Pat Scott

Academic Achievements: Degrees

2006–2010 **PhD**, *Stockholm University*, Theoretical Physics.
Title: Searches for Particle Dark Matter (Supervisors: Joakim Edsjö, Lars Bergström)

2006–2008 **Fil. Lic.**, *Stockholm University*, Theoretical Physics.

2001–2005 **BSc (Hons)**, *Australian National University*, Astrophysics, Neuroscience, Theoretical Physics.
Double First Class Honours, Dual University Medals (Astrophysics & Neuroscience)

Academic Achievements: Positions Held

2012– **Banting Fellow**, *Department of Physics*, McGill University, Canada.

2010–2012 **Trottier Astrophysics Fellow & Institute for Particle Physics Theory Fellow**, *Department of Physics*, McGill University, Canada.

2008–2009 **Teaching Assistant**, *Oskar Klein Centre*, Stockholm University.

Academic Achievements: Prizes

2010 **The Sigrid Arrhenius Prize**, *Stockholm University*, best PhD thesis in Science.

2005,2006 **The University Medal (twice)**, *Australian National University (ANU)*.

2006 **The Sir Grafton Elliot Smith Prize**, *Australian Neuroscience Society*, best student manuscript.

2005 **The Bok Prize**, *Astronomical Society of Australia*, best Hons/Master thesis in astrophysics.

Academic Achievements: Grants and Personal Fellowships

2014-2019 **Ernest Rutherford Fellowship**, *Science and Technology Facilities Council, UK*, €555k.

2014 **International Research Collaboration Award**, *Sydney University, Australia*, €12k.

2012-2014 **Banting Fellowship**, *Tri-Agency Research Council, Government of Canada*, €104k.

2010-2012 **Theory Fellowship**, *Canadian Institute for Particle Physics*, €30k.

2010-2012 **Trottier Fellowship in Astrophysics**, *McGill University*, €52k.

2010 **CfA Fellowship (declined)**, *Harvard-Smithsonian Center for Astrophysics*, €216k.

2009 **G & E Kobbs Foundation Grant**, €6.0k.

2009 **Helge Axelsson Johnsons Foundation Grant**, €1.6k.

2009 **CF Liljevalchs Foundation Travel Grant**, €0.9k.

2008 **G & E Kobbs Foundation Grant**, €1.7k.

2008 **European Network for Theoretical Astroparticle Physics ILIAS/N6 Travel Grant**, €1.0k.

2008 **Helge Axelsson Johnssons Foundation Grant**, €1.6k.

2007 **IAU Exchange of Astronomers Grant**, *International Astronom. Union Commission 46*, €1.5k.

2006-2010 **HEAC (High Energy Astrophysics and Cosmology Centre) Doctoral Fellowship**, *AlbaNova University Centre, Stockholm*, €110k.

2001-2005 **National Undergraduate Scholarship and Distinguished Scholar Program**, *ANU*, €45k.

Research Publications (in the previous 3 years)

Available from www.physics.mcgill.ca/~patscott/publications
Career summary (Sep 10 2013, NASA ADS): 38 publications, 1753 citations, h-index: 15

Journal articles

[1] J. M. Cline, K. Kainulainen, P. Scott, and C. Weniger, *Update on scalar singlet dark matter*, *Phys. Rev. D* (2013) accepted, [arXiv:1306.4710].

[2] J. M. Cline and P. Scott, *Dark matter CMB constraints and likelihoods for poor particle physicists*, *JCAP* **3** (2013) 44, [arXiv:1301.5908].

[3] S. Shandera, A. L. Erickcek, P. Scott, and J. Yana Galarza, *Number Counts and Non-Gaussianity*, *Phys. Rev. D* (2013) submitted, [arXiv:1211.7361].

[4] H. Silverwood, P. Scott, M. Danninger, C. Savage, J. Edsjö, J. Adams, A. M. Brown, and K. Hultqvist, *Sensitivity of IceCube-DeepCore to neutralino dark matter in the MSSM-25*, *JCAP* **3** (2013) 27, [arXiv:1210.0844].

[5] E. Zackrisson, *et al.*, *Hunting for dark halo substructure using submilliarcsecond-scale observations of macrolensed radio jets*, *MNRAS* **431** (2013) 2172–2183, [arXiv:1208.5482].

[6] P. Scott, C. Savage, J. Edsjö, and the IceCube Collaboration: R. Abbasi et al., *Use of event-level neutrino telescope data in global fits for theories of new physics*, *JCAP* **11** (2012) 57, [arXiv:1207.0810].

[7] A. C. Vincent, P. Scott, and R. Trampedach, *Light bosons in the photosphere and the solar abundance problem*, *MNRAS* **432** (2013) 3332–3339, [arXiv:1206.4315].

[8] P. Scott, *Pippi – painless parsing, post-processing and plotting of posterior and likelihood samples*, *Eur. Phys. J. Plus* **127** (2012) 138, [arXiv:1206.2245].

[9] C.-E. Rydberg, E. Zackrisson, P. Lundqvist, and P. Scott, *Detection of isolated Population III stars with the James Webb Space Telescope*, *MNRAS* **429** (2013) 3658–3664, [arXiv:1206.0007].

[10] P. Scott, A. I. Cowan, and C. Stricker, *Quantifying impacts of short-term plasticity on neuronal information transfer*, *Phys. Rev. E* **85** (2012) 041921, [arXiv:1204.3270].

[11] C. Strege, R. Trotta, G. Bertone, A. H. G. Peter, and P. Scott, *Fundamental statistical limitations of future dark matter direct detection experiments*, *Phys. Rev. D* **86** (2012) 023507, [arXiv:1201.3631].

[12] T. Bringmann, P. Scott, and Y. Akrami, *Improved constraints on the primordial power spectrum at small scales from ultracompact minihalos*, *Phys. Rev. D* **85** (2012) 125027, [arXiv:1110.2484].

[13] P. Scott, A. Venkatesan, E. Roebber, P. Gondolo, E. Pierpaoli, and G. Holder, *Impacts of Dark Stars on Reionization and Signatures in the Cosmic Microwave Background*, *ApJ* **742** (2011) 129, [arXiv:1107.1714].

[14] J. Ripken, J. Conrad, and P. Scott, *Implications for constrained supersymmetry of combined H.E.S.S. observations of dwarf galaxies, the Galactic halo and the Galactic centre*, *JCAP* **04** (2011) 012, [arXiv:1012.3939].

[15] Y. Akrami, C. Savage, P. Scott, J. Conrad, and J. Edsjö, *How well will ton-scale dark matter direct detection experiments constrain minimal supersymmetry?*, *JCAP* **4** (2011) 12, [arXiv:1011.4318].

[16] Y. Akrami, C. Savage, P. Scott, J. Conrad, and J. Edsjö, *Statistical coverage for supersymmetric parameter estimation: a case study with direct detection of dark matter*, *JCAP* **7** (2011) 2, [arXiv:1011.4297].

[17] E. Zackrisson, P. Scott, C.-E. Rydberg, F. Iocco, S. Sivertsson, G. Östlin, G. Mellema, I. T. Iliev, and P. R. Shapiro, *Observational constraints on supermassive dark stars*, *MNRAS* **407** (2010) L74–L78, [arXiv:1006.0481].

[18] E. Zackrisson, P. Scott, C.-E. Rydberg, F. Iocco, B. Edvardsson, G. Östlin, S. Sivertsson, A. Zitrin, T. Broadhurst, and P. Gondolo, *Finding High-redshift Dark Stars with the James Webb Space Telescope*, *ApJ* **717** (2010) 257–267, [arXiv:1002.3368].

Other refereed contributions (proceedings)

[19] N. Grevesse, M. Asplund, J. Sauval, and P. Scott, *Why GN93 should not be used anymore*, in *40th Liège International Astrophysical Colloquium. Ageing Low Mass Stars: From Red Giants to White Dwarfs* (J. Montalbán, A. Noels, and V. Van Grootel, eds.), *European Physical Journal Web of Conferences* **43** (2013) 1004.

[20] N. Grevesse, M. Asplund, A. J. Sauval, and P. Scott, *The New Solar Chemical Composition – from Z = 0.02 to Z = 0.013*, in *Progress in Solar/Stellar Physics with Helio- and Asteroseismology* (H. Shibahashi, M. Takata, and A. E. Lynas-Gray, eds.), *Astronomical Society of the Pacific Conference Series* **462** (2012) 41.

[21] P. Scott, T. Bringmann, and Y. Akrami, *Constraints on small-scale cosmological perturbations from gamma-ray searches for dark matter*, in *Proceedings of TAUP 2011* (G. Raffelt et. al., ed.), *J. Phys. Conf. Series* **375** (2012) 032012, [arXiv:1205.1432].

[22] C. Blázas *et al.*, *DLHA: Dark Matter Les Houches Agreement*, in *Les Houches 2011: Physics at TeV Colliders New Physics Working Group Report* (Brooijmans, G. et. al., ed.) (2012) [arXiv:1203.1488].

[23] P. Scott, *Dark stars: structure, evolution and impacts upon the high-redshift Universe*, in *Cosmic Radiation Fields: Sources in the early Universe* (M. Raue, T. Kneiske, D. Horns, D. Elsaesser, & P. Hauschildt, ed.) (2011) *PoS*(**CRF 2010**)021, [arXiv:1101.1029].

[24] C. E. Rydberg, E. Zackrisson, and P. Scott, *Can the James Webb Space Telescope detect isolated population III stars?*, in *Cosmic Radiation Fields: Sources in the early Universe* (M. Raue, T. Kneiske, D. Horns, D. Elsaesser, & P. Hauschildt, ed.) (2011) *PoS*(**CRF 2010**)026, [arXiv:1103.1377].

Research Interests and Participation in Research Projects

Broad Interests

Theory and detection of particle dark matter, phenomenology of particle physics beyond the standard model, numerical methods in physics, evolution and chemical composition of the Sun and other stars

Specific Interests

Techniques for scanning parameter spaces of theories beyond the standard model (supersymmetric and otherwise), supersymmetry and its breaking, indirect dark matter detection with gamma rays, cosmic rays and neutrino telescopes, direct detection of dark matter, dwarf galaxies, collider phenomenology

Research Programs

- Progressive inclusion of different dark matter searches, in detail, in global fits to particle physics theories beyond the Standard Model
- GAMBIT: the Global and Modular Beyond-the-Standard-Model Inference Tool. A broad new collaborative effort by 22 theorists and experimentalists to create a second-generation global fitting framework.
- Many-parametric fits of the gamma-ray sky in the region of the Galactic Centre, with specific reference to dark matter signals

Specific Interest ***Impacts of dark matter upon stars***

Research Program Investigation of the impacts of dark matter upon the formation, structure and evolution of main-sequence stars, at high redshift and in our own Galaxy

Specific Interests ***Dark matter in the very early Universe, cosmology of the very early Universe***

Research Program Searches for ultracompact minihalos, and implications for cosmological perturbations, inflation and cosmic strings

Specific Interest ***The chemical composition of the Sun***

Research Program Ongoing update of solar spectroscopic abundances of all elements, accounting for new model atmospheres, atomic data and observations

Specific Interest ***Techniques for numerical optimisation***

Research Program Production of an optimisation package based on differential evolution, specifically for use in physical problems

Participation in Conferences, Workshops and Seminars
(in the past 3 years; all slides available at www.physics.mcgill.ca/~patscott/talks)

Plenaries

[1] *Identifying and Characterizing Dark Matter via Multiple Probes*, Kavli Institure for Theoretical Physics, University of California Santa Barbara, 2013.

[2] *CosmoStats13*, Banff International Research Centre, 2013.

[3] *Imperial Centre for Inference and Cosmology Inaugral Workshop*, Imperial College London, 2012.

[4] *The LHC, Particle Physics and The Cosmos*, Auckland University, 2012.

[5] *Cosmic Radiation Fields 2010: Sources in the Early Universe*, DESY Hamburg, 2010.

[6] *Searching for Dark Matter – A Multi-Disciplinary Approach*, University of Leicester, 2010.

Invited Conference Presentations

[7] *Beyond the LHC Workshop*, NORDITA, Stockholm, 2013.

[8] *Cosmic Rays and Photons from Dark Matter Annihilations: Theoretical Issues*, Schloss Waldthausen, Mainz, Germany, 2013.

[9] *SnowDOG Dark Matter Meeting*, Snowbird, Utah, 2012.

[10] *Topics in Astroparticle and Underground Physics (TAUP) 2011*, Munich, 2011.

[11] *TeV Particle Astrophysics VII*, Stockholm, 2011.

[12] *Nordic Astrophysics 2010*, Visby, Sweden, 2010.

Invited Colloquia & Institutional Seminars

[13] *KITP Program "Hunting for Dark Matter: Building a cross-disciplinary, multi-pronged approach"*, Kavli Institure for Theoretical Physics, University of California Santa Barbara, 2013.

[14] *Joint Particle Seminar Series*, University of California Irvine, 2013.

[15] *Astrophysics Seminar*, University of Liège, Belgium, 2012.

[16] *Astroparticle Seminar*, CENTRA, Instituto Superior Técnico, Lisbon, 2012.

[17] *School of Physics Colloquium*, Monash University, Melbourne, 2012.

[18] *Departmental Seminar*, Physics, University of Canterbury, Christchurch, 2011.

[19] *Theoretical Astrophysics Seminar Series*, Fermilab, Batavia, 2011.

[20] *Weinberg Theory Group Seminar Series*, University of Texas, Austin, 2011.

[21] *Astroparticle Seminar Series*, Univeristy of Hamburg, 2010.

[22] *Astronomy & Theoretical Physics Colloquium*, Lund, 2010.

[23] *Astronomy Colloquium*, Imperial College London, 2010.

Other Contributions

[24] *HEP Theory Seminar*, McGill University, 2013.

[25] *EPS-HEP Meeting*, Stockholm, 2013.

[26] *2nd GAMBIT Collaboration Meeting*, Albanova University Centre, Stockholm, 2013.

[27] *Snowmass Theory Meeting*, KITP, Santa Barbara, USA, 2013.

[28] *1st GAMBIT Collaboration Meeting*, CERN, Geneva, 2012.

[29] *Identification of Dark Matter*, Chicago, 2012.

[30] *LHC Theory Workshop*, University of Melbourne, 2012.

[31] *TOOLS Conference*, Stockholm, 2012.

[32] *UCLA Dark Matter Conference*, Marina del Rey, California, 2012.

[33] *Particle Group Seminar*, University of Sydney, 2011.

[34] *Stellar Lunch*, Mt Stromlo Observatory, Australian National University, Canberra, 2011.

[35] *Northeast Cosmology Conference*, Montreal, 2011.

[36] *Workshop on Indirect Detection of Dark Matter*, University Hamburg, DESY Hamburg, 2011.

[37] *Indirect and Direct Detection of Dark Matter Conference*, Aspen Center for Physics, Colorado, 2011.

[38] *HEP Seminar*, University of Sydney, 2010.

[39] *HEP Theory Seminar*, McGill University, 2010.

[40] *PROSPECTS Conference*, Albanova University Center, Stockholm, 2010.

Professional Activities: Scientific & Professional Leadership

since late 2012 **Collaboration Leader** and **Core/Theory Working Group Co–convenor**, Global And Modular BSM Inference Tool (GAMBIT) Collaboration

since 2011 **Associate member** of the IceCube Collaboration

since 2008 **Affiliated member** of the *Fermi* Large Area Telescope (LAT) Collaboration

2013 **Guest editor**, *Physics of the Dark Universe* (Elsevier), issue “Multiple Probes of Dark Matter”

2013 **Session chair**, *Identifying and Characterizing Dark Matter*, KITP, Santa Barbara, USA

2013 **Session chair**, *CosmoStats13*, Banff, Canada

2012 **PhD thesis opponent**, Jordi Casanellas, IST Lisbon

2012 **Session chair**, *The LHC, Particle Physics and the Cosmos*, Auckland, NZ

2012 **Convenor & session chair**, *Particle Astrophysics and Cosmology Track*, International Conference on High Energy Physics (ICHEP), Melbourne

since Jan 2012 **Founder & committee chair**, *McGill Astroparticle Seminar Series*

2011 **Discussion leader**, *Dark Matter*, Northeast Cosmology Workshop, Montreal

2011 **Chair of organising committee**, *Dark Matter From Every Direction*, McGill U, 27 attendees

2010 **Co-chair of organising committee**, *PROSPECTS* Conference, Stockholm U, 42 attendees

2009 **Session chair**, *Dark2009*, Christchurch, NZ

2009–2010 **Member** of Stockholm U. Physics Departmental Computing Committee

Referee for *JHEP*, *JCAP*, *Phys. Rev. Lett.*, *ApJ Lett.*, *MNRAS Lett.*, *Europhys Lett.*, *Astronomy & Astrophysics* and *Statistical Analysis & Data Mining*

Professional Activities: Teaching & Supervision

2011, 2013 Lecturer, Tutor and Course Responsible, *PHYS606: Practical Numerical Methods in Physics*, McGill University, Winter 2011 (13 students) and Winter 2013 (11 students); mixed graduate/undergraduate.

2011 Guest Lecturer, *Stellar Evolution*, San Francisco University (Main Lecturer: Aparna Venkatesan); ~20 students, undergraduate.

2008-2009 Tutor, *FK7025: Advanced Relativistic Quantum Field Theory*, Stockholm U.; 6 graduate students

2003 Residential Tutor in Physics and Mathematics, Burgmann College, Australian National University, 2003; ~20 students, undergraduate.

Supervision Assistant supervision (unofficial) of PhD students Elinore Roebber, Grace Dupuis (both McGill, 2015), Aaron Vincent (McGill, 2012) and Yashar Akrami (Stockholm, 2010), Master's students Hamish Silverwood (Canterbury, 2012), Elinore Roebber, Grace Dupuis (both McGill, 2012), Philippe Giguere (McGill, 2013), and Honours student Madeleine Athonisen (McGill 2013).

Professional Activities: Software

GAMBIT (founding author) an upcoming second-generation public package for global fits in any beyond the standard model theory

pippi (sole author) a public package for parsing, post-processing and plotting samples from MCMCs and related sampling algorithms

FLATLib (sole author) a public package for fast convolution with the *Fermi*-LAT instrumental response

DarkStars (sole author) a public package for computing the effects of dark matter on the evolution of stars

SuperBayeS (development author) a first generation public package for performing SUSY global fits

Proficient in C/C++, Fortran, Python, Perl, Ruby, IDL, Basic, Visual Basic, Matlab, IGOR Pro, LaTeX

Professional Activities: Outreach

Logistics Arranged public lectures by Brian Schmidt (2013, McGill) and John Ellis (2010, Stockholm)

Print "Med mörk materia som drivmedel" (Fuelled by dark matter), *Populär Astronomi* No. 3, 2008. Interview by *New Scientist* for "Dark matter makes galaxy's stars live long and prosper", 2008.

In person Volunteer communicator at the John Curtin School of Medical Research Open Day (2005), Mount Stromlo Post-Bushfire Reopening Day (2004), and the Australian Science Festival (2001, 2004).

Personal

Date of Birth June 21 1982

Languages English (native), Swedish (basic conversational)

Hobbies Hiking, distance running, sailing, canoeing, mountain-biking, cross-country skiing, snowboarding, bodysurfing, politics, cooking.