

# Guillaume St-Onge

Ph.D. candidate in Physics studying Complex Systems

Département de physique, génie physique, et d'optique

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Research interests: Complex Networks, Dynamical Systems, Bayesian Inference, Contagions

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## Education

### Degrees

Ph.D. in Physics, Université Laval	2018–2021 (expected)
<ul style="list-style-type: none"><li>Advisors: Antoine Allard and Laurent Hébert-Dufresne (co-advisor)</li><li>Thesis title: <i>Contagion dynamics on complex networks: beyond pairwise interactions</i></li></ul>	
M.Sc. in Physics, Université Laval	2015–2017
<ul style="list-style-type: none"><li>Advisor: Louis J. Dubé</li><li>Thesis title: <i>Propagation dynamics on random networks: characterization of the phase transition</i></li><li>Honor board mention: <b>Highest grade attributed unanimously by the jury</b></li></ul>	
B.Sc. in Physics, Theoretical physics concentration, Université Laval	2012–2015
<ul style="list-style-type: none"><li><b>Governor General's Academic Medal:</b> Highest academic standing, B.Sc. degree</li></ul>	2016

### Summer and winter schools

• <a href="#">Complex Systems Summer School</a> , Santa Fe (NM), USA	2018
• <a href="#">Complex Networks Winter Workshop</a> , Québec (QC), Canada	2018

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## Scholarships and honors

### Graduate research scholarships

• <a href="#">NSERC: Doctoral Scholarship – Alexander Graham Bell Canada</a> (\$105 000)	Jan. 2018–Dec. 2020
• <a href="#">FRQNT: Doctoral Scholarship*</a> (\$60 000)	Jan. 2018–Dec. 2020
• <a href="#">NSERC: Master Scholarship – Alexander Graham Bell Canada</a> (\$17 500)	Sept. 2015–Aug. 2016
• <a href="#">FRQNT: Master Scholarship</a> (\$30 000)	Sept. 2015–Aug. 2017
• <a href="#">Desjardins Foundation: Master Scholarship*</a> (\$3 000)	Oct. 2015

### Internship research grants

• <a href="#">FRQNT: International Internship Program</a> (\$7 500)	2020
• <a href="#">NSERC: Michael Smith Foreign Study Supplements</a> (\$6 000)	2019
• <a href="#">NSERC: Undergraduate Student Research Award</a> (\$4 500, Awarded 3 times)	2013, 2014, 2015

### Other awards

• <a href="#">Concours d'expression scientifique Pierre Amiot<sup>†</sup></a> (3rd place), Université Laval	2017
• Student merit award–Direction mention, Université Laval	2015
• Pedagogue of the year, Physics Students Association, Université Laval	2014

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\*Awarded but declined

<sup>†</sup>Scientific communication prize

## Publications and patents

### Articles published or accepted in a peer-reviewed journal

14. [Social Confinement and Mesoscopic Localization of Epidemics on Networks](#)  
G. St-Onge, V. Thibeault, A. Allard, L. J. Dubé, L. Hébert-Dufresne  
Phys. Rev. Lett. **126**, 098301 2021
13. [Master equation analysis of mesoscopic localization in contagion dynamics on higher-order networks](#)  
G. St-Onge, V. Thibeault, A. Allard, L. J. Dubé, L. Hébert-Dufresne  
Phys. Rev. E **103**, 032301 2021
12. [Inference, Model Selection, and the Combinatorics of Growing Trees](#)  
G. T. Cantwell, G. St-Onge, J.-G. Young  
Phys. Rev. Lett. **126**, 038301 2021
11. [Localization, epidemic transitions, and unpredictability of multistrain epidemics with an underlying genotype network](#)  
B. J. M. Blake, G. St-Onge, L. Hébert-Dufresne  
PLOS Comput. Biol. **17**, e1008606 2021
10. [Threefold way to the dimension reduction of dynamics on networks: an application to synchronization](#)  
V. Thibeault, G. St-Onge, L. J. Dubé, P. Desrosiers  
Phys. Rev. Research **2**, 043215 2020
9. [Network comparison and the within-ensemble graph distance](#)  
H. Hartle, B. Klein, S. McCabe, A. Daniels, G. St-Onge, C. Murphy, L. Hébert-Dufresne  
Proc. Math. Phys. Eng. Sci. **476**, 20190744 2020
8. [Thresholding normally distributed data creates complex networks](#)  
G. T. Cantwell, Y. Liu, B. F. Maier, A. C. Schwarze, C. A. Serván, J. Snyder, G. St-Onge  
Phys. Rev. E **101**, 062302 2020
7. [Phase transition in the recoverability of network history](#)  
J.-G. Young, G. St-Onge, E. Laurence, C. Murphy, L. Hébert-Dufresne, P. Desrosiers  
Phys. Rev. X **9**, 041056 2019
6. [Efficient sampling of spreading processes on complex networks using a composition and rejection algorithm](#)  
G. St-Onge, J.-G. Young, L. Hébert-Dufresne, L. J. Dubé  
Comput. Phys. Commun. **240**, 30 2019
5. [Universality of the stochastic block model](#)  
J.-G. Young, G. St-Onge, P. Desrosiers, L. J. Dubé  
Phys. Rev. E **98**, 032309 2018
4. [Phase transition of the susceptible-infected-susceptible dynamics on time-varying configuration model networks](#)  
G. St-Onge, J.-G. Young, E. Laurence, C. Murphy, L. J. Dubé  
Phys. Rev. E **97**, 022305 2018
3. [Geometric evolution of complex networks with degree correlations](#)  
C. Murphy, A. Allard, E. Laurence, G. St-Onge, L. J. Dubé  
Phys. Rev. E **97**, 032309 2018
2. [Exact vectorial model for nonparaxial focusing by arbitrary axisymmetric surfaces](#)  
D. Panneton, G. St-Onge, M. Piché, S. Thibault  
J. Opt. Soc. Am. **33**, 801 2016
1. [Needles of light produced with a spherical mirror](#)  
D. Panneton, G. St-Onge, M. Piché, S. Thibault  
Opt. Lett. **4**, 419 2015

### Preprints

- [Bursty exposure on higher-order networks leads to nonlinear infection kernels](#)  
G. St-Onge, H. Sun, A. Allard, L. Hébert-Dufresne, G. Bianconi  
arXiv:2006.05232
- [Detecting structural perturbations from time series with deep learning](#)  
E. Laurence, C. Murphy, G. St-Onge, X. Roy-Pomerleau, V. Thibeault  
arXiv:2006.05232

## Patents

- [Hybrid nanocomposite materials, laser scanning system and use thereof in volumetric image projection](#), C. Allen, S. Thibault, A. Talbot-Lancuault, P. Blais, **G. St-Onge**, P. Desaulniers  
CA Patent No. 2983656 2017

## Other research experiences

### Internships

Vermont Complex System Center, Burlington (VT), USA

- **Visiting graduate student**, group of Prof. Laurent Hébert-Dufresne 2019-2020  
Project: *Temporal reconstruction of networks with message-passing*

Université Laval, Québec (QC), Canada

- **Undergraduate research assistant**, group of Prof. Louis J. Dubé 2015  
Project: *Statistical physics of complex networks*
- **Undergraduate research assistant**, group of Prof. Michel Piché 2014  
Project: *Highly focused laser beam modeling*
- **Undergraduate research assistant**, group of Prof. Claudine Allen 2013  
Project: *Development of an optical system for biodetection*

### Workshops

- *Detecting structural perturbations from time series*, Université Laval, Québec (QC), Canada 2019
- *Network Reconstruction & Graph Distances*, Northeastern University, Boston (MA), USA 2019
- *Network Archaeology*, Université Laval, Québec (QC), Canada 2016

## Teaching

- PHY-3500: *Computational Physics*, teaching assistant 2016, 2018  
Tasks: guidance for student projects, marking
- PHY-3000: *Statistical Physics*, teaching assistant 2016–2018, 2020  
Tasks: lectures, marking

## Selected conference contributions and invited lectures

- **G. St-Onge**, I. Iacopini, G. Petri, A. Barrat, V. Latora and L. Hébert-Dufresne 2020  
*Influence maximization in simplicial contagion*  
[14th International School and Conference on Network Science](#), Rome, Italy
- **G. St-Onge**, A. Allard, L. Hébert-Dufresne 2020  
*Localization, bistability and optimal seeding of contagions on higher-order networks*  
[Artificial Life Conference](#), Montreal (QC), Canada
- **G. St-Onge**, V. Thibeault, L. Hébert-Dufresne, L. J. Dubé 2019  
*Mesosopic localization of spreading processes on networks*  
[14th International School and Conference on Network Science](#), Burlington (VT), USA
- **G. St-Onge**, J.-G. Young, E. Laurence, C. Murphy, L. J. Dubé 2017  
*SIS dynamics on time-varying random networks*  
[Institute for Disease Modeling](#), Seattle (WA), USA
- **G. St-Onge**, J.-G. Young, E. Laurence, C. Murphy, L. J. Dubé 2017  
*Susceptible-infected-susceptible dynamics on the rewired configuration model*  
[12th International School and Conference on Network Science](#), Indianapolis (IN), USA
- **G. St-Onge**, E. Laurence, C. Murphy, J.-G. Young and L. J. Dubé 2016  
*Co-evolution of Growth and Dynamics on Network*  
[11th International School and Conference on Network Science](#), Seoul, Republic of Korea
- **G. St-Onge**, D. Panneton, M. Piché, S. Thibault 2014  
*Modeling ultra-sharp needles of light using vector diffraction theory*  
[50th Canadian Undergraduate Physics Conference](#), Kingston (ON), Canada

## Service and leadership

Projects liaison: [Complex Networks Winter Workshop](#)

2019

### Journal referee

- Nature Communications
- PLOS Computational Biology
- Scientific Reports
- Journal of Complex Networks
- Chaos: An Interdisciplinary Journal of Nonlinear Science
- IMA Journal of Applied Mathematics

### Mentoring

- Internship mentor for an undergraduate student research 2018
- Mentor for Physique mathématique III (undergraduate course) 2014
- Mentor for Physique mathématique I, II (undergraduate courses) 2013

### Volunteering

- La Coupe de Science (youth science contest) 2016
- Festival de Sciences et Génies (science festival) 2015
- Les Jeux photoniques (youth science contest) 2012–2014

## Miscellaneous

### Media coverage

- [To find the right network model, compare all possible histories](#), Phys.org 2021
- [How large a gathering is too large during the coronavirus pandemic?](#), Science News 2020

### Computer skills

Programming languages and tools: C++, Python, Bash, CSS, HTML, L<sup>A</sup>T<sub>E</sub>X, Linux , Git, Jupyter Notebook, Pybind11

Selected packages (open-source):

- [SamplableSet](#): implementation of sets which can be randomly sampled efficiently (C++/Python)
- [spreading\\_CR](#): stochastic simulation algorithm for contagion processes (C++/Python)
- [fasttr](#): uniform sampler for the temporal reconstruction of growing trees (C++/Python)

### Languages

- French–native speaker
- English–fluent (spoken and written); 117/120 on the TOEFL test
- German–elementary