

## Highlights

- Forbes Top 30 Under 30 | 2x TEDx Speaker | Member, Royal Society of Canada
- Carbontech co-founder & finalist (1 of 10 globally) of the \$20M Carbon XPRIZE
- Youngest-ever Director at the National Research Council of Canada leading a \$57M R&D program
- 47 publications in high-impact journals such as *Nature* and *Science* (>10,00 citations in the past 5 years)

## Experience

### Expert, Sustainability at McKinsey & Company

*Apr 2022 – Present*

- Advises Fortune 100 organizations on how to develop and go to market with innovative solutions or business models that enable other organizations to decarbonize their operations.
- Leads teams of consultants to conduct due diligence, regulatory guidance, and cost analysis for clients to develop and implement action plans, provide support, and meet scope, budget, schedule, and quality.

### Adjunct Professor at the University of Toronto

*Dec 2021 – Present*

- Adjunct Professor in the Materials Science & Engineering (MSE) Department at the University of Toronto. Member of the MSE advisory board providing strategic advice and direction to the department.

### Director, Materials for Clean Fuels at National Research Council of Canada

*Feb 2019 – Mar 2022*

- Built and launched a 7-year \$57M mission-driven collaborative R&D program focused on disruptive decarbonization technologies. Led the strategic planning, objective setting, and partnership development.
- Manages a research team of >40 FTE in three thrusts – CO<sub>2</sub> conversion, H<sub>2</sub> technology, and artificial intelligence for materials discovery across a portfolio of >30 collaborative research projects with world-leading academics and startups in Canada, UK, Germany, and the US.
- Engages with oil & gas, energy, and chemical industry executives, high-ranking government officials, cleantech entrepreneurs, and technology innovators to align program for deepest impact.
- Contributes to national energy policy strategies around hydrogen and carbon capture, utilization, & storage.

### Chair, Board of Directors at Carbon Management Canada (CMC)

*Sep 2019 – Present*

- Led a strategic plan exercise and provides key insight and direction to the firm's key value offerings in the carbontech ecosystem. Oversaw board renewal and hiring of the latest CEO.
- Leads the governance of the board and engagement with the management team including setting CEO compensation, approving yearly budgets, and facilitating stakeholder relationship development.

### MP Candidate for Toronto-St. Paul's at the Green Party of Canada

*May 2021 – Sept 2021*

- Federal candidate for the Green Party of Canada in the 2021 Federal election in Toronto-St. Paul's.
- Built and executed a successful campaign, fundraising over \$45,000, managing over 150 volunteers, and touching over 40,000 homes across 90% of the riding. The campaign was covered by media such as CBC, National Observer, City News, and more.
- Finished in the top 5 percentile of Green Party candidates with 2.7x greater vote share than the national average. Earned a prestigious GreenPAC endorsement (1 of only 5 Greens) as a climate champion.

### Co-Founder & Finalist at Carbon XPRIZE

*Sep 2016 – Mar 2019*

- Co-founded a carbontech firm (CERT Systems) that raised >\$2M in non-dilutive funding to develop breakthrough technology to convert CO<sub>2</sub> to ethylene, a critical chemical feedstock with a global market of \$92B. 2019 Creative Destruction Lab – Energy cohort, a highly competitive startup accelerator.
- Brokered partnerships with engineering scale up providers, strategic oil & gas investment, and government funding programs. Led a team to scale up CO<sub>2</sub> conversion technology from bench to prototype.

### Research Scientist at Toyota Research Institute

*Jun 2018 – Sep 2018*

- Worked with researchers at Stanford University to use artificial intelligence to accelerate the discovery of new fuel cell and battery materials. Acceleration factors of >10x traditional experimental discovery was achieved.

### Research Scientist at IBM TJ Watson Research Center

*May 2016 – Sep 2016*

- Developed large-scale simulations to understand biomolecule-material interfaces in the context of point-of-care biosensing applications. Published 4 research papers in high-impact journals over the course of a 4-month internship.

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<b>Education</b>	2015 – 2018	University of Toronto	PhD Materials Science & Engineering
	2017	University of California, Berkeley	Visiting Scholar
	2013 – 2015	University of Ottawa	MSc Chemistry
	2009 – 2013	University of Windsor	BSc [H] Chemistry

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## Awards & Recognition

- 2022 Top 50 Changemaker, Globe & Mail  
Early Career Award, University of Toronto Engineering Alumni Network
- 2021 Member of the College, Royal Society of Canada  
Highly Cited Researcher (Top 1% in The World), Clarivate Analytics  
Alumni Odyssey Award, University of Windsor  
Corporate Knights Top 30 Under 30, Corporate Knights  
Clean50 Emerging Leader, Clean50  
Bay Street Bull 30x30, Bay Street Bull Magazine  
Highly Cited Researcher, Clarivate
- 2020 Action Canada Fellow, Public Policy Forum  
Mission Innovation Champion – Canada, Mission Innovation
- 2019 Forbes Best of Canada Top 30 Innovators, Forbes  
Forbes Top 30 Under 30 – Energy, Forbes  
Governor General's Gold Medal, Governor General of Canada  
GreenBiz Top 30 Under 30, GreenBiz Magazine  
Member, Institute of Corporate Directors
- 2017 Massey College Catherall Award, Massey College
- 2016 Alexander Graham Bell Canada Graduate Scholarship (CGS-D), NSERC  
CIFAR Graduate Fellow, Canadian Institute for Advanced Research
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## Volunteer Activities

### **Mentor at Creative Destruction Lab**

*May 2020 – Present*

- Helping early-stage founders build massive and scalable technology companies through technical assessments and entrepreneurial mentorship (mentored >12 startups). Specialization in advanced materials and founding mentor of the Matter (Toronto) and Climate (Paris) streams.

### **Member, Advanced Materials Steering Committee at the OECD**

*May 2019 – Mar 2022*

- Works with other international leaders from Japan, US, European Commission, Korea etc. to provide recommendations and case studies for topics such as best practices for collaborative research platforms and state-of-the-art in carbon capture, utilization, and storage technologies.
- Contributed to OECD policy reports and regularly appears as a guest speaker and panelist and OECD conferences.

### **Co-Host & Executive Producer at “What’s Next In…” Podcast**

*Jan 2021 – Mar 2022*

- Podcast host and producer of “What’s Next In…” a podcast about the rapidly changing world and how we can get ahead of it. Topics include the science and behaviour of climate change, what makes people happy, the future of work, and more. >1000 listens in first 6 weeks of launch.

### **Member, Sustainable AI Ethics Working Group at the Canadian Commission for UNESCO**

*Oct 2020 – Dec 2021*

- Works with the UNESCO secretariat to develop proposals for applying artificial intelligence technology to advance the realization of Canadian UN Sustainable Development Goals.

### **Mentor, Invention to Innovation (I2I) Program**

*Jan 2021 – Mar 2022*

- Provides mentorship to young science-based entrepreneurs regarding getting technologies out of lab and into the marketplace.

### **Fellow, Action Canada at the Public Policy Forum**

*Jun 2020 – Mar 2021*

- Participated in prestigious Canadian public policy leadership accelerator program (1 of 12 fellows nationally).
  - Co-authored a public policy task force report on the future of work in the agriculture sector from a place-based lens with a specific focus on recommendations to decrease barriers for entry for new entrants in agriculture.
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## Junior Fellow at Massey College

August 2016 – January 2019

- Participated in a number of committees as an active member in the Massey College Community, an exclusive graduate community focused on multi-disciplinary research excellence at the University of Toronto.
  - Served as Co-Chair Junior Fellow Lecture Series, Co-Chair Quarter Century Fund, Lionel Massey Fund Committee Member, Junior Fellow/Senior Fellow Liaison Committee Member, Science at Massey Committee Member, House Committee Member and the Massey Tutors Program High School Tutor.
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## Selected Media

The Nature of Things, “*Carbon: The Unauthorized Biography*” Mar. 2022  
TEDxToronto, “*We can’t fight emissions if we keep fighting each other*” Feb. 2021  
VICE Mini-Documentary, *Empowered Episode 2*, Mar. 2020  
Forbes x Polestar Video, “*How Phil De Luna is shaping the future of clean energy*”, Jan. 2021  
Toronto Star Opinion Editorial, “*If you want a diverse workforce, you need diverse leadership*”, Aug. 2020  
Podcast Interviews, *Forbes Ignite, Hot Talks, Pipelines & Turbines, & Forward – How Stories Drive Change*

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## Publications Policy Reports

1. Growing the Next Crop of Canadian Farmers, *Action Canada Fellowship Report*, Public Policy Forum, Mar 2021.
2. A Better Tomorrow: Policy Priorities for Toronto-St. Paul’s, *2021 Campaign Election Platform*, Aug 2021.
3. Collaborative platforms for innovation in advanced materials, *OECD Science, Technology, and Industry, Policy Papers*, No. 95, Dec 2020.
4. How Canada Can Meet the Climate Challenge of Net-Zero, *Canadian Science Policy Magazine*, Issue 2, Nov 2020.

## Scientific Publications (\* denotes equal contribution)

1. **De Luna, P.**, Accelerated Materials Discovery: How to Use Artificial Intelligence to Speed Up Development, de Gruyter, 2022.
  2. Cao, X. E. & **De Luna, P.** Why we need scientists to make sustainable policies. *Matter*, 2021, 4(9), 2690-2693
  3. Ruttinger, A. W., Kannangara, A., Shadbahr, J., **De Luna, P.**, & Bensebaa, F. How CO<sub>2</sub>-to-Diesel Technology Could Help Reach Net-Zero Emissions Targets: A Canadian Case Study. *Energies*. 2021, 14 (21), 6957
  4. Hui, S., & **De Luna, P.** How increasing proton and electron conduction benefits electrocatalytic CO<sub>2</sub> reduction. *Matter*, 2021, 4(5), 1555-1577
  5. Wen, Y., Chen, P., Wang, L., Li, S., Wang, Z., Abed, J., Mao, X., Min, Y., Dinh, C.T., **De Luna, P.** Huang, R., Zhang, L., Wang, L., Wang, L., Nielsen, R.J., Li, H., Zhuang, T., Ke, C., Voznyy, O., Hu, Y., Li, Y., Goddard III, W.A., Zhang, B., Peng, H., Sargent, E.H. Stabilizing Highly Active Ru Sites by Suppressing Lattice Oxygen Participation in Acidic Water Oxidation. *Journal of the American Chemical Society*, 2021, 143, 17, 6482-6490
  6. Zhong, M.,\* Tran, K.,\* Min, Y.,\* Wang, C.,\* Wang, Z., Dinh, C. T., **De Luna, P.**, Yu, Z., Rasouli, A. S., Brodersen, P., Sun, S., Voznyy, O., Tan, C. S., Askerka, M., Che, F., Liu, M., Seifitokaldani, A., Pang, Y., Lo, S. C., Ip, A., Ulissi, Z., & Sargent, E. H. Accelerated discovery of CO<sub>2</sub> electrocatalysts using active machine learning. *Nature*, 2020, 581, 178-183
  7. Nam, D. H.,\* **De Luna, P.**,\* Rosas-Hernandez, A., Thevenon, A., Li, F., Agapie, T., Peters, J. C., Shekhah, O., Eddaoudi, M., & Sargent, E. H. Molecular enhancement of heterogeneous CO<sub>2</sub> reduction. *Nature Materials*, 2020, 19, 226-276
  8. Zhang, B., Wang, L., Cao, Z., Kozlov, S. M., Garcia de Arquer, F. P., Dinh, C. T., Li, J., Wang, Z., Zheng, X., Zhang, L., Wen, Y., Voznyy, O., Comin, R., **De Luna, P.**, Reiger, T., Bi, W., Alp, E. E., Pao, C. W., Zheng, L., Hu, Y., Ji, Y., Li, Y., Zhang, Y., Cavallo, L., Peng, H., Sargent, E. H. High-valence metals improve oxygen evolution reaction performance by modulating 3 d metal oxidation cycle energetics. *Nature Catalysis*, 2020, 3, 985-992
  9. Coskun, H., Aljabour, A., **De Luna, P.**, Sun, H., Nishiumi, N., Yoshida, T., Koller, G., Ramsey, M. G., Greunz, T., Stifter, D., Strobel, M., Hild, S., Hassel, A. W., Sariciftci, N. S., Sargent E. H., & Stadler, P. Metal-Free Hydrogen-Bonded Polymers Mimic Noble Metal Electrocatalysts. *Advanced Materials*, 2020, 32(25)
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10. Hui, S., Shaigan, N., Neburchilov, V., Zhang, L., Malek, K., Eikerling, M., & De Luna, P. Three-Dimensional Cathodes for Electrochemical Reduction of CO<sub>2</sub>: From Macro- to Nano-Engineering. *Nanomaterials*, 2020, 10(9), 1884
  11. De Luna, P., Hahn, C., Higgins, D., Jaffer, S. A., Jaramillo, T. F., & Sargent, E. H. What would it take for renewably powered electrosynthesis to displace petrochemical processes? *Science*, 2019, 364, 6438
  12. Ross, M. B., De Luna, P., Li, Y., Dinh, C. T., Kim, D., Yang, P., & Sargent, E. H. Designing materials for electrochemical carbon dioxide recycling. *Nature Catalysis*, 2019, 2, 648-658
  13. Liu, M., Liu, M., Wang, X., Kozlov, S. M., Cao, Z., De Luna, P., Li, H., Qui, X., Liu, K., Hu, J., Jia, C., Wang, P., Zhou, H., He, J., Zhong, M., Lan, X., Zhou, Y., Wang, Z., Li, J., Seifitokaldani, A., Dinh, C. T., Liang, H., Zou, C., Zhang, D., Yang, Y., Chan, T. S., Han, Y., Cavallo, L., Sham, T. K., Hwang, B. J., & Sargent, E. H. Quantum-Dot-Derived Catalysts for CO<sub>2</sub> Reduction Reaction. *Joule*, 2019, 3, 1-16
  14. Duan, G., Chen, L., Jing, Z., De Luna, P., Wen, L., Zhang, L., Zhao, L., Xu, J., Li, Z., Yang, Z., & Ruhong, Z. Robust Antibacterial Activity of Tungsten Oxide (WO<sub>3-x</sub>) Nanodots. *Chemical Research in Toxicology*, 2019, 32(7), 1357-1366
  15. Nandi, S., De Luna, P., Maity, R., Chakraborty, D., Daff, T. D., Burns, T. D., Woo, T. K., Ramanathan, V. Imparting Gas Selective and Pressure Dependent Porosity into a Non-Porous Solid via Coordination Flexibility. *Materials Horizons*, 2019, 6, 1883-1891
  16. Pang, Y., Li, J., Wang, Z., Tan, C. S., Hsieh, P. L., Zhuang, T. T., Liang, Z. Q., Zou, C., Wang, X., De Luna, P., Edwards, J. P., Xu, Y., Li, F., Dinh, C. T., Zhong, M., Lou, Y., Wu, D., Chen, L. J., Sargent, E. H., & Sinton, D. Efficient electrocatalytic conversion of carbon monoxide to propanol using fragmented copper. *Nature Catalysis*, 2018, 2, 251-258
  17. Dinh, C. T.,\* Jain, A.,\* de Arquer, F. P. G.,\* De Luna, P., Wang, N., Zheng, X., Cai, J., Gregory, B. Z., Voznyy O., Zhang, B., Liu, M., Sinton, D., Crumlin, E. J., & Sargent, E. H. Multi-Site Catalysts Destabilize Water Molecules and Achieve High-Activity Neutral Hydrogen Evolution. *Nature Energy*. 2018, 4, 107-114
  18. Li, J.,\* Che, F.,\* Pang, Y.,\* Zou, C.,\* Howe, J. Y., Burdyny, T., Edwards, J. P., Wang, Y., Li, F., De Luna, P., Dinh, C. T., Zhuang, T. T., Saidaminov, M. I., Cheng, S., Wu, T., Finck, Y. Z., Ma, L., Hsieh, S. H., Liu, Y., Botton, G., Pong, W. F., Du, X., Guo, J., Sham, T. K., Sargent, E. H., & Sinton, D. Copper adparticle enabled selective electrosynthesis of n-propanol. *Nature Communications*. 2018, 9, 4614
  19. Zhuang, T. T.,\* Pang, Y.,\* Liang, Z. Q., Li, Y., Tan, C. S., Li, J., Din, C. T., De Luna, P., Hsieh, P. L., Burdyny, T., Li, H. H., Liu, M., Wang, Y., Li, F., Proppe, A., Johnston, A., Wu, Z. Y., Zheng, Y. R., Ip, A. H., Tan, H., Chen, L. J., Yu, S. H., Kelly, S. O., Sinton, D., & Sargent, E. H. Copper nanocavities confine intermediates for efficient electrosynthesis of C<sub>3</sub> alcohol fuels from carbon monoxide. *Nature Catalysis*. 2018, 1, 945-951
  20. Ross, M. B., Li, Yi., De Luna, P., Kim, D., Sargent, E. H., & Yang, P. Electrocatalytic Rate Alignment Enhances Syngas Generation. *Joule*. 2018, 3 (1), 257-264
  21. Kibria, M. G., Dinh, C. T., Seifitokaldani, A., De Luna, P., Burdyny, T., Quintero-Bermudez, R., Ross, M. B., Bushuyev, O. S., de Arquer, F. P. G., Yang, P., Sinton, D., & Sargent, E. H. A Surface Reconstruction Route to High Productivity and Selectivity in CO<sub>2</sub> Electroreduction Toward C<sub>2+</sub> Hydrocarbons. *Advanced Materials*. 2018, 30 (49), 1804867
  22. Liang, Z.,\* Zhuang, T.,\* Seifitokaldani, A., Tan, C. S., Li, Y., De Luna, P., Huang, C. W., Hsieh, P. L., Dinh, C. T., Wang, Y., Quintero-Bermudez, R., Zhou, Y., Li, J., Chen, P., Pang, Y., Lo, S. C., Chen, L. J., Tan, H., Xu, Z., Zhao, S., & Sargent, E. H. Copper-on-nitride enhances the stable electrosynthesis of multi-carbon products from CO<sub>2</sub>. *Nature Communications*. 2018, 9, 3828
  23. De Luna, P., Liang, W., Mallick, A., Shekhah, O., Garcia de Arquer, F. P., Proppe, A., Todorovic, P., Kelley, S. O., Sargent, E. H., & Eddaoudi, M. Metal-Organic Framework Thin Films on High-Curvature Nanostructures Towards Tandem Electrocatalysis. *ACS Applied Materials Interfaces*. 2018, 10 (37), 31225-31232
  24. Nam, D. H., Bushuyev, O. S., Li, J., De Luna, P., Seifitokaldani, A., Dinh, C. T., Garcia de Arquer, F. P., Wang, Y., Liang, Z., Proppe, A. H., Tan, C. S., Todorovic, P., Shekhah, O., Gabardo, C. M., Jo, J. W., Choi, J., Choi, M. J., Baek, S. W., Kim, J., Sinton, D., Kelley, S. O., Eddaoudi, M., & Sargent, E. H. Metal-Organic Frameworks Mediate Cu Coordination for Selective CO<sub>2</sub> Electroreduction. *Journal of the American Chemical Society*. 2018, 140 (36), 11378-1138
  25. Garcia de Arquer, F. P.,\* Bushuyev, O. S.,\* De Luna, P.,\* Dinh, C. T., Seifitokaldani, A., Saidaminov, M. I., Quan, L. N., Proppe, A., Kibria, M. G., Kelley, S., Sinton, D., & Sargent, E. H. 2D Metal Oxyhalide-Derived Catalysts for Efficient CO<sub>2</sub> Electroreduction. *Advanced Materials*. 2018, 1802858
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27. Zhuang, T.,\* Liang, Z.Q.,\* Seifitokaldani, A.,\* Li, Y., **De Luna, P.**, Burdyny, T., Meng, F., Quintero-Bermudez, R., Dinh, C.T., Zhong, M., Che, F.L., Zhang, B., Li, J., Chen, P.N., Zheng, X.L., Liang, H.Y., Ge, W.N., Ye, B.J., Sinton, D., Yu, S.H., & Sargent, E.H. Steering post-C-C coupling selectivity enables high efficiency electroreduction of carbon dioxide to multi-carbon alcohols. **Nature Catalysis**. 2018, 1, 421–428
28. Dinh, C. T.,\* Burdyny, T.,\* Kibria, M.,\* Seifitokaldani, A.,\* Gabardo, C., de Arquer, F. P. G., Kiani, A., Edwards, J., **De Luna, P.**, Bushuyev, O., Zou, C., Quintero-Bermudez, R., Pang, Y., Sinton, D., & Sargent E. H. Sustained high-selectivity CO<sub>2</sub> electroreduction to ethylene via hydroxide-mediated catalysis at an abrupt reaction interface. **Science**. 2018, 360 (6390), 783-787
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31. **De Luna, P.\***, Quintero-Bermudez, R.\*, Dinh, C. T., Ross, M. B., Bushuyev, O., Todorovic, P., Regier, T., Yang, P., & Sargent, E. H. Electro-redeposited catalysts control morphology and oxidation state for selective carbon dioxide reduction. **Nature Catalysis**. 2018, 1 (2), 103-110
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