prize in Fundamental Physics (as a member of the LIGO collaboration), the 2016 Gruber Foundation Cosmology Prize (as a member of the LIGO collaboration), and the 2015 Classical Quantum Gravity Editors' Choice for Noteworthy Papers. The Breakthrough Prize in Fundamental Physics recognizes individuals who have made profound contributions to human knowledge. It is open to all physicists - theoretical, mathematical and experimental - working on the deepest mysteries of the Universe. The Gruber Cosmology Prize is a part of the International Prize Program, which honors individuals in the fields of Cosmology, Genetics, and Neuroscience, whose groundbreaking work provides new models that inspire and enable fundamental shifts in knowledge and culture. In 2013, due in part to his early accomplishments, Professor Cornish was elected as a Fellow of the American Physical Society.

At MSU, in recognition of his outstanding research efforts, Professor Cornish has received the Nora L. Wiley Award for Meritorious Research (2005), the College of Letters and Science Dean's Award for Meritorious Research (2006), the Cox Family Award for Creative Scholarship and Teaching (2012), and the Provost's Award for Graduate Research and Creativity Mentoring (2016).

### **Teaching and mentoring**

Professor Cornish has consistently been ranked as a top performing teacher in our department, where there is substantial competition. He has introduced new courses into the physics curriculum, and is a thoughtful, valuable contributor in departmental affairs related to our instructional program. He has taught at the undergraduate-level and the graduate level. At the undergraduate level, students often request Professor Cornish continue as the instructor for our Honors PHSX 240 course (General and Modern Physics I for our majors and for students from the Honor's College). This is the first physics course for our majors and Professor Cornish is relied on to set department expectations at an appropriately high level for future student success in this demanding field. At the graduate level, Professor Cornish typically teaches one of our three General Relativity courses, receiving very high student evaluations. In addition to the numerical ratings, the student comments often reflect on his absolute mastery of the material and his ability to instill enthusiasm in the students for such a difficult topic.

Recognition of his teaching goes beyond the Physics Department through his long-standing participation in team teaching the Honors Seminar course entitled "Origins". This seminar is one of the most in-demand offerings of the Honor's College, usually being restricted to seniors. His student evaluations from the Honor's College consistently rank him as a top instructor for the College.

Professor Cornish's reputation as a teacher of upper division and graduate courses in the department is such that our majors and graduate students actively seek out courses he is scheduled to teach and often petition him to teach special courses not in the catalog in topics of interest to them. In 2012, in partial recognition of Professor Cornish's outstanding teaching, he received the Cox Family Award for Creative Scholarship and Teaching from MSU and in 2016 he was awarded the Provost's Award for Graduate Research and Creativity Mentoring.

Professor Cornish is also a highly sought after mentor for our incoming graduate students with nearly half the incoming class selecting him as their research advisor for the last four years. A large part of the reason for the strong entering Physics class is that Professor Cornish's reputation is a unique recruitment incentive for students. Such a large number of graduate students conducting research in gravitational theory is not sustainable or desirable and Professor Cornish does a good and appropriate job of identifying the strengths of our students and directing them accordingly. He has one of the largest research groups in the department, successfully mentoring his students, serving on 15 graduate committees, and generating one to three Ph.D.s each year. His graduates are actively sought by others for post-doctoral opportunities elsewhere. One of his past graduate students, Dr. Laura Samson, was awarded the L'Oreal USA for Women in Science Fellowship. Another, Dr. Katerina Chatziioannou was awarded the Canadian Institute for Theoretical Astrophysics Fellowship.

**Service to his profession, Montana, and to Montana State University**

Professor Cornish has an outstanding record of service individually and collectively to the Department of Physics, the University, and the national and international scientific community. His annual reviews routinely note service and public outreach activities that exceed expectations. A good example of Professor Cornish's outreach are his public presentations at MSU. In February of 2016, he spoke to a packed group at the Procrastinator Theater announcing and detailing that first observation of gravitational waves. Attended by dignitaries, faculty, staff, and a large group of interested students from a variety of backgrounds and disciplines, it generated a tremendous enthusiasm and excitement about science and the process of discovery. In March of 2017, Professor Cornish delivered a Provost's Distinguished Lecturer Series at another packed house at the Museum of the Rockies and very recently, Professor Cornish was the Convocation Speaker for the 2018 Spring Convocation.

Such scholarly, but accessible presentations are typical of Professor Cornish's public talks. Engaging and inspiring, replete with titles such as "Black Hole Hunting", and "The Universe: Stretching the Imagination", and "Listening to the Universe", and lastly "Striking Gold: How MSU Helped Open a New Window on the Universe and Win the 2017 Nobel Prize in Physics", Professor Cornish captures the audience's attention and is an ideal public speaker. These presentations, which occur in many venues in many states, broadens the MSU name recognition and stature and demonstrates that Montana has both top-tier universities and top tier faculty.

Professor Cornish's professional service contributions to the Relativity/Gravitation/Cosmology community are numerous, as listed in his CV. These include a number of particularly high-profile contributions as a member of strategic advisory committees to national and international groups and federal agencies, including the New Worlds, New Horizons 2010 Decadal Survey, Cosmology and Fundamental Physics Panel and serving as a Council Representative for the American Physical Society (2009-2013). He is now serving as a member of the AAS High Energy Astrophysics Division executive team and the National Research Council's Astrophysics Mid-Decadal Assessment Committee where committee recommendations will establish decisions that will take effect in the upcoming decade. By participating on committees that help set policy and funding priorities, Professor Cornish's service benefits the Department of Physics, Montana State University, and the state of Montana.

In summary, Professor Neil Cornish is, without question, a phenomenally productive scientist of international stature and renown. His internationally recognized record of sustained scholarship and service to his profession and to MSU, along with a record of brilliance in the classroom and thoughtful mentoring of graduate and undergraduate students, have earned him many awards and distinctions. With great enthusiasm, we present his nomination to you for the distinguished honor of Regents Professor.

Sincerely,



Yves Idzerda, Head and Professor  
Department of Physics



Nicol C. Rae, Dean  
College of Letters and Science