

Nele Horemans Curriculum Vitae

Research Statement: a narrative on your scientific career in past, present and future

Following a masters in Biology option Plant physiology, I obtained an FWO grant (1992-1997) to perform a PhD on the role and uptake of ascorbate in plants at the University of Antwerp. During my FWO-post-doc position (from 1997-2007) I shifted from pure plant physiology to how plants respond to stress and studied the effects of heavy metals (Cd en Cu) and ozone on the antioxidative system of plants. In October 2008 I joined the team of Biosphere Impact Studies at SCK CEN (Belgian Nuclear Research Centre) to lead the research on mechanistic understanding of effects induced by radiation and radionuclides in plants. Since October 2012 I am a 5% guest docent position at the UHasselt giving courses on eco- and radiotoxicology. In September 2015 I became unit head of the BIS team and now combine the management tasks with my ongoing research interest in plant defence and adaptation. To conduct my research I perform both lab and field studies. The latter focusing on the effect of chronic exposure to radiation on plants growing in the exclusion zones of both Chornobyl and Fukushima. As such I have previously conducted field work in both the Chornobyl and Fukushima exclusion zone in the framework of a pan-European EC-funded project and as part of a FWO-JSPS bilateral collaboration (VS.017.19N). Currently, I am co-investigator in an FWO project coordinated by UHasselt (G082621). I have a strong publication record (> 100 peer-reviewed papers, **h-index 34 (WoS) and 35 (Scopus)**) and successfully guided already more than 10 PhDs. Currently, I co-supervise 4 PhD students.

- **Short CV & Career path**

Career path

01/04/2015 - present Head or research unit

Biosphere Impact Studies Unit, Belgian Nuclear Research Centre SCK CEN, Mol, Belgium
Head of research group, resource management, administration and logistics, research planning and co-ordination, project co-ordination and management, research, guidance PhD students
The unit Biosphere Impact Studies performs radioecological research on behaviour of radionuclides in the environment, food web and food chain transfer of radionuclides and effects induced by radiation in wildlife mainly plants. Research on bio-based solutions for remediation of radiological contaminated land or water
Guidance to Researchers, PhD, Master and bachelor students

01/10/2008 – 30/03/2015 Senior Scientist

Biosphere Impact Studies Unit, Belgian Nuclear Research Centre SCK CEN, Mol, Belgium
Perform research on studying the effects induced in plants (*Arabidopsis*, *Lemna minor* and *Oryza sativa*) exposed to radionuclides (U, Sr, Am) or gamma radiation at different levels of biological complexity from individual to molecular responses. One of the focuses of the research was to study toxicity in multi-contaminated exposure. Guidance to PhD, Master and bachelor students

01/10/2012-present Guest docent (5%)

Centrum voor Milieukunde University of Hasselt, Belgium. Give a course of Eco- and radiotoxicity to first year Master Students Biomedical sciences within their option genes, environment and health.

01/10/1997-30/09/2008 Post-doctoral fellowship funded by National Science foundation (FWO) (01/10/1997-30/09/2005) and University of Antwerp (01/10/2005-30/09/2008)

University of Antwerp, Department Biology, group Plant physiology
Studying the effects of different stressors like Cd, Cu, Zn and ozone on plant physiology with a focus on the role of antioxidants (mainly ascorbate).

Education:

01/10/1992-30/09/1997 PhD in Sciences, (**greatest distinction**), University of Antwerp Belgium, title: Ascorbate-mediated functions at the plasma membrane of higher plants (17/03/1997)

01/10/1990-01/07/1992 Master in Biological Sciences (Plant Biology) (great distinction) University of Antwerp Belgium, title: Research on the involvement of plasma membrane redox components in transmembrane electron transport.

01/10/1988-01/07/1990 Bachelor in Biological Sciences (great distinction), University of Antwerp Belgium

Career breaks

5 jan 1999-10 jun 1999 (Maternity and breast-feeding leave, birth Vincent 11/01/1999)

6 sep 2000-12 feb 2001 (Maternity and breast-feeding leave, birth Elise 13/09/2000)

24 jun 2002-26 nov 2002 (Maternity and breast-feeding leave, birth Margaux 27/06/2002)

Project management

- Owner of FWO doctoral (1993-1997) and FWO post-doc fellowship (1997-2000 and 2000-2005):
- Principal investigator of national funded projects mainly funded through Belgian science foundation. Most recent one on studying the Stress responses induced in *Lemna minor* by different radiation types: characterisation and comparison by a multi-endpoint molecular approach. (G A040.11N)
- Key investigator for SCK CEN in EU-funded project STAR Strategy for Allied Radioecology was a Network of Excellence (NoE) funded under the EC's 7th program (Contract Number: Fission-2010-3.5.1-269672), dedicated to strengthening the science of radioecology in Europe. My contributions was mainly on the two science oriented work packages on radiation protection in a mixed contaminant context (WP4) and ecologically relevant low dose effects (WP5).
- Key investigator for SCK CEN in EU-funded project COMET CO-ordination and iMplementation of a pan-European project for radioecology (Grant Agreement number: 604974) My main contribution was in the WP4 on epigenetic changes and their possible role in adaptation and trans-generational effects Within this research activity the objective was to increase our understanding of the effects of chronic low-dose radiation and the possible contribution of epigenetic mechanisms to long-term effects.
- Key investigator in a bilateral project between the Belgian and Japanese Science Foundation (FWOJSPS) (contract number: VS01719N) on the possible role of epigenetic changes in the morphological abnormalities observed in plants after the Fukushima accident.
- Principal Investigator Icon project (SpaceBakery) (2020-2022, 30 months), Closed Ecological Plant Cultivation System and Bakery for extended stays on Planet Mars and their applications for Planet Earth (Puratos coordinator, financed by VLAIO, hosted by Flanders'FOOD)
- Principal investigator on FWO-project (G 082621N) , (2021-2025) Exploring mechanisms of environmental adaptation in pine trees and associated rhizosphere microbiome: using the extreme event of the Fukushima nuclear disaster as a case study (together with UHasselt (coordinator) and VUB)
- Marie Curie ITN CHRONIC, (H2020-MSCA-ITN-2020, 36 Months) (Proposal number 956009) Chronic exposure scenarios driving environmental risks of chemicals, principal investigator and guidance to Early Scientific Researcher

Publication list in the last 10 years

- Mishra, S., G. T. Duarte, **N. Horemans**, J. Ruytinx, D. Gudkov and M. Danchenko (2024). "Complexity of responses to ionizing radiation in plants, and the impact on interacting biotic factors." *Science of the Total Environment* 924: 20.
- Van Dyck, I., N. Vanhoudt, J. V. I. Batlle, C. S. Vargas, **N. Horemans**, A. Van Gompel, R. Nauts, A. Wijgaerts, W. Marchal, J. Claesen and J. Vangronsveld (2024). "Differentiation between chemo- and radiotoxicity of ¹³⁷Cs and ⁶⁰Co on *Lemna minor*." *Journal of Environmental Radioactivity* 272: 19.
- Degenhardt, Ä., S. Sreetharan, A. Amrenova, C. Adam-Guillermin, F. Dekkers, S. Dumit, S. Frelon, **N. Horemans**, D. Laurier, L. Liutsko, S. Salomaa, T. Schneider, M. P. Hande, R. Wakeford and K. E. Applegate (2024). "The ICRP, MELODI, and ALLIANCE workshop on effects of ionizing radiation exposure in offspring and next generations: a summary of discussions." *International Journal of Radiation Biology*: 11.
- Van Dyck, I., N. Vanhoudt, J. V. I. Batlle, **N. Horemans**, A. Van Gompel, R. Nauts, J. Wannijn, A. Wijgaerts, A. Vassilev and J. Vangronsveld (2023). "Uptake of Co, Cs, Mn, Ni and Zn by *Lemna minor* and their effects on physiological and biochemical functions." *Environmental and Experimental Botany* 213: 13.
- Sreetharan, S., S. Frelon, **N. Horemans**, P. Laloi, S. Salomaa and C. Adam-Guillermin (2023). "Ionizing radiation exposure effects across multiple generations: evidence and lessons from non-human biota." *International Journal of Radiation Biology*: 18.
- **Horemans, N.**, J. Kariuki, E. Saenen, M. Mysara, G. T. S. Beemster, K. Sprangers, I. Pavlovic, O. Novak, M. Van Hees, R. Nauts, G. T. Duarte and A. Cuypers (2023). "Are *Arabidopsis thaliana* plants able to recover from exposure to gamma radiation? A molecular perspective." *J Environ Radioact* 270: 107304.
- Van Dyck, I., N. Vanhoudt, I. B. J. Vives, **N. Horemans**, A. Van Gompel, R. Nauts and J. Vangronsveld (2023). "Effects of environmental parameters on starch and soluble sugars in *Lemna minor*." *Plant Physiol Biochem* 200: 107755.
- De Micco, V., G. Aronne, N. Caplin, E. Carnero-Diaz, R. Herranz, **N. Horemans**, V. Legue, F. J. Medina, V. Pereda-Loth, M. Schiefloe, S. De Francesco, L. G. Izzo, I. Le Disquet and A. I. Kittang Jost (2023). "Perspectives for plant biology in space and analogue environments." *NPJ Microgravity* 9(1): 67.
- Laanen, P., Cuypers A, Saenen E and **Horemans N** (2023). "Flowering under enhanced ionising radiation conditions and its regulation through epigenetic mechanisms." *Plant Physiol Biochem* 196: 246-259. (IF 5.437)
- Duarte, GT, Volkova PY, Fiengo Perez F and **Horemans N** (2023). "Chronic Ionizing Radiation of Plants: An Evolutionary Factor from Direct Damage to Non-Target Effects." *Plants (Basel)* 12(5). (IF: 4.658)
- Van Antro, M., Prelovsek S., Ivanovic S., Gawehns F., Wagemaker N., Mysara M., **Horemans N.**, Vergeer P. and Verhoeven K. J. F. (2023). "DNA methylation in clonal duckweed (*Lemna minor* L.) lineages reflects current and historical environmental exposures." *Molecular Ecology* 32(2): 428-443. (IF 6.622)
- Burt, J. J., J. Leblanc, K. Randhawa, A. Ivanova, M. A. Rudd, R. Wilkins, E. I. Azzam, M. Hecker, N. **Horemans**, H. Vandenhove, C. Adam-Guillermin, O. Armant, D. Klokov, K. Audouze, J. C. Kaiser, S. Moertl, K. Lumniczky, I. B. Tanaka, Y. Yamada, N. Hamada, I. Al-Nabulsi, R. J. Preston, S. Bouffler, K. Applegate, D. Cool, D. Beaton, K. E. Tollefsen, J. Garnier-Laplace, D. Laurier and V. Chauhan (2022). "Radiation adverse outcome pathways (AOPs) are on the horizon: Advancing radiation protection through an international Horizon-Style exercise." *International Journal of Radiation Biology* 98(12): 1763-1776. (3.352)
- Tollefsen KE, Alonzo F, Beresford NA, Brede DA, Dufourcq-Sekatcheff E, Gilbin R, **Horemans N**, Hurem S, Laloi P, Maremonti E, Oughton D, Simon O, Song Y, Wood MD, Xie L, Frelon S (2022)

Adverse outcome pathways (AOPs) for radiation-induced reproductive effects in environmental species: state of science and identification of a consensus AOP network. *Int J Radiat Biol*:16. doi:10.1080/09553002.2022.2110317 (IF 3.352)

- Mertens A, **Horemans N**, Saenen E, Nauts R, Cuypers A (2022) Calcium affects uranium responses in *Arabidopsis thaliana*: From distribution to toxicity. *Plant Physiology and Biochemistry* 185:101-111. doi:10.1016/j.plaphy.2022.05.020 (IF 5.437)
- Gilbin R, Arnold T, Beresford NA, Berthomieu C, Brown JE, de With G, **Horemans N**, Madruga MJ, Masson O, Merroun M, Michalik B, Muikku M, O'Toole S, Popic JM, Nogueira P, Real A, Sachs S, Salbu B, Stark K, Steiner M, Sweeck L, Vandenhove H, Vidal M, Batlle JVI (2021) An updated strategic research agenda for the integration of radioecology in the european radiation protection research. *Journal of Environmental Radioactivity* 237:10. doi:10.1016/j.jenvrad.2021.106697 (IF 2.655)
- Van Dyck I, Vanhoudt N, Batlle JVI, **Horemans N**, Nauts R, Van Gompel A, Claesen J, Vangronsveld J (2021) Effects of environmental parameters on *Lemna minor* growth: An integrated experimental and modelling approach. *Journal of Environmental Management* 300:14. doi:10.1016/j.jenvman.2021.113705 (IF 8.91)
- Laanen P, Saenen E, Mysara M, Van de Walle J, Van Hees M, Nauts R, Van Nieuwerburgh F, Voorspoels S, Jacobs G, Cuypers A and **Horemans N** (2021) Changes in DNA Methylation in *Arabidopsis thaliana* Plants Exposed Over Multiple Generations to Gamma Radiation. *Front. Plant Sci.* 12:611783. doi: 10.3389/fpls.2021.611783 (IF 4.402)
- Mothersill CE, Oughton DH, Schofield PN, Abend M, Adam-Guillermin C, Ariyoshi K, Beresford NA, Bonisoli-Alquati A, Cohen J, Dubrova Y, Geras'kin SA, Hevroy TH, Higley KA, **Horemans N**, Jha AN, Kapustka LA, Kiang JG, Madas BG, Powathil G, Sarapultseva EI, Seymour CB, Vo NTK, Wood MD From tangled banks to toxic bunnies; a reflection on the issues involved in developing an ecosystem approach for environmental radiation protection. *Int J Radiat Biol*. doi:10.1080/09553002.2020.1793022 (IF 2.368)
- Cristina A, Samson R, **Horemans N**, Van Hees M, Wannijn J, Bruggeman M, Sweeck L (2020) Interception of radionuclides by planophile crops: A simple semi-empirical modelling approach in case of nuclear accident fallout. *Environ Pollut* 266. doi:10.1016/j.envpol.2020.115308 (IF 6.973)
- Hendrix S, Iven V, Eekhout T, Huybrechts M, Pecqueur I, **Horemans N**, Keunen E, De Veylder L, Vangronsveld J, Cuypers A (2020) Suppressor of Gamma Response 1 Modulates the DNA Damage Response and Oxidative Stress Response in Leaves of Cadmium-Exposed *Arabidopsis thaliana*. *Front Plant Sci* 11:13. doi:10.3389/fpls.2020.00366 (IF 4.402)
- Beresford NA, **Horemans N**, Copplestone D, Raines KE, Orizaola G, Wood MD, Laanen P, Whitehead HC, Burrows JE, Tinsley MG, Smith JT, Bonzom JM, Gagnaire B, Adam-Guillermin C, Gashchak S, Jha AN, de Menezes A, Willey N, Spurgeon D (2020) Towards solving a scientific controversy - The effects of ionising radiation on the environment. *Journal of Environmental Radioactivity* 211. doi:10.1016/j.jenvrad.2019.106033 (IF 2.161)
- Tewari RK, **Horemans N**, Nauts R, Wannijn J, Van Hees M, Vandenhove H (2019) The nitric oxide suppressed *Arabidopsis* mutants- *Atnoa1* and *Atnia1nia2noa1-2* produce nitric oxide in MS growth medium and on uranium exposure. *Plant physiology and biochemistry : PPB / Societe francaise de physiologie vegetale* 140:9-17. doi:10.1016/j.plaphy.2019.04.042 (IF 3.72)
- Mothersill C, Abend M, Brechignac F, Copplestone D, Geras'kin S, Goodman J, **Horemans N**, Jeggo P, McBride W, Mousseau TA, O'Hare A, Papineni RVL, Powathil G, Schofield PN, Seymour C, Sutcliffe J, Austin B (2019) The tubercular badger and the uncertain curve:- The need for a multiple stressor approach in environmental radiation protection. *Environ Res* 168:130-140. doi:10.1016/j.envres.2018.09.031 (IF 5.715)
- Kariuki, J., **Horemans, N.**, Saenen, E., Van Hees, M., Verhoeven, M., Nauts, R., Cuypers, A. (2019). The responses and recovery after gamma irradiation are highly dependent on leaf age at the time of exposure in rice (*Oryza sativa* L.). *Environmental and Experimental Botany*, 162, 157-167. doi:10.1016/j.envexpbot.2019.02.020, IF: 3.666

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- **Horemans, N.**, Nauts, R., Vives i Batlle, J., Van Hees, M., Jacobs, G., Voorspoels, S., Gaschak, S., Nanba, K., Saenen, E., 2018. Genome-wide DNA methylation changes in two Brassicaceae species sampled alongside a radiation gradient in Chernobyl and Fukushima. *Journal of Environmental Radioactivity* 192, 405-416. (IF 2.263)
- Volkova, P.Y., Geras'kin, S.A., **Horemans, N.**, Makarenko, E.S., Saenen, E., Duarte, G.T., Nauts, R., Bondarenko, V.S., Jacobs, G., Voorspoels, S., Kudin, M., (2018). Chronic radiation exposure as an ecological factor: Hypermethylation and genetic differentiation in irradiated Scots pine populations. *Environ. Pollut.* 232, 105-112. (IF 4.358)
- Van Hoeck A, **Horemans N**, Nauts R, Van Hees M, Vandenhove H, Blust R (2017) Lemna minor plants chronically exposed to ionising radiation: RNA-seq analysis indicates a dose rate dependent shift from acclimation to survival strategies. *Plant Sci* 257:84-95. doi:<http://dx.doi.org/10.1016/j.plantsci.2017.01.010> (IF 3.362)
- van de Walle J, **Horemans N**, Saenen E, Van Hees M, Wannijn J, Nauts R, van Gompel A, Vangronsveld J, Vandenhove H, Cuypers A (2016) Arabidopsis plants exposed to gamma radiation in two successive generations show a different oxidative stress response. *Journal of Environmental Radioactivity* 165:270-279. doi:10.1016/j.jenvrad.2016.10.014 (IF 2.047)
- Vercamp H, Vassilev A., Koleva L., **Horemans N.**, Biermans G., Vangronsveld J., Cuypers A (2016) The functional role of the photosynthetic apparatus in the recovery of Brassica napus plants from pre-emergent metazachlor exposure *J Plant Physiol* 196-197:99-105. doi:10.1016/j.jplph.2016.04.001 (IF 2.971)
- **Horemans N**, Van Hees M, Saenen E, Van Hoeck A, Smolders V, Blust R, Vandenhove H, (2016) Influence of nutrient composition on uranium toxicity and choice of the most sensitive endpoint in Lemna minor, *J Env Rad*, 151 Pt 2:427- 437 <http://dx.doi.org/10.1016/j.jenvrad.2015.06.024> (IF 2,483)
- Van Hoeck A, **Horemans N**, Monsieus P, Cao HX, Vandenhove H, Blust R (2015) The first draft genome of the aquatic model plant Lemna minor opens the route for future stress physiology research and biotechnological applications. *Biotechnology for Biofuels* 8:13. doi:10.1186/s13068-015-0381-1 (IF 6,04)
- Van Hoeck, A., **Horemans N.**, Van Hees, M., Nauts, R., Knapen, D., Vandenhove, H., Blust, R., 2015. Characterizing dose response relationships: Chronic gamma radiation in Lemna minor induces oxidative stress and altered polyploidy level. *Journal of Environmental Radioactivity* 150, 195-202. (IF 2.483)
- Tewari, R.*, **Horemans N.***, Nauts, R., Wannijn, J., Van Hees, M., Vandenhove, H., 2015. Uranium exposure induces nitric oxide and hydrogen peroxide generation in Arabidopsis thaliana. *Environ. Exp. Bot.* 120, 55-64. (* both authors contributed equally) (IF 3.359)
- Saenen, E., **Horemans N.**, Vanhoudt, N., Vandenhove, H., Biermans, G., Van Hees, M., Wannijn, J., Vangronsveld, J., Cuypers, A., 2015. miRNA398b and miRNA398c are involved in the regulation of the SOD response in uraniumexposed Arabidopsis thaliana roots. *Environ. Exp. Bot.* 116, 12-19. (IF 3.359)
- Biermans G, **Horemans N**, Vanhoudt N, Vandenhove H, Saenen E, Van Hees M, Wannijn Vangronsveld J, Cuypers A (2015) Biological effects of alpha radiation exposure by 241Am in Arabidopsis thaliana seedlings are determined both by dose rate and 241Am distribution *J Env Rad* 149, 51-63 (IF 2,483)
- Lofts S, Fevrier L, **Horemans N**, Bruggeman Ch., Vandenhove H (2015) Assessment of co-contaminant effects on uranium and thorium speciation in freshwater using geochemical modelling, *J. Env Rad. J Environ Radioact* 149, 99- 109, (IF 2,483)

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- Jozefczak M, Bohler S, Schat H, **Horemans N**, Guisez Y, Remans T, Vangronsveld J, Cuypers A (2015) Both content and redox state of glutathione and ascorbate influence *Arabidopsis*' sensitivity towards cadmium *Annals of Botany* doi:10.1093/aob/mcv075 (in press) (IF 3,654)
- Van Hoeck A, **Horemans N**, Van Hees M, Nauts R, Knapen D, Vandenhove H, Blust R (2015) Radiation Stress responses on Growth and Antioxidative Defense System in Plants: A Study with Strontium-90 in *Lemna minor* *Int J Mol. Sci*, 16, 15309-15327; doi:10.3390/ijms160715309 (IF 2,682) 2015
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