

Curriculum Vitae (*Short Version*)

Name: Manish N. Raizada, Ph.D.

Citizenship: Canadian

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EDUCATION AND TRAINING

- Research Fellow (Microbial Engineering with 2018 Chemistry Nobel Laureate Frances Arnold), California Institute of Technology, Pasadena, California, USA (2003-2004)
- Post-Doctoral Fellow (Crop Genomics), CIMMYT, Mexico City (2000)
- Ph.D. (Maize Molecular Genetics with Virginia Walbot), Stanford University, California, USA (2000)
- B.Sc. (Genetics), The University of Western Ontario, London, Canada (1992)
- High School Diploma, North Park Secondary School, Brampton, Canada (1988)

EMPLOYMENT

- | | |
|--------------|---|
| 2001-current | Assistant, Associate and now Full Professor, University of Guelph
Department of Agriculture (probiotics for crops, sustainable agriculture kits for subsistence farmers, microbial biosensors for nitrogen, agronomy, cover crops) |
| 2003-2004 | Research Fellow, California Institute of Technology
Department of Chemical Engineering (microbial engineering) |
| 2000 | Post doctoral Research Fellow, International Maize and Wheat Improvement Center (CIMMYT), Mexico City (genomic tech transfer to developing countries) |
| 1992-1999 | Teaching Assistant, Stanford University, Department of Biological Sciences |
| 1991 | Teaching Assistant, University of Western Ontario, Genetics Program |

RECENT INVITED LECTURES (SELECTED)

13. Raizada, M. (2020) Invited Lecture, Ontario Certified Crop Advisors Conference (London ON, Canada, Jan 15, 2020)
12. Raizada, M. (2019) Mohammed VI Polytechnic University (UM6P, Ben Guerir, Morocco), Invited Lecture. Oct 3, 2019.
11. Raizada, M. (2019) Annual International Science, Technology & Innovation Congress, Cali, Colombia, May 7, 2019 (Invited lecture)
10. Raizada, M. (2018) United Nations International Centre for Genetic Engineering and Biotechnology (ICGEB), Trieste, Italy, Nov 29, 2018
9. Raizada, M. (2018) Keynote, Centre SEVE Plant Science Annual Meeting, Quebec (Nov 1, 2018)
8. Raizada, M. (2018) John Innes Centre, Norwich, U.K. (2018) (Institute Speaker), March 3, 2018
7. Raizada, M. (2017) University of California at Berkeley (2017) (Department of Plant and Microbial Biology Seminar Series), October 25, 2017
6. Raizada, M. (2017) Chair's Choice Plenary Speaker, 29th Fungal Genetics Conference (Genetics Society of America), Asilomar, California, USA, March 17, 2017 (attended by 900 scientists)
5. Raizada, M. (2016) Conference of the World Mycotoxin Forum, June 6-9, Winnipeg.
4. Raizada, M. (2016) South Dakota State University, USA. (Weekly Seminar Series, Apr 22, 2016).

3. Raizada, M. (2016) Samuel Roberts Noble Foundation, USA. Institute Seminar Series. (Mar 31, 2016).
2. Raizada, M. (2013) University of Minnesota, *MPGI Fall Symposium*. (Aug 29, 2013).
1. Raizada, M. (2013) Donald Danforth Plant Science Institute, St. Louis, USA. (Feb 24-27, 2013).

CONTRIBUTIONS – last 6 years

A. Five Most Significant Contributions to Research and/or to Practical Applications

1. Pioneering & testing of sustainable agriculture kits (SAKs) for subsistence farmers:

From 2014-2018, I founded & co-led a \$2.3 million IDRC international development research grant to help Nepalese farmers (www.SAKNepal.org and www.SAKBooks.com) which has thus impacted up to 271,000 people including novel cropping strategies. Watch a mini-documentary about the project: https://www.youtube.com/watch?v=HTt0jvG_Yws&index=17&list=UUrKWhLffIZVpErHNWuakYkg.

2. Evidence that plant microbes display convergent evolution to human immunity cells: My Lab proposed and provided evidence for a novel hypothesis that immobile plant cells may have retained mobile endophytic microbes to serve a similar role as mobile immune cells in animals, to seek-and-destroy pathogens [Soliman et al. (2015) *Current Biology* and Mousa et al. (2016) *Nature Microbiology*].

3. Unexpected discovery that seeds carry (beneficial) microbes that populate the rhizosphere (4 publications): We have provided evidence in 4 publications that seeds package microbes that subsequently exit the plant to occupy the rhizosphere –opposite to dogma with implications for agbiotech.

4. Evidence that indigenous peoples have selected their crops to possess beneficial microbes, leading to the discovery of potent microbes for ag-biotech: We have revealed the scientific/economic value of the crop microbes selected by indigenous peoples (4 U.S. patents, 10 publications, 2 licenses).

5. Engineering and innovative application of microbial biosensors to measure and optimize agricultural nitrogen: Starting at Caltech as a postdoc with Frances Arnold (2018 Nobel Laureate), my lab has engineered biosensors to diagnose soil N & microbial N fixation, decreasing costs from >\$10 to \$1/sample (8 publications, 2 US patents, and adoption by multiple labs in Europe/USA/Asia since 2017).

B. Research Contributions and Practical Applications (last 6 years)

B1.1 Published articles in refereed publications (Career total is 93 journal articles + book chapters, 71 articles since 2013 + 4 book chapters, most as senior author. Most recent citation impact: cited nearly 600 times in 2020 according to Google Scholar):

[*denotes researcher where Prof. Raizada was the major advisor]

[Manuscripts available to download at: <http://raizadalab.weebly.com/>]

2020 [21 additional manuscripts are forthcoming]

71. *Sousa EC and **Raizada MN** (2020) Contributions of African crops to American culture and beyond: The Slave Trade and other journeys of resilient peoples and crops. *Frontiers in Sustainable Food Systems* 4: 586340

70. *Devkota R, Hambly Odame H, Fitzsimons J, Pudasaini R, and **Raizada MN** (2020) Evaluating the Effectiveness of Picture-Based Agricultural Extension Lessons Developed Using Participatory Testing and Editing with Smallholder Women Farmers in Nepal. *Sustainability* 12, 9699

69. Khadka K, Torkamaneh D, Kaviani M, Belzile F, **Raizada MN** and Navabi A (2020) Population structure of Nepali spring wheat (*Triticum aestivum* L) germplasm. *BMC Plant Biology* 20:530

68. *Khalaf EM and **Raizada MN**. 2020. Draft genome sequences of six strains of *Lactococcus lactis* (phylum *Firmicutes*), spanning the seeds of *Cucumis sativus* L. (cucumber), *Cucumis melo* L. (cantaloupe), & *Cucurbita pepo* var. *turbinata* (acorn squash). *Microbiol Resour Announc* 9:e00665-20.
67. *Khalaf EM and **Raizada MN**. 2020. Draft genome sequences of *Pantoea agglomerans*, *Paenibacillus polymyxa*, and *Pseudomonas* sp. strains, seed biogel-associated endophytes of *Cucumis sativus* L. (cucumber) and *Cucumis melo* L. (cantaloupe). *Microbiol Resour Announc* 9:e00667-20.
66. Khadka K, **Raizada MN** and Navabi A (2020) Recent Progress in Germplasm Evaluation and Gene Mapping to Enable Breeding of Drought-Tolerant Wheat. *Frontiers in Plant Science* 11:1149
65. *Khalaf EM and **Raizada MN**. 2020. Draft genome sequences of *Bacillus* and *Paenibacillus* species isolated from seeds of *Citrullus lanata* (watermelon), *Cucurbita moschata* (butternut squash), and *Cucurbita pepo* L. var. *pepo* L. (pumpkin). *Microbiol Resour Announc* 9:e00727-20.
64. *Khalaf EM and **Raizada MN**. 2020. Draft genome sequences of seven strains of *Paenibacillus* spp. (phylum *Firmicutes*) inhabiting the seeds of *Cucumis melo* L. (cantaloupe) and exhibiting plant probiotic traits. *Microbiol Resour Announc* 9:e00715-20.
63. Khadka K, Earl HJ, **Raizada MN** and Navabi A (2020) A Physio-Morphological Trait-Based Approach for Breeding Drought Tolerant Wheat. *Frontiers in Plant Science* 11: 715
62. *Khalaf EM and **Raizada MN**. 2020. Draft genome sequences of *Acinetobacter* sp. strain EKM10A, *Enterobacter hormaechei* EKM10E, and *Enterobacter hormaechei* EKM11E (phylum *Proteobacteria*) colonizing the seed surface biogel of *Echinocystis lobata* (wild cucumber). *Microbiol Resour Announc* 9:e00184 20.
61. *Khalaf EM and **Raizada MN**. 2020. Draft genome sequence of *Bacillus* sp. strain EKM601B (phylum *Firmicutes*), living inside the seeds of *Luffa acutangula* (Chinese okra). *Microbiol Resour Announc* 9:e00180-20.
60. *Soliman, S.S.M. and **Raizada, M.N.** (2020) Sites of biosynthesis and storage of Taxol in *Taxus media* (Rehder) plants: Mechanism of accumulation. *Phytochemistry* 175:112369 ([Selected to be on the Cover](#))
59. *Chapagain, T., Lee E.A. and **M. N. Raizada** (2020) The Potential of Multi-Species Mixtures to Diversify Cover Crop Benefits. *Sustainability* 12, 2058;
58. *Devkota R, Pant LP, Gartaula HN, Patel K, Gauchan D, Hambly-Odame H, Thapa B, and **Raizada M.N.** (2020) Responsible Agricultural Mechanization Innovation for the Sustainable Development of Nepal's Hillside Farming System. *Sustainability* 12, 374.

2019

57. *Thilakarathna MS and **Raizada MN** (2019) A biosensor-based assay (*GlnLux*-agar) shows defoliation triggers rapid release of glutamine from nodules and young roots of forage legumes. *Phytobiomes* 3: 85-91
56. *Chapagain, T., 7 co-authors and **M. N. Raizada** (2019) The underutilized terrace wall can be intensified to improve farmer livelihoods. *Agronomy for Sustainable Development* 39:29
55. *Thilakarathna MS, 10 co-authors & **Raizada MN** (2019) Evaluating the effectiveness of rhizobium inoculants & micronutrients as technologies for Nepalese common bean smallholder farmers. *Agriculture* 9:20

2018

54. *Thompson MEH and **Raizada MN** (2018) Fungal Pathogens of Maize Gaining Free Passage Along the Silk Road. *Pathogens* 7:81 ([Selected as Editor's Choice](#))
53. *Dumigan CR, Perry GE, Pauls KP, and **Raizada MN** (2018) Draft genome sequence of *Enterobacter cloacae* 3D9. *Microbiol Resource Announcements* 7(16):e00902-18

52. *Thilakarathna MS and **Raizada MN** (2018) Visualizing glutamine accumulation in root systems involved in the legume-rhizobia symbiosis by placement on agar embedded with companion biosensor cells. *Phytobiomes* 2(3):117-128 [[Selected as Editor's Pick](#)]
51. *Chapagain T, Ghirmire B, Pudasaini R, Gurung K, Choi K, Rai L, Magar S, Bishnu BK & **Raizada MN** (2018) Intercropping of maize, millet, mustard, wheat and ginger increased land productivity and potential economic returns for smallholder terrace farmers in Nepal. *Field Crops Research* 227: 91-101
50. *Dumigan CR, Perry GE, Pauls KP, and **Raizada MN**. 2018. Draft genome sequence of *Enterobacter cloacae* 3F11 (phylum *Proteobacteria*). *Microbiol Res Announcements* 7:e00846-18.
49. *Thilakarathna MS and **Raizada MN** (2018) Challenges in Using Precision Agriculture to Optimize Symbiotic Nitrogen Fixation in Legumes. *Agronomy* 8(5):78
48. *Soliman SSM and **Raizada MN** (2018) Darkness: A crucial factor in fungal Taxol production. *Frontiers in Microbiology* 9: 353
47. *Nameth MB, *Goron TL, *Dinka SJ, 4 co-authors, and **Raizada MN** (2018) The initial hours of post-excision light are critical for adventitious root regeneration from *Arabidopsis thaliana* cotyledon explants. *In Vitro Cellular & Developmental Biology - Plant* (DOI : 10.1007/s11627-017-9880-z)
46. *Khalaf EM and **Raizada MN** (2018) Bacterial seed endophytes of domesticated cucurbits antagonize fungal and oomycete pathogens including powdery mildew. *Frontiers in Microbiology* 9:42
45. *Shehata HR, Lyons EM and **Raizada MN** (2018) Turfgrasses as model assay systems for high-throughput *in planta* screening of beneficial endophytes isolated from cereal crops. *Symbiosis* 76:71-76

2017

44. *Shehata HR, *Dumigan C, *Watts S, **Raizada MN** (2017) An endophytic microbe from an unusual volcanic swamp corn seeks and inhabits root hair cells to extract rock phosphate. *Sci Rep* 7:13479
43. *Thilakarathna MS, *Moroz N and **Raizada MN** (2017) A biosensor-based leaf punch assay for glutamine correlates to symbiotic nitrogen fixation measurements in legumes. *Front Plant Sci* 8: 1714
42. *Goron TL and **Raizada MN** (2017) Biosensor-mediated in situ imaging defines the availability period of assimilatory glutamine in maize seedling leaves following nitrogen fertilization. *Nitrogen* 1:2
41. *Shehata HR and **Raizada MN** (2017) A *Burkholderia* endophyte of the ancient maize landrace Chapalote utilizes c-di-GMP-dependent and –independent signaling to suppress diverse plant fungal pathogen targets. *FEMS Microbiology Letters*. 364: fnx138
40. *Goron TL, coauthors & **Raizada MN** (2017) Mid-season leaf glutamine predicts end-season maize grain yield & nitrogen content in response to nitrogen fertilization under field conditions. *Agronomy* 7:41.
39. *Chapagain T and **Raizada MN** (2017) Impacts of natural disasters on smallholder farmers: Gaps and recommendations. *Agriculture and Food Security* 6:39
38. *Chapagain T and **Raizada MN** (2017) Agronomic challenges and opportunities for smallholder terrace agriculture in developing countries. *Frontiers in Plant Science* 8: 331
37. *Small FAA and **Raizada MN** (2017) Mitigating dry season food insecurity in the subtropics by prospecting drought-tolerant, nitrogen-fixing weeds. *Agriculture & Food Security* 6:23
36. **Raizada MN** and co-authors (2017) Loss of developmental pluripotency occurs in two stages during leaf aging in *Arabidopsis thaliana*. *In Vitro Cellular & Developmental Biology - Plant* 53: 178-187
35. *Shehata HR, Griffiths MW and **Raizada MN** (2017) Seeds of the wild progenitor of maize possess bacteria that antagonize foodborne pathogens. *Foodborne Pathogens and Disease* 14: 4
34. *Thilakarathna MS and **Raizada MN** (2017) A meta-analysis of the effectiveness of diverse rhizobia inoculants on soybean traits under field conditions. *Soil Biology and Biochemistry* 105: 177-196
33. *Quach Mason, M, 6-co-authors **Raizada MN** (2017) Pyramid screening: combining three genetic screens into one efficient screen for shoot regeneration mutants. *J. Plant Growth Reg* 36: 528-534

2016

32. *Goron TL and **Raizada MN** (2016) Biosensor-based spatial and developmental mapping of maize leaf glutamine at vein-level resolution in response to different nitrogen rates. *BMC Plant Biology* 16:230
31. *Thilakarathna MS, McElroy M, *Chapagain T, Papadopoulos YA and **Raizada MN** (2016) Belowground nitrogen transfer from legumes to non-legumes under managed herbaceous cropping systems. A review. *Agronomy for Sustainable Development* 36:58
30. *Shehata HR, Ettinger CL, Eisen JA and **Raizada MN** (2016) Genes required for the anti-fungal activity of a bacterial endophyte isolated from a corn landrace grown continuously by subsistence farmers since 1000 BC. *Frontiers in Microbiology* 7: 1548
29. *Mousa WK, *Shearer C, Limay-Rios V, Ettinger CL, Eisen JA, **Raizada MN** (2016) Root hair-endophyte stacking (RHESt) in finger millet creates a physico-chemical barrier to trap the fungal pathogen *Fusarium graminearum*. *Nature Microbiology* 1: 16167 (Article, 93rd percentile in attention)
28. *Mousa WK, Schwan A and **Raizada MN** (2016) Characterization of antifungal natural products isolated from endophytic fungi of finger millet (*Eleusine coracana*). *Molecules* 21: 1171
27. *Khalef EK and **Raizada MN** (2016) Taxonomic and functional diversity of cultured seed associated microbes of the cucurbit family. *BMC Microbiology* 16: 131
26. *Johnston-Monje D, Lundberg DS, Lazarovits G, Reis VM and **Raizada MN** (2016) Bacterial populations in juvenile maize rhizospheres originate from both seed and soil. *Plant and Soil* 405: 337
25. *Shehata HR, 2-co-authors & **Raizada MN** (2016) Bacterial endophytes from wild and ancient maize are able to suppress the fungal pathogen *S. homoeocarpa*. *J. Appl. Microbiol.* 120: 756-769
24. *Shehata HR, 2-co-authors and **Raizada MN** (2016) Relevance of *in vitro* agar based screens to characterize the anti-fungal activities of bacterial endophyte communities. *BMC Microbiology* 16:8

2015

23. *Mousa WK, 6 co-authors and **Raizada MN** (2015) An endophytic fungus isolated from finger millet (*Eleusine coracana*) produces anti-fungal natural products. *Frontiers in Microbiology* 6, 1157.
22. *Mousa WK, *Shearer C, Limay-Rios V, Zhou T and **Raizada MN** (2015) Bacterial endophytes from wild maize suppress *Fusarium graminearum* in modern maize. *Frontiers in Plant Science* 6, 805.
21. *Soliman SM, Greenwood JS, Bombarely A, Mueller LA, Tsao R, Mosser DD and **Raizada MN** (2015) An endophyte constructs fungicide-containing extracellular barriers for its host plant. *Current Biology* 25, 1-7 (Selected as a Special Feature; and Editor's Choice in *The Scientist*).
20. *Harding DP and **Raizada MN** (2015) Alternative strategies for controlling weeds in field crop and turf systems using bacteria, fungi and viruses. *Frontiers in Plant Science* 6:659
19. *Goron T, Bhosekar VK, Shearer C, Watts S and **Raizada MN** (2015) Whole plant acclimation responses by finger millet to low nitrogen stress. *Frontiers in Plant Science* 6:652
18. *Thilakarathna MS and **Raizada MN** (2015) A Review of Nutrient Management Studies Involving Finger Millet in the Semi-Arid Tropics of Asia and Africa. *Agronomy* 5: 262-290
17. *Goron TL, *Watts S, *Shearer C and **Raizada MN** (2015) Growth in Turface clay permits root hair phenotyping along the entire crown root zone in cereal crops. *BMC Research Notes* 8:143
16. *Mousa WK and **Raizada MN** (2015) Biodiversity of genes encoding anti-microbial traits within plant associated microbes. *Frontiers in Plant Science* 6: 231
15. *Goron, TL and **Raizada MN** (2015) Genetic diversity and genomic resources available in the small millet crops to accelerate a New Green Revolution. *Frontiers in Plant Science* 6: 157
14. Ettinger C, *Mousa WK, **Raizada MN** and Eisen JA (2015) Draft Genome Sequence of *Enterobacter* sp. str. UCD-UG_FMILLET. *Genome Announcements* 3: e01461-14.
13. Ettinger C, *Shehata H, *Johnston-Monje D, **Raizada MN** and Eisen JA (2015) Draft Genome Sequence of *Burkholderia gladioli* str. UCD-UG_CHAPALOTE *Genome Announce* 3: e01462-14.

2014

12. *Johnston-Monje D, 2coauthors & **Raizada MN** (2014) Impact of Swapping Soils on the Endophytic Bacterial Communities of Pre-Domesticated, Ancient & Modern Maize. *BMC Plant Biology* 14:233.
11. *Goron, T.L. and **Raizada, M.N.** (2014) Current and Future Transgenic Whole-Cell Biosensors for Plant Macro- and Micro-nutrients. *Critical Reviews in Plant Sciences* 33: 392-413
10. *Gaudin, ACM, *Soliman SS, *McClymont SA & **Raizada MN** (2014) Effect of Altered Dosage of a Mutant Allele of *Teosinte Branched 1* on the Root System of Modern Maize. *BMC Genetics* 15:23

2013

9. *Liseron-Monfils C., Bi Y.-M., Downs G.S., Wu W. 8-co-authors and **Raizada M.N.** (2013) Nitrogen transporter and assimilation genes exhibit developmental stage-selective expression in maize (*Zea mays* L.) associated with distinct cis-acting promoter motifs. *Plant Signaling & Behavior* 8: e26056
8. *Bargout, R.N. and **Raizada, M.N.** (2013) Soil Nutrient Management in Haiti, Pre-Columbus to the Present Day: Lessons for Future Agricultural Interventions. *Agriculture & Food Security* 2:11
7. *Soliman, SSM, 3-co-authors and **Raizada, M.N.** (2013) A Fungal Endophyte Induces Transcription of Genes Encoding a Redundant Fungicide Pathway in its Host Plant. *BMC Plant Biology* 13:93
6. *Berchie, J.N., *Gaudin, A., *McClymont, S. **Raizada, M.** Adu-Dapaah, H. and Sarkodie-Addo, J. (2013) Performance of 13 Bambara Groundnut (*Vigna subterranea* (L) Verdc.) Landraces (from Sub-Saharan Africa) under 12 h and 14 h Photoperiod. *Journal of Agronomy* 12: 20-28
5. *Mousa, W.K. and **Raizada, M.N.** (2013) The diversity of anti-microbial secondary metabolites produced by fungal endophytes: An interdisciplinary perspective. *Frontiers in Microbiology* 4:65
4. *Liseron-Monfils, C., Lewis, T., Ashlock, D., McNicholas, P.D., Fauteaux, F., Stromvik, M. and **Raizada, M.N.** (2013) Promzea: A pipeline for discovery of regulatory motifs in maize and other plant species and its application... *BMC Plant Biology* 13: 42
3. *Soliman,S.S.M. and **M.N.Raizada** (2013) Interactions between co-habiting fungi elicit synthesis of Taxol from an endophytic fungus in host *Taxus* plants. *Frontiers in Microbiology* 4(3): 1-14
2. *Nameth, B., *Dinka SJ, 5 co-authors, and **M. N. Raizada** (2013) The Shoot Regeneration Capacity of Excised Arabidopsis Cotyledons... *Plant Cell & Environment* 36: 68-86
1. *Chatfield S.P., 6 co-authors, **Raizada M.N.** and Provart N.J. (2013) Incipient stem cell niche conversion in tissue culture... *Plant Journal* 73: 798-813

B2. Other Refereed Contributions (last 6 years, book chapters)

4. *Johnston-Monje, D, Castillo-Avila, DK, **Raizada, MN**, Becerra Lopez-Lavalle, L.A. (2019) Paying the Rent: How Endophytic Microorganisms Help Plant Hosts Obtain Nutrients. In Comprehensive Biotechnology, Vol. 4, Moo-Young, M., Ed., Elsevier: Pergamon, pp 770–788.
3. **Raizada, M.N.** (2017) Challenges and Solutions for Subsistence Farmers. In **Plants, Genes and Agriculture: Sustainability through Biotechnology** (MJ. Chrispeels, P Gepts, Eds). Oxford Univ Press
2. *Mousa WK & **Raizada, MN** (2016) Natural Disease Control in Cereal Grains. In: C.Wrigley, H. Corke, K Seetharam, Faubion, J (eds) **Encyclopedia of Food Grains**. Oxford:Academic Press, p257-263.
1. *Johnston-Monje D. and **Raizada M.N.** (2013) A survey of diverse *Zea* seeds for bacterial endophytes. Volume I, First Edition. In: F.J. de Bruijn (ed.), **Molecular Microbial Ecology of the Rhizosphere**. Wiley-Blackwell. Chapter 42, pp. 445-455.

B.3. Non-refereed contributions (last 6 years)

B3.1 Books (published)

A Picture Book of Best Practices for Subsistence Farmers (190 pages, 5 geographic versions). By **Raizada MN** with illustrations by Smith L. (2017). Available at www.SAKBooks.com

B3.2 Books (in preparation)

Encyclopedia of Subsistence Farming Solutions (2021 version, ~900 pages), MN Raizada (Editor) and J Wilker (Assoc Editor) Available at www.SAKBooks.com (open access)

B.3.3. Edited Student Theses (last 6 years) (3 MSc and 5 PhD theses are in progress)

Career = 8 MSc and 12 PhD theses as primary advisor and 2 PhD theses + 1 MSc as co-advisor (completed or in progress)

Student	Degree	Completed	Thesis Topic
Rachana Devkota (co-advisor)	PhD	June 2020	Smallholder farmers in Nepal and small scale mechanization
Kamal Khadka (co-advisor)	PhD	May 2020	Genetic and phenotypic diversity of Nepali spring wheat
Bowornnan Chantapakul (co-advisor)	MSc	Apr 2020	Endophytic microbes that suppress foodborne pathogens
Chris Dumigan	MSc	Nov 2018	Endophytes that promote nitrogen use efficiency in grasses
Finlay Small	MSc	Nov 2017	Lentil tolerance to nitrogen fixation during drought
Travis Goron	PhD	Jul 2017	Microbial biosensor for measuring soil nitrogen in corn
Walaa Mousa	PhD	Feb 2016	Endophytes that suppress Fusarium disease in cereals
Dylan Harding	MSc	Jan 2016	Endophytes as selective herbicides
Hanan Shehata	PhD	Jan 2016	Endophytes that suppress fungal disease, nitrogen biosensor

C. Other Evidence of Impact and Contributions (highlights, last 6 years)

C.1. Editorial Board Memberships

- Associate Editor, *BMC Plant Biology* (Plant-Microbe Interactions) (2015-2017)
- Editorial Board, journal *PLoS One* (2014-2017)

C.2. International Outreach:

- I led a \$2.3 million IDRC grant to help subsistence farmers in Nepal (2014-2017) which has impacted up to 272,000 people using Sustainable Agriculture Kits (SAKs). See www.SAKNepal.org, www.SAKbooks.com and YouTube mini-documentary at https://www.youtube.com/watch?v=HTt0jvG_Yws&index=17&list=UUrKWhLffzVpErHNWuakYkg
- Member, International Scientific Advisory Board, AgroBioSciences Program, Mohammed VI Polytechnic University, elite \$1 billion new private university that provides free scholarships for graduate students from across Africa (UM6P, Morocco, 2020-)

C.3. Public Awareness/Education: 63 media interviews (career), including Canada's leading science broadcast (*Quirks & Quarks*), leading TV news (*The National*), and newspaper (*The Toronto Star*).

D. Contributions to the Training of Highly Qualified Personnel (HQP) including Women Scientists

My Lab has an excellent record in HQP training including women/minority groups. All previous 7PhD+7MSc students have stayed in plantµbial biology.

- Current PDF** Malinda Thilakarathna, now tenure-track Asst Professorship at U.Alberta (started 9/2019).
- My earlier **PhD grads include:** Amelie Gaudin, now Assoc. Prof, U.California, Davis, selected as a 'Scientist to Watch' by *The Scientist* Magazine; David Johnston Monje, now Max Planck Tandem Group Leader (Colombia/Germany) after being the first scientist at IndigoAg, an agricultural startup now valued at >\$1 billion; Sameh Soliman, who became a postdoc at UCLA, now Assoc. Prof at Sharjah University (UAE).

•**My most recent PhD grads were:** Walaa Mousa, finalist for the Polanyi Prize, the top award for young scientists in Ontario & now postdoc at McMaster; Hanan Shehata, College nominee for the Forster Medal (top all around convocation award at UofG) & now postdoc at Guelph's Biodiversity Institute; & Travis Goron, University finalist for the Governor General's Academic Gold Medal later postdoc at Wageningen Univ (#1 ranked ag university globally). The latter 3 PhDs all subsequently won NSERC PDF fellowships.

•**My notable undergrad lab trainees included:** Arani Kajenthira, subsequent Rhodes Scholar, Oxford PhD, Harvard postdoc, now Sr Advisor, Walton [Walmart] Foundation); Michael Pautler (subsequent PhD, Cold Spring Harbor, now Principal Investigator at Vineland Research Innovation Centre, Ontario); Sarah McClymont (recently defended PhD, Johns Hopkins); and Sophia Watts (2017 Rhodes Scholarship nominee, now NSERC Scholarship MSc student at Dalhousie).