

PROMOTION RECOMMENDATION  
The University of Michigan  
College of Literature, Science, and the Arts

Henriette D. Elvang, associate professor of physics, with tenure, College of Literature, Science, and the Arts, is recommended for promotion to professor of physics, with tenure, College of Literature, Science, and the Arts.

Academic Degrees:

Ph.D. 2005 University of California, Santa Barbara  
M.Sc. (equiv.) 2001 University of Copenhagen  
B.Sc. 1998 University of Copenhagen

Professional Record:

2012 – present Associate Professor, Department of Physics, University of Michigan  
2009 – 2012 Assistant Professor, Department of Physics, University of Michigan  
2010 Visiting Member, Institute for Advanced Study, Princeton  
2008 – 2009 Post-doctoral Member, Institute for Advanced Study, Princeton  
2005 – 2008 Pappalardo Post-doctoral Fellow in Physics, Massachusetts Institute of Technology

Summary of Evaluation:

Teaching – Professor Elvang is a vigorous, dedicated, and popular teacher. She has recently developed an important new course, “Honors Physics III/Physics 360: Waves, Heat, and Light,” enhancing the Physics Honors sequence through a third semester of critically important topics. She has also masterfully taught perhaps the most difficult course in physics, the two-semester graduate course, “Quantum Field Theory I-II/Physics 513-523.” Student reactions praise her clarity as well as her investment of time and attention to student success. She has written the first comprehensive graduate-level textbook on the rapidly developing subject of quantum amplitudes, Scattering Amplitudes in Gauge Theory and Gravity. Professor Elvang’s teaching was recognized by LSA in 2014 with an award for Outstanding Contributions to Undergraduate Education.

Research – Professor Elvang is a world-recognized and well-funded leader in the theory of elementary particles and their behavior in space and time. She has made incisive contributions to the theory of “scattering amplitudes” which determine the quantum mechanical probabilities for particle interactions, dramatically streamlining the calculations in ways that can reveal new insights about the nature of fundamental processes. She has made equally incisive contributions in string theory, proving the robustness of theories connecting gravity and string theory in multiple dimensions. Her papers are universally regarded as of high quality and impact, and they are admired for their clarity of presentation. Her work has been honored with the UM 2015 Henry Russel Award and the American Physical Society’s 2016 Maria Goeppert Award.

Recent and Significant Publications:

Scattering amplitudes in gauge theory and gravity, with Y.-T. Huang, Cambridge University Press, 2015.

“Exact results for corner contributions to the entanglement entropy and Rényi entropies of free bosons and fermions in 3d,” with M. Hadjiantonis, *Physics Letters B*, 749, 2015, pp. 383-388.

“Grassmannians for scattering amplitudes in 4d  $N=4$  SYM and 3d ABJM,” with Y.-T. Huang, et al., *Journal of High Energy Physics*, 1412, 2014, p. 181.

“Holography for  $N=2^*$  on  $S^4$ ,” with N. Bobev, et al., *Journal of High Energy Physics*, 1407, 2014, p. 001.

Service – Professor Elvang has made energetic service contributions to physics at all levels. She most recently served on the departmental Executive Committee and chaired a 2015 faculty search committee. At the university, she is a member of the Provost’s Faculty Advisory Committee (PFAC). At the national level, Professor Elvang is a co-organizer over the past four years of five physics’ workshops, including a three-week summer workshop at the Aspen Center for Physics.

#### External Reviewers:

##### Reviewer (A)

“Henriette is a superb physicist, teacher and communicator. She is coveted by many major institutions, and you are really lucky of her loyalty to Michigan. She has moved from being a brilliant student...to being one of the more influential members of the theoretical high energy community. She has become a leader in the field.”

##### Reviewer (B)

“Of all groups working on the implications of standard symmetries on ultraviolet divergences in supergravity theories, Henriette's is by far the most complete and compelling. It is a major achievement in the 40 year history of research into properties of supergravity theories.”

##### Reviewer (C)

“Henriette is an outstanding physicist. Her excellence has recently been recognized more broadly with the 2016 Maria Goeppert Mayer Award of the American Physical Society. She is a dynamic researcher who has had considerable impact already in three quite distinct fields: classical solutions in gravitational field theories with novel horizon configurations, general properties of conformal field theories, and quantum scattering amplitudes in both gauge and gravitational theories. I expect her to continue to write papers of great impact in the future.”

##### Reviewer (D)

“Her book on scattering amplitudes is very probably the best reference for an up-to-date entry into this subject. This, and the clarity of her lectures, have made her a fixture in all the major conferences on one of the most active and important current fields in theoretical research. ... Henriette’s remarkable breadth and technical ability, as well as her quickness in catching up on recent advances, have also enabled her to make significant contributions to the very topical field of holographic entanglement entropy. ... This is important work. I see her extremely well positioned to making an impact on this subject.”

Reviewer (E)

“Henriette Elvang is a theorist whose research has made substantial impact in a range different subjects. She has special talent as a presenter of physics. Through ability, personality and judgment she has achieved an outstanding reputation both in the US and beyond. ... Needless to say, my strong recommendation is to promote her.”

Reviewer (F)

“Henriette is a leading theoretical physicist with a very high international reputation based on her research in a number of areas at the interface of quantum field theory, string theory and quantum gravity. ... She has consistently produced world-class results and has emerged as one of the leading figures in her generation. ... Henriette has written a very impressive textbook on modern approaches to scattering amplitudes, ‘Scattering Amplitudes in Gauge Theory and Gravity’ (with YuTin Hung, published by CUP). This fills an important gap in the modern literature of a rapidly expanding field and is becoming a standard text on the subject.”

Reviewer (G)

“...I read through her teaching statement and...hers was filled with a deep understanding of what it takes to be an effective teacher and novel ideas for how to accomplish this. I hope to implement some of the techniques she suggested in my own teaching. ... Prof. Elvang’s promotion case in one of the strongest I have seen in many years in this field, and it is uniformly strong in all areas that matter: research, teaching, leadership, and contributions to the community.”

Reviewer (H)

“...[Elvang] is playing a leadership role in the community by organizing a number of workshops and conferences. In particular, she is one of the main organizers of a three month workshop at the KITP in Santa Barbara on scattering amplitudes next spring. ...Henriette has outstanding technical ability, creativity and insight. She has a vibrant research program and clearly deserves a promotion to full professor.”

Summary of Recommendation:

Professor Elvang has shown the highest intellectual quality, productivity, and leadership in creating and disseminating knowledge in physics. The Executive Committee of the College of Literature, Science, and the Arts and I recommend that Associate Professor Henriette D. Elvang be promoted to the rank of professor of physics, with tenure, College of Literature, Science and the Arts.



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Andrew D. Martin, Dean  
Professor of Political Science and Statistics  
College of Literature, Science, and the Arts

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