15th EUROPEAN NITROGEN FIXATION CONFERENCE, NAPLES 2023

August 31, Thursday

14.00 - 17.00 **Registration and poster installation**

Opening – Auditorium

17.00 - 17.30 **Welcome and Institutional Greetings**
Maurizio Chiurazzi – Chair of the Local Organizing Committee
Nicola Caputo – Councilor of Campania Region for Agriculture
Matteo Lorito – Rector of the University Federico II, Napoli

17.30 – 17.40 **Eva Kondorosi –** Member of the award committee
Presentation of the Adam Kondorosi Early-career investigator awardee

17.40 - 18.10 **Lecture of the Adam Kondorosi Early-Career Investigator Awardee**

18.10 – 18.15 **Luis Rubio -** President of the ENFC
Presentation of the Opening Lecture

18.15 – 19.00 **Marcel Kuypers (DE)** - Opening Lecture
Microbial Nitrogen Fixation in the changing ocean

19.00 – 21.30 **Welcome reception**
At the restaurant of the Royal Continental Hotel

September 1, Friday

Plenary Sessions 1 and 2 – Auditorium

9.00 – 10.30 **Biochemistry and Bioengineering**
Chair: Luis Rubio (ES)

9.00 – 9.30 **Lance Seefeldt (USA)** *Insights into the mechanism of N_2 reduction catalyzed by nitrogenase* (PL1)
9.30 – 10.00 **Stefan Burén (ES)** *Engineering of nitrogenase in eukaryotes* (PL2)
10.00 – 10.30 **Kasper Andersen (DK)** *Structure and function of symbiotic cell-surface receptors* (PL3)
10.30 – 11.00 Coffee Break

11.00 – 12.30 **Symbiotic Nitrogen Fixation**
Chair: Giles Oldroyd (UK)

11.00 – 11.30 **Alessio Mengoni (IT)** *All parents, all different: questioning on the many variations of Sinorhizobium meliloti strains* (PL4)
11.30 – 12.00 **Delphine Capela (FR)** *Evolution of legume symbionts: genetic bases and selective forces* (PL5)
12.00 – 12.30 **Thomas Ott (DE)** *The molecular mechanisms enabling intracellular rhizobial infections in legumes* (PL6)

12.30 – 14.00 Lunch

Parallel session A1 – Mirabilis Hall

14.00 – 15.40 **Biochemistry and Bioengineering**
Chairs: Phil Poole (UK), Xin-Ran Li (CN)

14.00 – 14.20 **Phil Poole (UK)** *Engineering N_2-fixation by rhizobia on cereal roots* (O1)
14.20 – 14.40 **Xin-Ran Li (CN)** *A friendly dialogue between plants and beneficial microbes-lipochitooligosaccharide perception in cereals* (O3)
14.40 – 14.50 **Thiago Humberto Peralta (MX)** *Characterization of the rubisco-like protein in rhizobial strains* (O3)
14.50 – 15.00 **Cedric Owens (US)** *Mechanism for the CowN-mediated protection of nitrogenase against carbon monoxide inhibition* (O4)
15.00 – 15.10 **Anna Schmidt (UK)** *Cryo-Electron Microscopy of nitrogenase – FeSII complex* (O5)
15.10 – 15.20 **Bergthor Traustason (UK)** *Understanding and optimizing targeted nitrogenase expression in γ-proteobacteria for sustainable cereal agriculture* (O6)
15.20 – 15.30 **Sarah Zecchin (IT)** *Bio-electrochemical Nitrogen Fixation driven by cathodic biofilms* (O7)
15.30 – 15.40 **Courtney Winning (AU)** *UmamiT amino acid transporters and their role in legume nodulation* (O8)

Parallel session A2 – Auditorium

14.00 – 15.40 **Symbiotic Signaling**
Chairs: Simona Radutoiu (DK), Eric Giraud (FR)

14.00 – 14.15 **Simona Radutoiu (DK)** *LYSM receptors have a programable capacity for ligand perception and downstream signaling enabling rational engineering* (O9)
14.15 – 14.30 **Eric Giraud (FR)** *Diverse type 3 effectors can trigger nodulation independently of NOD factors* (O10)
14.30 – 14.40 **Henriette Rübsam (DK)** *Nanobody-driven signaling reveals the core receptor complex in root nodule symbiosis* (O11)
14.40 – 14.50 **Anne Bennion (DE)** *Tracking Sinorhizobium meliloti cell proliferation dynamics during early stages of host invasion* (O12)
14.50 – 15.00 **Pengbo Liang (CN)** *An evolutionarily shared formin protein mediates different symbiotic intracellular infections by specific transcription gating in legume and non-legume plants* (O13)

15.00 – 15.10 **Jeremy D Murray (CN)** *Mildew Locus O (MLO) proteins are required for rhizobial infection in Medicago truncatula* (O14)
15.10 – 15.15 **Fang Xie (CN)** *NF signaling mediates rhizobia infection* (O15)
15.15 – 15.20 **Natasha Horta Araújo (FR)** *AeRLCK2, a receptor like cytoplasmic kinase required for Nod-independent rhizobial symbiosis in Aeschynomene evenia* (O16)
15.20 – 15.25 **Thi Thu Dang (FR)** *Chromatin regulators associated with the pioneer transcription factor NFYA1, during nodulation of Medicago truncatula* (O17)
15.25 – 15.30 **Firoz Molla (IN)** *Sugar signaling acts as a proxy for cytokinin signaling for de novo meristem formation during nodule organogenesis* (O18)
15.30 – 15.35 **Sultan Alhusayni (NL)** *A rare non-canonical splice site in Trema orientalis SYMRK does not affect its dual symbiotic functioning in endomycorrhiza* (O19)
15.35 – 15.40 **Pongpan Songwattana (TH)** *Identification of type 3 secretion system effectors impacting Rhizobium-legume symbiosis in Vigna species using the Bradyrhizobium vignae strain ORS3257* (O20)

15.40 – 16.20 Coffee Break

Parallel session B1 – Mirabilis Hall

16.20 – 18.00 **Regulatory Processes**
Chairs: Eva Kondorosi (HU), Makoto Mayashi (JP)

16.20 – 16.40 **Eva Kondorosi (HU)** *Widely conserved AHL transcription factors are essential for NCR gene expression and nodule development in Medicago* (O21)
16.40 – 17.00 **Kai Battenberg (JP)** *Chromatin remodeling in a subset of epidermal cells during root nodule symbiosis* (O22)
17.00 – 17.10 **Matthias Benoit (FR)** *Epigenetic mechanisms regulate transcription of symbiotic islands during nodule development* (O23)
17.10 – 17.20 **Beatrice Lace (DE)** *The role of RPG during infection thread formation and progression* (O24)
17.20 – 17.30 **Natalia I García-Tomsig (SP)** *Characterization of the metabolic regulon of the sibling non-coding RNAs Abcr1 and Abcr2 in Sinorhizobium meliloti* (O25)
17.30 – 17.40 **Carmen Sánchez Cañizares (UK)** *PTSNtr interacts with RelA to signal the intracellular nitrogen and carbon balance in Rhizobium leguminosarum* (O26)
17.40 – 17.50 **Jasmine Therrien (CA)** *The autoregulation of nodulation has originated from a mechanism that restricts lateral root formation* (O27)
17.50 – 18.00 **Manuel Frank (DK)** *Transcriptional regulation of autoregulation of nodulation at the single-cell level in Lotus japonicus* (O28)

Parallel session B2 – Auditorium

16.20 – 18.00 **Other Nitrogen-Fixing and mycorrhizal symbioses**
Chairs: Caroline Gutjahr (DE), Katharina Pawlowski (SE)

16.20 – 16.40 **Katharina Pawlowski (SE)** *The hidden biodiversity of Casuarina-infective Frankia* (O29)
16.40 – 17.00 **Caroline Gutjhar (DE)** *Interaction of phytohormone signaling pathways regulating root colonization by arbuscular mycorrhiza fungi* (O30)
17.00 – 17.10 **Anna Martyn (DK)** *Impact of common symbiosis signaling pathway genes onto barley root colonisation by diazotrophic bacteria* (O31)
17.10 – 17.20 **Daniela Tsikou (GR)** *Interaction between arbuscular mycorrhizal fungi and rhizobia during the tripartite symbiosis with Lotus japonicus* (O32)
17.20 – 17.30 **Solène Moulin (US)** *The endosymbiont of Epithemia clementina is specialized for Nitrogen Fixation within a photosynthetic eukaryote* (O33)
17.30 – 17.40 **Barbara Reinhold-Hurek (DE)** *Defense responses of rice roots are dynamically suppressed during the establishment of bacterial endophytes* (O34)
17.40 – 17.50 **Jose Castro (BR)** *Co-inoculation using species of Bradyrhizobium and Azospirillum brasilense – the brazilian case of success on biological Nitrogen Fixation* (O35)
17.50 – 18.00 **Rafael Venado (US)** *Biological Nitrogen Fixation on the aerial roots of maize and sorghum for sustainable agriculture* (O36)

18.00 – 19.30 Poster session 1 (From P1 to P87)

September 2, Saturday

Plenary Sessions 3 and 4 – Auditorium

9.00 – 10.30 **Symbiotic Signaling**
Chair: Jens Stougaard (DK)

9.00 – 9.30 **Stig Andersen (DK)** *Single-cell approaches for dissecting symbiotic signaling* (PL7)
9.30 – 10.00 **Myriam Charpentier (UK)** *Regulation of nuclear calcium signaling in endosymbioses* (PL8)
10.00 – 10.30 **Fernanda de Carvalho (FR)** *Rhizobia on the move: signaling and cellular responses guiding transcellular host infection* (PL9)

10.30 – 11.00 Coffee Break

11.00 – 12.30 **Nodule Function**
Chair: Peter Mergaert (FR)

11.00 – 11.30 **Florian Flugier (FR)** *Local and systemic regulation of nodulation in Medicago truncatula* (PL10)
11.30 – 12.00 **Dugald Reid (AU)** *The fun transcription factor mediates environmental control of Nitrogen Fixation* (PL11)
12.00 – 12.30 **Macarena Marín (DE)** *Control of oxygen permeation into Lotus japonicus nodules* (PL12)

12.30 – 14.00 Lunch

Parallel session C1 – Mirabilis Hall

14.00 – 15.40 **Nodule Development**
Chairs: René Geurts (NL)

14.00 – 14.20 **Giles Oldroyd (UK)** *Light sensitive short hypocotyl (LSH) genes confer symbiotic nodule identity in Medicago truncatula* (O37)
14.20 – 14.30 **Andreas Niebel (FR)** *Long non-coding RNAs may facilitate the regulatory activity of the pioneer transcription factor NFYA1 during nodule development* (O38)
14.30 – 14.40 **Michael Djordjevic (AU)** *The Medicago SymCEP7 hormone promotes nodulation from shoots without penalizing lateral root number* (O39)
14.40 – 14.50 **Wendell J Pereira (US)** *Single-cell analysis of lineages transitions during nodule development in Medicago truncatula* (O40)
14.50 – 15.00 **Baocheng Sun (CN)** *A high-resolution transcriptomic atlas depicting Nitrogen Fixation and nodule development in soybean* (O41)
15.00 – 15.10 **Judith Van Dingenen (BE)** *Strigolactones repress nodule development and senescence in pea* (O42)
15.10 – 15.20 **Momona Noda (JP)** *A novel motif of NIN determines its different DNA-binding specificity from NLPs* (O43)
15.20 – 15.30 **Anindya Kundu (UK)** *Does auxin act as a switch for NIN activation during actinorhizal nodule development?* (O44)
15.30 – 15.40 **Renè Geurts (NL)** *Parasponia nodule organogenesis cracks the door for rhizobium* (O45)

Parallel session C2 – Auditorium

14.00 – 15.40 **Diversity and Evolution**
Chairs: Pierre-Marc Delaux (FR), Rubén Garrido-Oter (DE)

14.00 – 14.20 **Ruben Garrido Oter (DE)** *Artificial evolution of artificial plant-associated bacterial communities* (O46)
14.20 – 14.40 **Jean-François Arrighi (FR)** *ORM-mediated regulation of sphingolipid biosynthesis is essential for lateral root base-nodulation in Aeschynomene evenia* (O47)
14.40 – 14.50 **Jason Terpolilli (AU)** *Evolution and diversity of Mesorhizobium legume symbionts* (O48)

14.50 – 15.00 **Arisa Nishihara (JP)** *Reconstruction of nitrogenase-oxidoreductase family tree reveals the evolutionary history of Nitrogen Fixation and its evolutionary timing* (O49)
15.00 – 15.10 **Amira Boukherissa (FR)** *Convergence and divergence of nodule specific cysteine rich peptides in diverse legume clades* (O50)
15.10 – 15.20 **Ellie Harrison (UK)** *Rhizobium leguminosarum populations in multi-host communities reveal divisions between symbiotic and free living life styles* (O51)
15.20 – 15.30 **Chrizelle Beukes (ZA)** *Fixation thread-forming Bradyrhizobia are genetically diverse* (O52)
15.30 – 15.40 **Shifeng Cheng (CN)** *Understanding Nitrogen-Fixing root nodule symbiosis in pea (Pisum sativum) population through quantitative genetics* (O53)

15.40 – 16.20 Coffee Break

Parallel session D1 – Mirabilis Hall

16.20 – 18.00 **Nodule Function**
Chairs: Xia Li (CN), Katharina Markmann (DE)

16.20 – 16.40 **Xia Li (CN)** *A Nitrogen Fixing symbiosis-specific pathway required for legume flowering* (O54)
16.40 – 17.00 **Jieshun Lin (DK)** *FUN: a zinc regulated transcription factor mediates the regulation of Nitrogen Fixation by the environment* (O55)
17.00 – 17.10 **Manuel González-Guerrero (SP)** *Nodule-specific Cu^{+}-chaperone NCC1 is required for symbiotic Nitrogen Fixation in Medicago truncatula* (O56)
17.10 – 17.20 **Suyu Jiang (CN)** *NLP2 regulation of nitrite reductase is required for vacuole integrity in N-fixing cells of Medicago truncatula under high nitrate* (O57)
17.20 – 17.30 **Defeng Shen (DE)** *The roles of apoplastic barrier in root nodule symbiosis* (O58)
17.30 – 17.40 **Lucía Domingo-Serrano (SP)** *Nitrogenase is the main target of a Rhizobium leguminosarum small heat shock protein* (O59)
17.40 – 17.50 **Thomas Underwood (UK)** *The resolution of conditional sanctioning in the pea Rhizobium leguminosarum symbiosis* (O60)
17.50 – 18.00 **To be defined** (O61)

Parallel session D2 – Auditorium

16.20 – 18.00 **Interaction of N_2 fixation and Environmental Factors**
Chairs: Jean-Michel Ané (USA), Martina Ried (DE)

16.20 – 16.40 **Martina Ried (DE)** *Inositol pyrophosphates - Potential regulators of plant root endosymbiosis* (O62)
16.40 – 17.00 **Jean-Michel Anè (US)** *Where are Nod factors coming from? Investigating the distribution and function of lipo-chitooligosaccharides in bacteria and fungi* (O63)
17.00 – 17.10 **Adname Bargaz (MA)** *Role of phosphorus in the legume rhizosphere interface and consequences on symbiotic performance and yield* (O64)
17.10 – 17.20 **Marcela Mendoza-Suárez (DK)** *Establishing efficient Biological Nitrogen Fixation as a breeding target in Vicia faba* (O65)
17.20 – 17.30 **Hayley Knights (UK)** *Genome-wide identification of colonisation determinants in Rhizobium leguminosarum using RB-TnSeq* (O66)
17.30 – 17.40 **Estibaliz Larrainzar (SP)** *Is ethylene signaling required for drought stress responses in Medicago truncatula?* (O67)
17.40 – 17.50 **Carlos Antonio Pérez Rízquez (AT)** *Role of Ferritin(s) in nodule formation and the symbiont induced stay-green effect upon drought* (O68)
17.50 – 18.00 **Katja Burow (DE)** *The targeted use of microbial consortia for an improved nitrogen supply in peat-free substrates* (O69)

18.00 – 19.30 Poster session 2 (From P88 to P173)

September 3, Sunday

Plenary Sessions 5 and 6 – Auditorium

9.00 – 10.30 **Non-legume Symbiotic Nitrogen Fixers**
Chair: Barbara Reinhold-Hurak (DE)

9.00 – 9.30 **Martin Parniske (DE)** *Genetic analysis of plant root endosymbioses in* Dryas *(Rosaceae)* (PL3)
9.30 – 10.00 **Euan James (UK)** Miscanthus *hosts a high diversity of diazotrophic Pgprs when grown in scottish soils* (PL14)
10.00 – 10.30 **Hasna Boubakri (FR)** *Ltp and Nitrogen-Fixing Symbiosis: distribution, evolution, and function* (PL15)

10.30 – 11.00 Coffee Break

11.00 – 12.00 **BNF Agronomic Impact and Legume Plants Breeding in the Mediterranean Area**
Chair: Maurizio Chiurazzi (IT)

11.00 – 11.30 **Roberto Papa (IT)** *INCREASE: a food legume's genetic resources infrastructure for the improvement of biological Nitrogen Fixation* (PL16)
11.30 – 12.00 **Anastasia Tampakaki (GR)** *Indigenous rhizobia nodulating grain legumes in greek soils and their impact in organic agricultural systems* (PL17)

12.00 – 12.30 **Pivot-Bio, Karsten Temme (USA)** *Improved agricultural productivity when deploying gene edited diazotrophs on millions of hectares of cereal cropland* (PL18)

12.30 – 14.00 Lunch

Plenary Session 7, 8 and Closing – Auditorium

14.00 – 15.30 **Free-living and symbiotic N_2 fixers from Aquatic Environments**
Chair: Rachel Foster (SE)

14.00 – 14.30 **Hugo Berthelot (FR)** *Measuring N_2 fixation in polar aquatic environments: new insights and challenges* (PL19)
14.30 – 15.00 **Laetitia Wilkins (DE)** *Using natural experiments to reconstruct symbiotic adaptation in lucinid clams and their bacterial partners* (PL20)
15.00 – 15.30 **Francisco Cornejo-Castillo (ES)** *Metabolic tradeoffs constrain the cell size ratio in a marine planktonic Nitrogen-Fixing Symbiosis* (PL21)

15.30 – 16.00 Coffee Break

16.00 – 17.00 **Systems Biology**
Chair Peter Young (UK)
16.00 – 16.30 **George di Cenzo (CA)** *The metabolic landscape of Sinorhizobium meliloti* (PL22)
16.30 – 17.00 **Katy Heath (USA)** *Systems genetics of mutualistic partner quality in legume-Rhizobium symbiosis* (PL23)

17.00 – 17.30 **Ray Dixon (UK)** *Concluding remarks and future challenges*

17.30 – 18.00 **Closing Ceremony: Farewell speeches and announcement of ENFC 2025**

Free time

19.45 – 24.00 **Banquet dinner and dance party at a surprise location…**