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Welcome!

The industry was abuzz in December with the news that Dr. Pam Marrone is retiring from her position as CEO of Marrone Bio Innovations, Inc. Marrone started the company in 2006 and has overseen a series of product launches. In our exclusive interview, which can be found on page 4, we learn that she will continue working part time for Marrone Bio, to help drive growth and advocate for biologicals.

We also bring to you an exclusive interview with Matteo Brognoli, founder of Solaris Biotech Solutions. Founded in 2002, Solaris Biotech is active in a number of sectors, including pharmaceutical, nutraceutical, cosmeceutical, chemicals and petrochemicals and others, and is a manufacturer of fermenters, bioreactors, reactors, gas analyzers and more. Brognoli tells 2BMonthly about the company's strategy in moving into bioag, and its cooperation with companies such as Novozymes and ADM. Read the interview starting on page 5.

Elsewhere in this final 2019 issue of 2BMonthly, we have news of several mergers, acquisitions and partnerships, including strategic partnerships between Genective and AgBiome, and between InnovaFeed and Italpollina; the acquisition by Mitsui of 62 percent of Belchim Crop Protection; the acquisition of Rodel Flowers by Rovensa; and a distribution agreement between UPL and *Biopreparáty*.

In events, the *European Biostimulant Industry Council* (EBIC) and New Ag International have launched a conference tailored to the European biostimulants industry. The conference will cover strategic business topics for the European biostimulants industry. The first edition of the joint EBIC-New Ag International European biostimulants conference will be held in Athens in June 2020.

And finally, the 2BMonthly team would like to wish readers a happy holiday season, and look forward to bringing you the latest news in the biological ag space in 2020.

2BMonthly Editorial Team

Trending Now

Mitsui & Co., Ltd. agrees to acquire 62% of the shares of Belchim Crop Protection NV/SA.
Read more on page 2.

InnovaFeed and Italpollina enter into a strategic partnership.
Read more on page 2.

Rovensa acquires Ecuadorian company Rodel Flowers.
Read more on page 2.

The European Division of UPL and Biopreparáty, spol. s r. o., a Czech company specializing in biological plant protection products, enter into a distribution agreement.
Read more on page 2.

Genective, a joint venture between Limagrain and KWS, dedicated to the development of transgenic traits, and AgBiome, a leader in the discovery and development of new technology from microbes, announces a strategic partnership.
Read more on page 2.

EBIC and New Ag International (a Division of Informa) launch a conference tailored to the European biostimulants industry.
Read more on page 3.

Marrone Bio Innovations, Inc. founder Dr. Pam Marrone will retire from her position as chief executive officer of the company.
Read more on page 4.

2BMonthly Feature Article-Reflections on the 4th Biostimulants World Congress
Read more on page 4.

Executives Speak: Dr. Pamela Marrone, CEO and Founder, Marrone Bio Innovations and Mr. Matteo Brognoli, Founder, Solaris Biotech Solutions
Read more on pages 6-8.

Mergers, Acquisitions and Partnerships

Mitsui & Co., Ltd. has agreed to acquire 62% of the shares of Belchim Crop Protection NV/SA (BCP), a European agrochemical company, from BCP's founder, Belchim Management NV/SA headquartered in Belgium, through Mitsui's wholly owned subsidiary Mitsui AgriScience International SA/NV (MASI). Once all relevant conditions including antitrust approval have been fulfilled, MASI will acquire 30% of the shares held by BM, making BCP its consolidated subsidiary. The remaining 32% of shares will be acquired in or after February 2021. BCP is engaged in the development and distribution of crop protection products of its other shareholders, ISK Biosciences Europe N.V. (28% shareholding in BCP) which is a wholly owned subsidiary of Ishihara Sangyo Kaisha, Ltd. and Mitsui Chemicals Agro, Inc.. BCP has built robust distribution platforms in Europe and North America. Since BCP's business activities are in alignment with the growth strategies of Mitsui's agrochemical business that are the expansion of its product portfolio and the strengthening of its distribution platforms, Mitsui made a decision to acquire the shares in the company. Mitsui has identified "Nutrition and Agriculture" as one of its key growth areas in its Medium-term Management Plan. Mitsui has built trust-based relationships with its customers and partners around the world in the business of supplying agrochemicals, fertilizers, seeds, and other agricultural supplies that contribute to improving the productivity and quality of agricultural produce. In the area of agrochemicals, Mitsui acquired a distribution company in the Netherlands in 1992. Since then Mitsui has expanded the agrochemicals business in Europe through a subsidiary, Certis Europe B.V. in which MASI has jointly invested with Nippon Soda Co., Ltd. and Kumiai Chemical Industry Co., Ltd.. In the United States, Mitsui has been developing business through Certis USA L.L.C., which manufactures and distributes biological pesticides. Mitsui has also started to build a significant presence in the Brazilian market through the investment in the agrochemical company Ouro Fino Química Ltda in February 2019. Through this investment in BCP, Mitsui will further strengthen its distribution platforms for agrochemicals.

InnovaFeed and Italpollina have entered into a strategic partnership to develop and commercialize organic fertilizers and biostimulants from insect ingredients. The partnership will combine a joint R&D program and the launch of a 100 percent natural fertilizer, jointly developed from insect frass, sustainably produced by InnovaFeed at its Nesle plant (Somme, France) and future sites. InnovaFeed repurposes co-products of local agro-industries into a high value source of feed for their insect larvae. These larvae are then harvested to produce ingredients for farming, and their dejections used to produce a high-quality organic fertilizer with a high nutrient value, stable organic matter and balance of essential primary elements (nitrogen, phosphorus and potassium). Performance has been validated across major crop groups (cereals and vegetables) through large-scale testing with major players. The product will be marketed in the second half of 2020.

Rovensa has acquired Ecuadorian company Rodel Flowers which will be integrated into Rovensa Crop Nutrition business unit (Tradecorp). Rodel has been an important partner for Tradecorp in Ecuador, as its exclusive distributor of chelates and biostimulants ranges. Rodel currently holds a leading position in the distribution of crop nutrition specialized products to the flowers market in Ecuador.

The European Division of UPL and Biopreparáty, spol. s r. o., a Czech company specializing in biological plant protection products, have entered into a distribution agreement for Polyversum WP, a biological fungicide manufactured by Biopreparáty, spol. s r. o. Under terms of the agreement, UPL will have the exclusive right to distribute the product in 18 European countries. Polyversum WP is based on the active ingredient *Pythium oligandrum* M1, which naturally suppresses phytopathogenic fungi while inducing the production of growth-stimulating substances in a plant.

Genective, a joint venture between Limagrain and KWS, dedicated to the development of transgenic traits, and AgBiome, a leader in the discovery and development of new technology from microbes, announced a strategic partnership to accelerate commercialization of coleopteran and lepidopteran resistant transgenic traits with unique modes of action. The partnership is intended to establish a new leader in insect traits, a market with over $5 billion in annual opportunities. "This is a key partnership during the exciting time at Genective, when we are expanding our investment and team in the U.S. with the vision of growing Genective into a globally impactful contributor to agriculture through biotechnology," said Qiaoni Linda Jing, President and CEO of Genective. "The complementary resources and capabilities Genective and AgBiome bring into the partnership will deliver innovations paramount to the future success of growers and the agriculture industry." "We are delighted to be deepening our relationship with Genective. This partnership marries AgBiome's industry-best trait discovery platform with Genective's access to key germplasm and breeding resources. Together we have vastly increased the value proposition around trait development for both companies. Growers are eager for new solutions and our partnership will deliver them. " said Eric Ward, Co-CEO, AgBiome.

Company News

Marrone Bio Innovations, Inc. has provided its financial results for the third quarter and first nine months ended September 30, 2019. According to the report, the company experienced mixed results combining Q3 and YTD increases in revenues and gross profit vs. 2018, while experiencing decreases in profitability due to increased operating expenses and acquisition and litigation expenses. YTD Revenues and Gross Profit increased to $22.7 million and $12.4 million respectively, improvements of 46% and 67% over 2018. The gains were more than offset by a $6.6 million increase in operating expenses in Q3 vs 2018, owing mainly to acquisition and litigation settlement expenses. Through Q3, MBI's YTD adjusted EBITDA was $(10.7) million vs. $(11.5) million in 2018.

Italpollina has launched www.biostimulant.com. The company stated it acquired the domain of biostimulant.com for the purpose of providing the industry with an innovative website with complete information about the topic. The site presents non-commercial content, invites interaction throughout the agriculture/horticulture community, and bridges users to technical, scientific and regulatory information on a global scale. Biostimulant.com will serve as an information source to a wide variety of constituents, including farmers and growers, technical and purchasing managers, journalists, students and the scientific public. The information presented is guided by a scientific committee comprised of university professors and well-published researchers who will regularly present scientific articles on topics of importance. Professor Giuseppe Colla of Tuscia University leads the scientific committee for the site and is joined by Professor Youssef Rouphael of the University of Naples and Professor Luigi Lucini of Catholic University of the Sacred Heart. There are plans to expand the scientific committee as well as invite editorial contribution from other industry-relevant authors and researchers.

Real IPM, Biobest's subsidiary in Kenya, is one of three collaborators in a project to improve rice production in Tanzania by developing microbe-based methods to manage rice blast. Funded by the UK's Development Fund for International Development (DFID), it is an Agri-Tech Catalyst project (managed by Innovate UK). With £200,000 of funding, the project sets out to combine seed-coating/priming with root dipping in specific beneficial bacteria (PGPR), complemented with foliar applications of biocontrol agents. Real IPM will be working with the UK's National Institute of Agricultural Botany (NIAB) and CropNuts Kenya – which provides crop nutrition support services to farmers across Africa. The project aims to optimize the effects of seed coating/priming and root dipping on rice endophytes and induced resistance, as well as the survival and dispersal of biocontrol agents on leaf surfaces under field conditions. A network of field studies in Tanzania and Kenya will be used to evaluate the effectiveness of the management strategy.

AgBiTech, in partnership with UFG (Federal University of Goiás), opened a state-of-the-art laboratory in the city of Goiânia, Brazil, dedicated to researching biological pest management. This investment by AgBiTech, a leading manufacturer of baculoviruses for controlling caterpillars in agriculture, is strategic for the use of baculoviruses as biological pesticides in Brazil. This new laboratory will play a major role in controlling the *Spodoptera* complex, as well as *Helicoverpa armigera* and *Chrysodeixis includens*, which are becoming more resistant to chemical products. According to Adriano Vilas Boas, director general of AgBiTech in Latin America, the laboratory will be located in the university's Technology Park, and researchers from the company and the institution aim to launch several projects together, to benefit agriculture in the Midwest and Brazil.

EBIC and New Ag International (A Division of Informa) have launched a conference tailored to the European biostimulants industry. The conference will cover the strategic business topics that are top-of-mind for the European biostimulants industry. The first edition of the joint EBIC-New Ag International European biostimulants conference will be held in Athens in June 2020. The conference is planned to be an annual event and will provide a platform for the industry to consider strategic topics that include regulatory affairs and long-term trends influencing the industry's operating environment such as climate change, consumer preferences for food production, shifting demographics, sustainability imperatives and many others.

Symborg has launched BlueN, the first sustainable biofertilizer that maximizes the efficiency of

atmospheric nitrogen. BlueN is a 100 percent biological and sustainable solution that improves the natural use of atmospheric nitrogen by 60 percent, contributing to the preservation of the environment by preventing the emission of nitrous oxide gas in its manufacturing process, soil degradation and pollution of aquifers. It is approved for use in organic farming and areas of special environmental protection. BlueN's innovation uses a new atmospheric nitrogen-fixing bacterium, *Methylobacterium symbioticum*, which allows a natural use of nitrogen of up to 60 percent, thereby reducing the current dependence on chemical fertilization.

STK bio-ag technologies has launched foliar fungicide STK REGEV in the Philippines for use on rice to prevent sheath blight and rice blast, and for bananas to protect against black sigatoka. STK REGEV is a hybrid product combining botanical plant extract with conventional chemistry and multiple modes of action. This hybrid product is being positioned as a "bridge" to help growers who have never used any biological product to experience, for the first time, the values and benefits of sustainable and conventional crop protection. STK REGEV is currently used in six countries in various regions of the world, with plans for additional expansion in the USA, Mexico and Turkey in 2020.

Marrone Bio Innovations, Inc. founder Dr. Pamela Marrone will retire from her position as chief executive officer of the company. The board of directors has begun the search process for a new CEO. Marrone will continue as CEO during the search process, and she and board chairman Bob Woods will shepherd the transition process until the new CEO is retained. Marrone will continue to serve on the company's board of directors as a non-executive member. Following her retirement, she also will serve as a consultant to Marrone Bio to advocate for the company and its mission, and to provide transition services and other support. *See page 4.*

Valagro has released MC Extra in a microgranular formulation. MC Extra is a biostimulant based on extracts from the *Ascophyllum nodosum* seaweed, which can support balanced plant growth in order to maximize the quantity and quality of crops. The new MC Extra expands the offer of innovative and sustainable solutions produced by Valagro's research. While the production of MC Extra has been carried out entirely in Norway to date, from 2020 onward it will involve the use of cutting-edge technologies located in the Atessa production plant in Italy. MC Extra will feature the same chemical characteristics as the current formulation, but with an improved physical shape, moving on from microscales to microgranules, which guarantees a more rapid solubility compared to the microscale version of the product.

Idai Nature has launched Esquive in Spain. Esquive is a biofungicide (*Trichoderma atroviride* strain I-1237) that controls wood trunk diseases in grapevine: esca, eutypiosis and black dead arm (BDA). Esquive is the only authorized phytosanitary product authorized by the Spanish MAP capable of reducing mortality of the vine because of these three diseases. Results obtained by more than 140 trials under different conditions show the effectiveness of Esquive as a palliative tool – it reduces the incidence of diseases and increases the effectiveness by more than 20 percent. In addition, Esquive reduces the mortality caused by these wood diseases by 15 percent.

Regulatory

Biocontrol

Bioinsecticide FLiPPER (fatty acids C7-C20), marketed by Bayer (UK), has been granted four new extensions of authorization for minor use (EAMU) for control of a broad range of insect pests in an assortment of outdoor and protected fruits, herbs and field vegetables ahead of the 2020 season. The product was granted EAMUs for the control of aphids, spider mites and whitefly in aubergine (eggplant), pepper and chili (permanent protection with full enclosure), and ornamentals (permanent protection with full enclosure) in 2017 and 2018 respectively. The EAMUs mean FLiPPER can be applied between 1 March and 30 September in field vegetables and 1 March and 30 August in leafy vegetables, fresh herbs, berries, currants, nuts, pome and stone fruit, and wine grapes. (11.26)

Koppert Biological Systems has registered a new biofungicide in France. Noli is a water dispersible granule preparation based on the naturally occurring *Metschnikowia fructicola* yeast, which prevents decay in fruit. Registration in other European countries and the USA are expected to follow. Noli is a spray suspension that is applied directly to leaves, blossom and fruits of the plant. It effectively controls Botrytis in grapes and soft fruits such as strawberries and blueberries, and Monilia brown rot in stone fruit, such as cherries and plums, without leaving a trace of residue. The product is intended for preventive treatment before disease symptoms appear, but can also be used in the finishing stages approaching the harvest for protection when most synthetic fungicides are not available. Noli is an antagonistic yeast that works by competing for space and nutrients with harmful fungi. It produces antifungal metabolites and attacks the plant's pathogens through mycoparasitism. (11.26)

❖2BMonthly Feature Article❖

Reflections on the 4th Biostimulants World Congress

Following the 4th Biostimulants World Congress, Chairman of the Scientific Committee, Dr. *Patrick* du Jardin, Professor at Gembloux Agro-Bio Tech, University of Liège in Belgium, gave his thoughts to Luke Hutson, Chief Editor of New Ag International.

The 4th Biostimulants World Congress was held in Barcelona, 18-21 November 2019. Organized by New Ag International, part of the Life Sciences business of Informa Connect, and in partnership with the European Biostimulants Industry Council (EBIC), this was the fourth edition of Biostimulants World Congress, which was first held in Strasbourg in 2012 and is currently run on a two-year cycle.

The congress recorded many milestones, registering its highest number of delegates – just over 1,600 from 72 countries and representing 835 companies and associations.

Renowned for its scientific and commercial focus, the congress had 53 speakers across the two tracks, plus there were speakers for a new event the Biostimulants Regulatory Forum, which ran during the congress. There

were two areas showing more than 170 posters of research.

Chairman of the Scientific Committee, Dr. Patrick du Jardin, Professor at Gembloux Agro-Bio Tech, University of Liège in Belgium, gave his thoughts to New Ag International after the event. Professor du Jardin said the first impressions of the congress were positive and that as the biostimulants industry becomes more mature we are starting to put these products into a better context.

"We are becoming aware of the regional difference in expectations that we might have for biostimulants," said du Jardin. Better value products are more important for an industrialized country, whereas in developing countries the need is for nutrients."

du Jardin and the three other members of the Scientific Committee, Dr. Huiming Zhang, Professor Jose Maria Garcia-Mina and Professor Patrick Brown, had more than 300 abstracts from which to select the conference and poster programme. The trends among the abstracts for this conference were presentations regarding phenotype response in controlled conditions and in the open field, diversification of the application of biostimulants and attention to the post-harvest biology and quality of product, as well as more targeted application at certain stages of plant growth.

When delivering his closing remarks to the congress, du Jardin set the scene by citing the economic, societal and environmental demands that will exist in the years ahead. The congress had heard from Professor Martin Van Ittersum from the Plant Production Systems Group, Wageningen University, Netherlands, that cereal demand in 2050 is projected to be 2.8 times higher than in 2015, and nutrient requirements more than three times higher. Another speaker highlighted the need to develop increased resilience in crops.

Building resilience

du Jardin picked up on the point of resilience based on a presentation from Scott Gibson, Executive Director, JAKL Inc. One of Gibson's slides presented survey data from the U.S. that showed how biostimulants and new seeds were viewed in equal measure as the key to building resilience to tackle changes in climate. du Jardin even expressed an element of surprise that biostimulants were rated at a similar level to seeds but suggested that reflected the growing importance of biostimulants.

"Biostimulants now seem to be a fourth pillar for crop production and sustainability – along with seeds, fertilizers and crop protection products – and we should use them to address issues such as climate mitigation and crop harvest losses," he said.

The survey suggests a closer relationship between biostimulant companies and plant breeders in future. Professor of Crop Physiology and Genetics, Xavier Draye from the Université Catholique de Louvain, gave an overview in root functional phenotyping. According to Draye, breeders have been handling GxE (Genotype x Environment) interactions already and are now moving towards including plant biostimulants (PB), in what are expressed as GxExPB interactions.

Another area of interest within the presentations for du Jardin was the topic of how to mitigate crop losses post-harvest. He expects to see more developments in future, while adding that it is difficult to anticipate them, particularly when considering the inter-relationship with biocontrol. "When you deal with post-harvest, you always have phytosanitary considerations and diseases, making it even more difficult to separate biostimulants from biocontrol," said du Jardin.

Meeting expectations

With this potential for overlap, it is even more necessary to characterize the performance of a biostimulant. du Jardin frames the question as: "Before looking at what biostimulants do, can you explain what you expect them to do?"

This requires having a clear technical narrative, with specific agronomic outcomes that lead to certain plant traits.

This refers to a presentation from UPL's Steven Parker, Global Development Lead-Biostimulants, where a technical narrative involves being able to navigate between different levels. In du Jardin's closing slides, he showed that these levels could be – from top to bottom – as follows: global aims (yield improvement, resource conservation); a specific agronomic outcome, such as NUE and WUE; and the underlying plant traits (such as root elongation, osmoregulation). du Jardin said it was important to be able to move up and down the three levels in order to give that clear technical narrative.

Next generation

So, what will the next generation of biostimulants look like? "We're moving towards having more precise components of biostimulants. Controlling the source material, fractionation and having in-depth characterisation of the biostimulant," said du Jardin. This will also be associated with a greater focus on the application, he continues, with a clear expectation of the trait that will be improved.

"Biostimulants of the future will be less and less a mixture of everything, such as seaweed extracts and amino acids, combined with vitamins and micro-elements. That's not the business model of tomorrow," added du Jardin, who expects a move towards simple composition-type products. "We have bioactives that can target specific plant traits, and that we know are optimized."

Time for a re-set

This leads to the big question: are we closer to understanding how biostimulants work?

"We need a re-setting of the mind," said du Jardin. He points out that there is not just one biostimulant. "We need to define the action of them, and the answer might be different for each one."

By way of example, he highlights the need to understand the link between a biostimulant being applied at low levels and an observed effect some weeks later. The idea of programming or genetic memory, known as epigenetics, is an area du Jardin feels could be a fertile ground for future research.

Although next generation biostimulants are likely to be more precisely defined, there is still the possibility of increased blurring between, say, biostimulants and biocontrol products, as well as between biostimulants and fertilizers. To illustrate the former, Dr. Francisco Romera of University Cordoba gave a presentation entitled: "Pseudomonas simiae and non-pathogenic strain of *F. oxysporum* improve the induction of iron deficiency responses in cucumber and tomato plants", showing that biocontrol and biostimulation may converge to the same signalling pathways within the cell, making it impossible to separate both responses at the cellular level.

Another presentation, to illustrate the second possible blurring, was from Professor Nikolaus von Wirén of Leibniz-Institute of Plant Genetics and Crop Plant research who presented on ammonium nutrition and signalling.

And what of the benefits from precision agriculture?

"Of course, we should first agree on what we call precision agriculture. Combining in-field sensing technology with biostimulants is key for me. This is how to optimize the product and maximize efficiency for the farmer. We know the importance of right time, right place, right rate, right source, and this will include the next generation of biostimulants. There is the need to build this narrative that we talked about earlier," said du Jardin. "If increasing the resilience of crops, and showing a biostimulant can increase drought tolerance, then it is important to have the monitoring tools."

Looking ahead to the next congress, du Jardin offered some expectations of potential topic areas: "Formulation in relation to efficacy and behaviour at contact within the plant largely remains a black box," He noted. "We don't know enough about the fate of substances or microorganisms, or what happens with co-formulations, with fertilizers for example. How cells and organisms can be primed for increased stress tolerance, keeping the memory of biostimulants treatments, is another important and more fundamental topic to be addressed. Biostimulants offer unique opportunities to probe these phenomena."

Regulatory

Biostimulants

Lavie Bio, a subsidiary of Evogene, has announced phase advancement in its product development pipeline for wheat biostimulants. Lavie Bio is advancing its leading product candidate LAV211 into development stage 2 while continuing the development of its additional product candidates LAV212 and LAV213. The spring wheat biostimulants program is running in-line with expectations, and commercialization of the leading candidate is targeted for 2022. This announcement follows a series of trials for Lavie Bio's wheat biostimulants candidates, in which LAV211, which was prioritized for advancement, exhibited consistent positive results across commercial varieties in target locations, with advanced product formulation for extended shelf life. Lavie Bio will further advance the development of LAV 212,213 as basis for future potential new products.

Executives Speak

Dr. Pam Marrone, CEO and Founder, Marrone Bio Innovations

Dr. Pam Marrone is CEO and Founder of Marrone Bio Innovations, Inc. (MBI), since 2006. Prior to that position, Dr. Marrone founded AgraQuest in 1995 and served as its CEO, Chairman and/or President until April 2006. In early December of this year, Dr. Marrone announced she would be retiring from her CEO position with MBI.

It's likely that no single person is more closely associated with the biocontrols industry than you are, Pam. Of all your many accomplishments, what's the one thing you're most proud of?

First of all, I am not actually retiring! Just retiring from the CEO job. I still have too many things to do in this industry. We have made a lot of progress but we still have a ways to go up the continuum to ecologically based IPM. I started my career with Monsanto 37 years ago, before founding three biopesticide companies (starting in 1990) so I can't pin it down to one. I am proud of the portfolio of products we have developed at MBI including the discovery of the systemic herbicide, which has been exceedingly technically challenging to develop. I don't think MBI's productivity and novelty have been matched in the time we've been up and running. Taking the company public was a major achievement and it still is despite all the challenges we've had being a small public company. Next - Getting Serenade Garden Disease Control into 2300 Wal-Mart stores in 2003 – the first organically listed product in Wal-Mart! The formation of the BPIA is a big deal! Finally, the development of an effective artificial diet for corn rootworm that allowed high throughput screening against the larvae.

Certainly, you've had many memorable moments over your distinguished career. In retrospect, what was the biggest surprise you can remember – good or bad?

The surprise is the depths to which people will go to follow their own agenda and do bad things. Notably, the horrible investigation and restatement leading to the arrest and guilty plea of our past COO and how much this cost the company in time, lost revenues and cost. Naively I gave people the benefit of the doubt and assume the best in people.

When you began your career journey back in the 80s, where did you think it would lead you? Did you

have any idea you'd become the industry leader and pundit you are today?

From an early age, I was determined to develop effective biological products that are science-based that would drive change to more sustainable crop protection. Industry leadership is only a byproduct of that unwavering pursuit.

What advice would you offer the young biocontrol/biostimulant professional looking to make their mark in a growing industry?

This is a great time to start up a company or join a startup. There are still so many problems to solve. You can't go wrong if you follow your passion. Become an expert in a topic you love. Never stop learning.

What advice for recently named executives?

Do not underestimate the importance of culture and values. Building the desired culture that endures through change and challenges is difficult. It is critical to hire people who share your passion for biologicals and in making the world a better place. Hire carefully to insure team alignment around mission, vision and values. This includes investors and board advisors. One misaligned person can swing the culture and blow up the values. Executives must be ever vigilant to keep the teams aligned and to prevent the culture from drifting.

If you had a panel of regulators in front of you, what would be your final recommendations to them regarding biocontrols and biostimulants?

Europe - you have removed so many chemicals but still have not accelerated biopesticides enough. There is a long 70-year history of biopesticide use with few, if any, human, non-target and environmental issues. Biopesticides are not synthetic chemicals and should not be regulated with the same mindset. Synergistic mixtures of compounds In a fermentation broth or plant extract should be looked at as a mixture, not as individual compounds since usually it is the mixture that is responsible for the efficacy. Taking some lessons from the successful US EPA system would help. Globally, I would reduce the number of stand-alone efficacy trials required and ask for data to show the value of the biopesticide in programs with other products. For biostimulants, I think the biostimulant coalitions in the US and Europe are handling the need to add some quality control requirements in balance with a framework that allows continued innovation, speed to market and without a large cost burden.

What major developments do you see for the biological products industry over the next ten to fifteen years?

It's a biological world. Biologicals are mainstream on the farm in integrated programs. Continued improvement in performance and transparency of their contribution to better ROI for farmers such that there will be no lingering perceptions about the value of biologicals. Synthetic biology approaches and gene editing will become commonplace to enhance microbials. We will understand a lot more about soil health, how to improve it, the role microorganisms play and how plants can more efficiently take up nutrients with microbes. Continued stream of innovative new startups. The complete marriage of precision tools with pest management.

If you had to do it all over again but were forced to choose a different career, what would you do?

No. Never. This is the one and only path for me. I wish I were younger so I could start up three more companies!

What's next for you? What are your short- and longer-term retirement plans?

I will be working ½ time for Marrone Bio continuing to help drive growth, monetize the pipeline, and advocate for biologicals. I also have a ½ time consulting agreement with Ospraie, our largest shareholder to help on their growing agbio portfolio. I also will continue to mentor and advise startups in the agbio and agtech space.

Mr. Matteo Brognoli, Founder, Solaris Biotech Solutions

Founded in 2002, Solaris Biotech might be a new name to readers in the bioag sector, but the

company is active in a number of sectors, such as pharmaceutical, nutraceutical, cosmeceutical, chemicals and petrochemicals and others, and is a manufacturer of fermenters, bioreactors, reactors, gas analyzers and more. Could you begin by giving a short history of the company, the countries where you are active, and an approximate annual turnover (either in USD or euro)?

Solaris is a dynamic company founded in 2002 from the experience of Mr. Matteo Brognoli, CEO and co-founder, and Mr. Cristiano Pecchini, Technical Director and co-founder in fermentation process set-up and optimization. Solaris Biotechnology is now considered one of the major players in the biotech market offering fully customizable Pilot and Industrial Biotech Solutions.
We're globally active with a distributor network able to cover more than 40 countries and a U.S. branch based in the San Francisco Bay.

Your website indicates that Solaris offers turnkey solutions. Some readers will be familiar with the phrase "lump sum, turn-key" (LSTK) contract. What type of buyer would normally opt for this solution?

Our concept of "turn-key" solutions doesn't properly match with LSTK meaning, which is mainly a contractual agreement in which a fixed price is agreed for the execution of a project or part of a project. Our idea of a turn-key solution is supporting the customer from the very early stage of visualizing the project up to the start-up. To better explain this concept, we can divide it into phases: Consultancy (GMP audit, project URS preparation, feasibility study, conceptual design, process simulation); Engineering and Manufacturing; and, Handover (commissioning, qualification/validation, start-up and training).

Why has the company decided that this is the time to move into bioag?

Our expertise in bioag counts nowadays many successful case stories. We consider bioag as one of the most active markets. 2019 has been a great year, which gave us the opportunity to start interesting cooperation with big establishments like Novozymes and ADM, and we're now discussing other projects for the next year with other big players.

In general, is there a particular feature that distinguishes Solaris fermenters (or equipment)?

Flexibility and high level of customization have always been our distinctive features. Our aim is to tailor perfect solutions for our customers in order to exactly meet their precise needs. Beside this, we've decided to invest in our software "Leonardo". The new 3.0 version consists of an extremely powerful and intuitive solution, conceived for parallel use, highly configurable, accessible and controllable remotely from any device. The biggest innovation here is actually the fact that the very same software is now able to control our smallest benchtop units as well as 30 m_3 vessel volumes.

Solaris Biotech is an equipment manufacturer. What does the company hope to bring to the bioag sector? For example, is there a particular gap in the market that your equipment can fill? Or is there a particular type of biocontrol product that your equipment is well suited for?

We are bringing 20 years' experience into pharma process development and equipment into this fast-growing and exciting bioag sector.

When we spoke at ABIM, you mentioned the company has a presence in Canada. I seem to recall this might be related to agriculture – what is the activity there?

Canada has been always one of our main target markets. To mention one case story, we've provided equipment to companies like PREMIER TECH, BIO-K, CDBQ, CNETE, JUBILANT, the National Dairy Research Institute (NDRI), etc. As well, we've been quite active all over Canada, mainly with pilot and industrial plants.

And finally, this was the first time for Solaris Biotech to attend ABIM – what were your impressions of the biocontrol industry and how does it compare to other sectors where Solaris is active?

We attended ABIM for the first time as an exhibitor with very positive feedback. We've had the opportunity to see how bioag is now focusing more and more on the use of biotechnologies and consequently on the biocontrol industry. Having the opportunity to deal with companies really interested in optimizing their process with our support was certainly very positive.

Scientific Findings

Common wasp species could be valuable at sustainably managing crop pests, finds a new University College London-led experimental study in Brazil. The study, published in *Proceedings of the Royal Society B*, found that social wasps are effective predators that can manage pests on two broad acre crops, maize and sugarcane. The study, conducted in collaboration with researchers at São Paulo State University and Universidade de São Paulo in Brazil, is the first controlled experiment in semi-natural conditions on the subject, as it was done on an outdoor research site. Maize was infested with a common pest, the fall army worm, while sugarcane was infested with sugarcane borer. The researchers introduced the social paper wasp, a hunting wasp common to the area. The wasps effectively reduced the pest populations, and the plants suffered less damage when wasps were present. Encouragingly, the researchers found that even when the pests had bored inside the plants without being present on the plant surface, the wasps were able to go into the plant and pull out the pests. The researchers say they hope to continue their work with larger trials in active agricultural fields, but for now they have established that wasps should be considered more seriously as pest controllers and could be an important part of an integrated pest management scheme.

Agriculture Victoria research scientists have identified a bug and a mite in the US that could help tackle one of Australia's worst agricultural weeds – silverleaf nightshade. Silverleaf nightshade is a Weed of National Significance and is a major problem for the red meat and grain industries in Southern Australia as it competes with other plants, depletes soil nutrients and is toxic to livestock. The lace bug is native to Texas and the mite is native to Argentina where they have both caused

damage to silverleaf nightshade without affecting other plants. Invasive species are the largest bioeconomic threat to Australian agriculture, with weeds alone estimated to cost nearly $5 million per year in control costs and production losses. Agriculture Victoria research scientists have undertaken pre-screening trials of the mite in Argentina and field trials of the lace bug are expected to take place in Texas in December. If they are suitable, they will be imported to the advanced quarantine facilities at the AgriBio Centre for AgriBioscience in Victoria, Australia. There, they will undergo rigorous screening against closely related native, ornamental and crop species, after which, the results will be submitted to the Australian Government for a detailed import risk analysis. Agriculture Victoria is also leading the Australian component of a new international biocontrol initiative to combat two other major agricultural weeds: serrated tussock and Chilean needle grass.

Central Mindanao University (CMU) in the Philippines has developed an organic fungicide from *Tasmannia piperita* (Hook.f.) Miers leaves. *T. piperita* is a shrub or treelet indigenous to the Philippines, Borneo, Sulawesi, Moluccas, Flores, New Guinea and Australia. It grows in exposed ridges and peaks of high-altitude mossy forests. CMU screened 10 potential indigenous plants from the island of Mindanao. Of these, it was found that the leaves of *Tasmannia piperita* (Hook.f.) Miers are effective when used as organic fungicide. When used on plants, the organic fungicide can prevent leaf spot disease of lettuce caused by *Alternaria brassicae* and the late blight disease of tomato caused by *Phytophthora infestans*. The project is funded by the Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development of the Department of Science and Technology (DOST-PCAARRD).

Personnel

On Nov. 12 during EBIC's General Assembly, *Jean-Marc Sanchez*, technical marketing director with Lallemand, was elected as vice-president of EBIC. He previously served as director-at-large. Meanwhile, Nicolas Willaume, director of regulatory affairs with CFPR Groupe Roullier, joined the EBIC board as director-at-large; and Martin Brown, European managing director with Verdesian Life Sciences Europe, was re-elected to a second term as director-at-large with EBIC. They join the following EBIC board members who continue in their current roles: Luca Bonini, (CEO, Italpollina), president of EBIC; Francisco M. Miguel Sastre (executive director, Atlántica Agrícola), treasurer of EBIC; and Massimo Toni (biostimulants consultant, Agronutrition), director-at-large. Stepping down from the board were Paul Mullins (managing director, Brandon Bioscience) and Claudia Michel (director agricultural policy affairs-Europe, Bayer CropScience), vice-president and director-at-large respectively.

Job Vacancies

Marrone Bio Innovations, a leading provider of bio-based pest management and plant health products is seeking to fill multiple open positions including: Senior Research Scientist – Chemistry
Group Leader – Bioprocess Technologies
Associate Research Scientist - Bioprocess Technology
Formulations Chemist – Principal Scientist
Research Scientist – Formulations
Bioprocess Engineer at our Michigan location
Bioprocess Technician
To learn more about these positions and apply, visit https://marronebioinnovations.com/company/careers/ for a full job description. MBI is an equal-opportunity employer.

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