

## **The Faculty of Agriculture Science in the University of Pisa: 180 Years Of Scientific Excellence**

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In the year 2020 we celebrated the 180th anniversary of the foundation of the Faculty of Agriculture of the University of Pisa, that is recognized as the oldest in the world. It was conceived by Marquis Cosimo Ridolfi who, in 1837 initiated to organize a sort of private school in his estate in Meleto, Tuscany, to discuss, compare and convey fundamental notions and knowledge on the different cultivation practices and management to be implemented in what he called “scientific agriculture”. He really had the dream of giving formality and dignity to agricultural studies, by founding an Academic Institute in Tuscany, aimed at organizing the sciences applied to agriculture at university level. In 1839, during the First Meeting of Italian Scientists he convinced the whole community to request the establishment of a Public Institute of Agriculture in Tuscany, following the example of the school founded in Meleto. On 5th October 1840, within the frame of the new study curricula at the University of Pisa, the Grand Duke Leopoldo II of Lorena established the Chair of “Agriculture and Sheep farming”, whose tenure was given to himself. He was one of the most eminent and famous agronomists in Europe, an expert in agricultural sciences and a member of the Academy of Georgofili. He claimed that theory and practice should be combined in agriculture, and thus asked for an adjoining piece of ground, where the theories learnt in class could be applied in practice. He obtained a piece of land of 34 hectares, where he and his students could transform a bucolic art into a real science by means of field experiments and studies. At that very time agriculture was becoming a true science all over Europe, also thanks to the discoveries on the importance of chemical nutrition of plants by the German scientist Justus von Liebig. On 3rd January 1843 Cosimo Ridolfi gave an influential lecture on “Agriculture and Sheep farming” in the Aula Magna of the University of Pisa. His dream had come true.

The actual School of Agriculture was established on 1st March 1844, with the official ordinance by the Education Office of the Grand Duke of Tuscany. The study curriculum included lessons in Mathematics, Physics, Botany, Geometry; Geodesy, Applied Geometry, Chemistry; Geology, Technical Physics, Rural Architecture, Agronomy. At the end of their studies, students were awarded a Diploma which historically represented the first step towards a degree in Agricultural Sciences.

Ridolfi's reputation was so high that in 1845 he was called to the Court of the Grand Duke of Tuscany, as tutor of his son. It is important to note that Ridolfi's fame at national and international level was due not only to his expertise as agronomist, and teacher, but also to his numerous innovative activities of high social value, such as the creation of the Society of the Cassa di Risparmio di Firenze. Moreover, in 1860 he was appointed Senator of the just born kingdom of Italy.

In 1845 Pietro Cuppari replaced Ridolfi as the Director of the Institute. In the meantime, Ridolfi became Ministry of Education of the government of Tuscany. Pietro Cuppari achieved European fame, travelling all over the continent and meeting scientists of his time. He was interested in soil fertility and new techniques for grapevine cultivation. In 1871, the very Faculty of Agriculture Science was established within the University of Pisa. After Cuppari's death, in 1871, Girolamo Caruso directed the Institute for 46 years, promoting researches on soil fertility and plant health, and mechanized agriculture. He was interested also in wine making, the use of selected fermentation yeasts, and the cultivation of olive trees.

Later on, the University Farm was absorbed by the city expansion, and a new estate was appointed in 1963 for teaching and research in agriculture: 1,700 hectares in the Tenuta of Tombolo, half of which is a woodland. The estate, entitled to Prof. Enrico Avanzi, agronomist and Rector of the reconstruction after World War II, was located at about 7 km from the Faculty main campus, and is the place where many researches are still carried out by Professors of the Faculty. Enrico Avanzi, the most famous disciple of Caruso and one of the prominent agronomists of his time, selected new valuable cereal varieties, including wheat, and established innovative agronomical techniques. The importance of his contribution to the development of the society is testified by the Fibonacci Prize and the Medaglia d'Oro as Benemerito. Ranieri Favilli, one of his successors, was Dean of the Faculty and long-time Rector of the University of Pisa. Following the footsteps of his Master,

he continued the studies on cereal and forage breeding, and participated in the community life, becoming President of the Opera Primaziale in Pisa. He received the Order of Merit “Cavaliere di Gran Croce” of the Italian Republic.

Many great persons and famous scientists have been Professors in the Faculty of Agriculture, including Antonio Pacinotti, who taught Mechanics applied to agriculture, and took interest in oenology, describing innovative machines for wine making. Napoleone Passerini, Senator of the kingdom of Italy, was a versatile agronomist, interested in the study of herbaceous crops and fruit trees, and wrote books and manuals on viticulture, olive growing, sericulture, meteorology and plant pathology.

In 1923, Professor Ciro Ravenna held the chair in Agricultural Chemistry, and became Dean of the Faculty in 1935. Tragically, in 1938 he was expelled from the University of Pisa as a Jew, because of the fascist racial laws. He was deported to Auschwitz, where he died as soon as he arrived. He was a modern scientist, interested in plant physiology and nutrition, and in the bioactive compounds produced by plants. We can claim that he was the pioneer of studies on the health-promoting properties of phytochemicals, that have been later continued in the Institute of Agricultural Chemistry by many of his successors, first of all Professor Gianfranco Soldatini, who performed many researches on plant food quality as affected by plant content in antioxidant phytochemicals and bioactive secondary metabolites. The fruits of his work are testified by the foundation of the Interdepartmental Research Centre Nutrafood “Nutraceuticals and Food for Health”, headed by her disciple Professor Lucia Guidi, whose main mission is represented by studies on the factors affecting the content of nutraceuticals in foods, and their health-promoting properties. The fruits of Professor Soldatini’s work are testified also by many research projects and scientific publications of his scientific heirs, many of them contributed a paper to this volume of *Agrochimica*. Studies dealing with the nutraceutical properties of plant products cut across the different disciplinary sectors, as shown by our young students and researchers: i.e. Giulia Foggi, Alina Silvi and Roxana Elena Amarie discuss of bioactive compounds in ruminant feeding; Giulia Lauria and Costanza Ceccanti report on plant photosynthesis and secondary metabolism; Ermes Lo Piccolo, Rossano Massai and Damiano Remorini analyse the horticultural techniques to increase anthocyanins in fruit skin and pulp; Ilaria Marchioni and Laura Pistelli propose ornamental flow-

ers as new functional foods; Marco Santin, Maria Calogera Sciampagna and Alessia Mannucci aim at producing ‘super-fruits’.

Another eminent scientist held the chair of Agricultural Chemistry, Orfeo Turno Rotini, who taught in a number of European Universities. Among his many scientific interests, he contributed to lay the foundations of the studies on pedology and chemical fertility of soils. His disciples continued in-depth researches on the subject, as shown by one of the papers in this volume, dealing with perspectives on soil and plant research, by Matteo Ferrarin, Michelangelo Becagli, Lorenzo Guglielminetti and Roberto Cardelli.

A renowned scientist was Professor in Agricultural Entomology from 1936 to 1938 in this Faculty, Enrica Calabresi, who became also the first woman Director of an Institute in the Faculty. She was an expert in zoology and in particular she studied insects from all over the world, describing more than 40 new taxa. Tragically, she was expelled from the University of Pisa as a Jew, because of the fascist racial laws, and in 1944, after being captured by the fascists, killed herself in prison. One of her successors as the Director of the Institute of Entomology of this Faculty, Filippo Venturi, was a scientist expert in Diptera and left many beautiful drawings of his favourite insects. The legacy of such eminent scientists is testified by two papers of this volume, dealing with the different roles of insects towards fruit and vegetable loss and waste, by Priscilla Farina, Linda Abenaim and Barbara Conti, and with the monitoring and management of tomato insect pests, by Valeria Zeni, Giovanni Benelli, Luca Incrocci, Angelo Canale, Luca Ciampi, Giuseppe Amato and Stefano Chessa.

Renato Perotti was a famous European microbiologist, who performed researches in Berlin and in Paris, at the Pasteur Institute. He was the Director of the Institute of Agricultural Microbiology from 1924 to 1949 and studied the complex biogeochemical microbial processes able to transform organic matter into plant mineral nutrients. In his vision the soil was a dynamic entity, where humus and microorganisms play a key role in plant nutrition, as opposed to the mineralist theory of Liebig. His pupil Onorato Verona followed Master’s footsteps, working at the same Pasteur Institute, where he met the great scientist Winogradsky. He studied not only soil microbiology, but also laid the groundwork for the development of industrial and food microbiology, that earned him the Marzotto Prize in 1952 and the *honoris causa* degree in Industrial Chemistry. His scientific legacy lives on the studies of his successors,

who are interested in the utilisation of beneficial bacteria for enhancing the functional value of fruits and vegetables, described in one of the papers published in the present volume by Michela Palla, Monica Agnolucci, Arianna Grassi, Luciano Avio and Alessandra Turrini.

No one can forget Professor Giovanni Scaramuzzi, who founded the Institute of Plant Pathology as soon as he arrived in Pisa and was one of the most eminent scientists studying plant viruses, together with several pathogens of economically important plants, such as citrus and grapevine. His international connections allowed the establishment of an interdisciplinary network for pioneer studies on air pollutants, which represent one of the main research subjects of the school he founded. His scientific heirs contributed two papers to this volume, one on the monitoring of plant diseases and stress, by Ivan Fiaccadori and Lorenzo Cotrozzi, and one on grapevine's viruses, by Athos Pedrelli, Alessandra Panattoni and Alberto Materazzi.

Last but not least, Professor Francesco D'Amato founded in the University of Pisa the first Institute of Genetics in a Faculty of Agriculture. He worked in many laboratories worldwide, from Sweden to UK to USA. A world-renowned scientist for his studies in cytology and plant cytogenetics, and on biological and genetic effects of X rays and mutagens, he was advisor for plant genetics in the National Committee for atomic energy, expert for plant genetics in the European Atomic Energy Community (Euratom), and academic of the Lincei. During the ceremony for his honorary degree award in the University of Tuscia, he claimed that the researches on crop plants are highly rewarding, as they contribute to great advances in agriculture, that means great economic and social advances in human community. His pupils fulfil such a commitment, as shown by their paper in this volume, dealing with studies on the genomics and breeding of the fig tree, an ancient crop with promising perspectives, by Gabriele Usai, Tommaso Giordani, Marco Castellacci, Alberto Vangelisti, Flavia Mascagni, Maria Ventimiglia, Samuel Simoni, Lucia Natali and Andrea Cavallini.

The high quality of the scientific papers presented in this volume is the proof that our young students and scientists have followed the Old Masters' footsteps. The hard challenges facing us in the years to come will be addressed bearing in mind that only scientific excellence can lead to innovation and evolution of agriculture and food production, able to protect the environment and maintain biodiversity. To this aim, knowledge-intensive methods, techniques and managements will be

devised, taking into consideration plants, animals and microorganisms of agricultural relevance, and, most importantly, the complex network of interactions that rule the functioning of agroecosystems.

I am confident that such challenges will be faced with great determination and outstanding performance by the scientists of the Department of Agriculture, Food and Environment, that was created in 2012, in the place of the Faculty, within the frame of the new university reform. Such a transformation was successfully headed by the enlightened leadership of the Director Professor Rossano Massai. The Department will certainly consolidate its worldwide reputation for top-level and innovative research under the Direction of the present Director, Professor Marcello Mele.