ORBIT$_{sience}$ Portrait Gallery

Biological Waste treatment and recycling

Professor Dr. Marco de Bertoldi
born 22.08.1941, Vicenza, Italy

Professor de Bertoldi was, in a time, when engineers dominate the waste composting technology, one of the view microbiologists, who was involved in waste composting. So he played an important role because he added the microbial fundament to the research and discussion. In addition he was involved in many projects of realisation of plants. His research makes a contribution to the success of the composting technoloy.

Education

- 1960 Scientific High School degree
- 1961 - 1964 Scuola Normale di Pisa
- 1965 Diploma Degree in Agricultural Sciences, University of Pisa
- 1972 . 1974 PhD in Somatic Genetics of Fungi, University of Birmingham, U.K
- 1980 Specialization in Soil and Environmental Microbiology

Academic career

- 1965 - 1970 scholarship holder, University of Pisa
- 1970 - 1973 Research Fellow in the National Council of Researches
- 1972 - 1974 Research Fellow in the Department of Genetics, University of Birmingham, U.K.
- 1974 - 1981 Assistant Professor in Microbiology, University of Pisa
- 1981 - 1985 Associate Professor in Soil Microbiology, University of Pisa.
- 1986 - 2010 Full Professor in Industrial Microbiology, University of Udine.
- 2008 - 2010 Honorary docent, Weimar University

Academic positions

- Full Professor in Industrial Microbiology, University of Udine
- Head, Department of Industrial Microbiology, University of Udine
- Dean of the Faculty of Food Sciences, University of Udine
- President of the Italian Council for Composting
- Vice - President of ORBIT, Bauhaus University, Weimar, Germany: the International Association of Organic Recovery and Biological Treatment.
- Delegate Member for Italy in The European Commission, Organic Waste management and treatment, Energy from Biomass by microbial processes.

Teaching activity

- Soil Microbiology
- Dairy Microbiology
- Agricultural Microbiology
- Industrial Microbiology
- Food Microbiology

- Mycology
- Microbial Biotechnology
- Environmental Microbiology
- Solid waste management and treatment
- Microbiology of composting

Scientific Activity

- Soil Microbiology
- General Microbiology and Microbial Biochemestry
- Microbial taxonomy (imperfect Fungi)
- Microbial genetics and biotechnology
- Environmental mutagenesis
- Industrial microbiology
- Waste management, recycling, composting and anaerobic digestion
- Biological treatment of organic refuses
- Energy from biomass: ethanol, methane.

Member of the following scientific Societies

- Società Italiana di Microbiologia
- Società Italiana di Genetica
- Società di Microbiologia Generale e Biotecnologie Microbiologiche
- Società Italiana di Scienza del Suolo
- Società Italiana di Microbiologia Agraria, Alimentare e Ambientale
- International Society for Soil Sciences
- Society for General Microbiology
- British Mycological Society
- Society for Applied Biology
- Society for Industrial Microbiology
- National Council for Composting, Italy
- ORBIT, Weimar, Germany

Editorial Board of the following scientific journals

- Italian Journal of Food Sciences
- Environmental Waste Management (USA)
- Waste Management & Research, Academic Press
- Annali di Microbiologia
- International Solid Waste Management (USA)
- Compost Science & Utilization (USA)
- Composting Frontiers (USA)
- Acqua e Aria
- Resources and Conservation, Elsevier, USA

Editor

- Biological Reclamation and Land Utilizaiton of Urban Waste, La Buona Stampa,

Napoli.
- Compost: Production, Quality and Use. Elsevier Appl. Sc., London, NY.
- Smaltimento dei fanghi in agricoltura, C.N.R., Roma
- Guida all'utilizzazione in agricoltura dei fanghi derivati dai trattamenti biologici delle acque di scarico urbane. C.N.R., Roma
- The Science of Composting, Two volumes. Blackie Academic & Professional, Glasgow
- Organic Recovery and Biological Treatment. Rhombos Verlag, Berlin.
- Biological Processing of Waste. ORBIT and Club Espanol de los Residuos, Madrid, Spain.Compost Science and Technology. Elsevier Science Ltd.
- Solid Waste Technology and Management. Ed. Christiansen & Barlaz.
- Production and Utilization of Suppressive Compost: Environmental, Food and Health and Benefits. In "Microbes at Work: From Waste to Resource: Springer New York.

Author of 253 scientific works, published in international journals with referee, 90 of which concerning biological waste treatment, composting and recycling, energy from biomass.

Administrative and organizing positions
- Head, Department of Industrial Microbiology, University of Udine
- Dean, Faculty of Food Sciences, University of Udine
- Member of Academic Senate, University of Udine
- President, National Council for composting
- President of ORBIT, The International Association of **O**rganic **R**ecovery and **Bi**ological **T**reatment (Associate to European Commission).
- Charter Member of U.S.A. Composting Council, Washington D.C. 1990.

President of the Organizing Committee of:
- C.E.C. Intern. Conference on "Compost: Production, Quality and Use.", Udine 1986,
- Intern. Conf. "The Science of Composting", Bologna 1995;
- Intern. Conference "Biodegradable Polymers" Wolfsburg, Germany, 2000.
- Intern. Symposium "Sustainable Management of Solid Organic Waste"
- Udine, 2002.
- Biomass and Organic waste as Sustainable Resources, ORBIT 2009 1921 Nov. 2009 Beijing.

Member of the Organizing Committee of:
- Intern. Symposium "Biological Reclamation & Land Utilization of Waste", Napoli 1983
- Intern. Conf. on "Compost Production and Use", Trento 1989
- 6th European Conf. on "Biomass for Energy, Industry and Environment". Athens 1991.
- Intern. Conf. on "Compost Recycling and Waste", Athens 1991
- Intern. Conf. on "Biological Treatment of Waste and Environment", Weimar, Ger-

many 1999.

- Intern. Conference on "Composting Microbiology" Innsbruck, Austria, 2000.
- Intern. Conference "Biological Processing of Waste" Sevilla,Spain 2001
- Intern. Symposium on "Solid Waste Management and Composting", Columbus, Ohio, USA 2002.
- International Conference: Biological Processing of Organics" ORBIT 2003, Perth, Australia 2003.
- International Symposium: Le Biotecnologie nella conservazione dei beni culturali. Trento, 8-9 June, 2006
- Int, Conf, ORBIT 2006, "Biological Waste Treatment: from Local to Global" Weimar, 13-15 September, 2006.
- "SARDINIA 2007" Eleventh Int. Waste Management and Landfill Symposium**,** Oct. 2007
- VENICE 2008: Energy from Biomass, November 12008
- ORBIT 2008, Wageningen, Oct. 2008
- ORBIT 2009, Beijing, China novembre 2009,
- ORBIT 2010, Heraclion, Grecia, Giugno 2010.

A Scientific Research

1. Taxonomy of Deuteromycetes (Imperfect Fungi) with traditional methods, with bio-chemical methods (GC and AT%) and with DNA hybridization.
2. Genetical Recombination in Deuteromycetes without sexual cycle. Discovery of Parasexual cycle in strains of *Humicola* by induction of heterokarion, vegetative diploids and haploidization by chromosome non-disjunction.
3. Chromosome mapping and determination of chromosome number (linkage) in *Aspergillus amstelodami* by haploidization analysis.
4. Construction of somatic diploids in Aspergillus nidulans (stable) with genetic markers (morphological and biochemical) to be used for evaluating the mutagenic activity of environmental genotossic molecules (pesticides, food addictives, etc.). With selective methods, the induction of gene mutation, gene conversion, mitotic crossing-over and chromosome non-disjunction was determined for many molecules.
5. Studies on pesticide effects on fungi symbiotic with plant roots (mycorrizae) in particular induced by systemic fungicides and their methabolites.
6. Evaluation and control of microbial growth (Bacteia and Eumycetes) in order to improve industrial microbial processes. Microorganisms have been analysed in three different methabolic pathways: aerobic respiration, fermentation and anaerobic respiration. Analyses of factor which influence and control microbial growth and their optimization.

B Activities In The Sector Of Industrial Microbiology : Biological Waste Treatment And Energy From Biomass

The activity of biological reclamation of waste and biomass started in the 70'. The main work was on composting and anaerobic digestion, microbiology of the process, control of the process, innovative processes with feed-back control based on temperature and oxy-

gen, study of process parameters, feedstock for composting and anaerobic digestion, composting and source separation, thermophilic microorganisms and composting. Pathogenic microorganisms and composting, odour control.

He worked with the European Commission as a Delegate member for Italy since 1975 in the Project of the D.G. XII "Waste Recylcing and Composting" ; "COST 68, Treatment and use of sewage sludge"; Energy from Biomass.

Coordinator of the Restricted Group on Composting of the European Commission, D.G. XII.

He was consultant of European Commission, D.G. XVII and he won three different THERMIE project in the field of solid waste recycling and composting, which resulted in the construction of three innovative recycling and composting plants, planned and designed by Marco de Bertoldi and built with the financial support of the E.C.. The first plant was built by Italimpianti s.p.a. in Lamezia Terme (Italy), treating 200 T/d of mixed municipal solid waste. The second plant was built in Pistoia by Ecologia s.p.a., (contract BM 236/88 IT) treating source separated municipal solid waste, 250 T/d: The third plant was built by Caviro in Faenza, treating food processing waste, yard waste and sludge (100 T/d) (contract BM 00238/92 IT).

He has operated as a consultant for many public and private corporations in the fields of waste recycling, sorting, composting and computerized control of the process.

He has prepared the Regional Project for Toxic Waste for the Regione Friuli Venezia Giulia, Italy, working in collaboration with Cal Recovery (USA):

He has planned and designed the composting plant for green waste in Rome for AMA.

He made the project and construction of a pilot plant for yard waste composting with energy recovery (heat for house heating) for the Federal Government of Switzerland (Green energy project).

He is the inventor and has the property of the patent (n. MC2000A/72) of a innovative Reactor for composting. The new concept consists to pass from discontinuous culture (batch), as all the previous plants are, to continuous culture, separating in two different reactors the thermophilic and the mesophilic phase. This new composting system gives a total control of pathogens and odours with a high quality end-product (compost). It reduces of 50-60% retention time, size of reactor, building, running and maintenance costs and energy consumption.

He is an expert in managing the process control of different microbial processes like: composting (aerobic respiration), anaerobic digestion with the production of methane (anaerobic respiration), and bioethanol production (fermentation). In particular he has worked on the control of the process, optimization of the main parameters which condition the rate of

the process; management of microbial process from discontinuous (batch) to continuous process to improve the yield of energy or of biomass. This in processes which involves microbial aerobic respiration (composting), microbial anaerobic respiration (methane production) and microbial fermentation (ethanol production).

He has worked, in collaboration with Cal Recovery from California, USA, on bioremediation in situ and ex situ, on the selection and construction of microorganisms for the degradation of hydrocarbons and other toxic organic molecules and their application in reactors to recover contaminated substrates (see and harbour sediments, polluted soils, soils under dismissed petrol services.

He is the scientific responsible and project manager of the Industrial Project financed by the Italian Ministry of Scientific Research and University (MIUR) for the planning and construction of the Composting plant Prometeo 2000 in Grumo (BA), treating 600 T/d of sludges, source separated urban waste, yard waste, agricultural waste and forestry waste to produce compost suppressive to plant pathogens.

In the field of suppressive compost he was working in the Hoio State University with Prof. Harry Hointink in three different periods and with Prof. Yona Chen, The University of Jerusalem.
As a Delegate of the Rector of the University of Udine, since 2006, working in collaboration with Chinese Academic of Sciences, he is preparing a project to produce by microbial processes bioethanol, methane and compost utilizing as starting materials Cassava and Sweet potato.

He is the inventor of the 3-BIO SYSTEMS: BIOETHANOL-METHANE-COMPOST.

Personal remarks (Werner Bidlingmaier)
I met Marco first time in the european Compost group in the mid of the seventies. It was an adventure, the first serious discussions on an equal level as an engineer with a microbiologist. All microbiologists I met before were not interested in waste; That matter was to dirty, but not for Marco. Over the years we built up a great friendship and we did a lot of scientific activities together. Especially the ORBIT conferences were an important activity we did together. I admire his straitness and clear scientific approach. Marco didn´t made any compromise when the discussion was about the quality of research results. Especially cooperation in the development of his idea of the 3-bio-system was for me a great chance to work together in an interdisciplinary project.

But next to all this aspects Marco is a great friend of mine! We had many hours of interesting, serious discussions, nice trips in Toscana and some good bottles of wine together. I don’t want miss this friendship!