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The Top 40 Under 40 Power List returns to celebrate the gifted young scientists making waves in analytical science. Here we present the rising stars of the field (in alphabetical order), as nominated by our readers and shortlisted by our independent judging panel.

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THE
POWER
LIST **2018**
the Analytical Scientist

Russ Algar

Associate Professor, Department of Chemistry, University of British Columbia, Vancouver, Canada.

Early inspiration
Analytical science is fun and diverse because it's the "jack of all trades". I get to mix chemistry with physics, engineering, and biology to work toward an objective with a clear current or future application.

Research
Luminescent (nano)materials for bioanalysis. Our research aims to develop new tools and technologies suitable for point-of-care medical diagnostics, and for elucidating complex biochemistry and cell biology.

Greatest achievement
Einstein said, "Life is like riding a bicycle. To keep your balance, you must keep moving." I tend to think of my biggest achievement in science as my next one. Hopefully, I'm still young enough for that to be true.

Objective
Continued growth. I want to look back and see that my team and I solved problems that were daunting or unimagined today, and have a research program that is broader in scope, with more partnerships with other research groups, industry, and clinicians.

Nominator comment: Russ's awards include the 2017 Canadian Society for Chemistry (CSC) Fred Beamish Award, 2017 Emerging Leader in Molecular Spectroscopy Award, 2017 Alfred P. Sloan Fellowship, 2017 CNC-IUPAC Travel Award, 2014-2019 MSFHR Scholar Award and 2012-2022 Canada Research Chair.

Robbyn K. Anand

Assistant Professor, Department of Chemistry, Iowa State University, Ames, USA.

Early inspiration
Despite a keen interest, I faced many obstacles in pursuing a career in science, including being actively discouraged from it based on my gender. This resistance only increased my determination, and now one of the most satisfying parts of my job is leading events that promote diversity in science.

Greatest achievement
My group recently developed a fully integrated process for parallel single-cell analysis in a device amenable to point-of-care use. The ability to interrogate tissues at the single-cell level has radically changed how disease is understood, and making that capability widely accessible is a major step towards personalized medicine.

Scientific heroes
My graduate advisor, Richard M. Crooks, for mentoring young scientists with sustained and focused intent. There are many attributes that make a scientist great, but what creates a legacy is active investment in others.

Advice
Embrace failure. While a student, I tried improvisational acting, and what I learned was revolutionary. Allowing yourself to take risks and to pose new ideas inevitably leads to failure. Learn from it and move on. "The master has failed more times than the beginner has even tried." – Stephen McCranie.

Nominator comment: "Robbyn has demonstrated immense creativity in the way she marries electrochemical methods such as dielectrophoresis with separation systems. Her group is focused on developing wearable devices capable of hemodialysis to assist those who suffer from kidney failure – and developing microfluidic platforms in which cancer cells can be captured and analyzed."

Andrew Ault

Assistant Professor, Department of Environmental Health Sciences, Department of Chemistry, University of Michigan, Ann Arbor, USA.

Research
My group and I develop spectroscopic and microscopic methods that enable study of the chemistry of atmospheric aerosols. We focus on individual particles (10-1,000 nm) containing thousands of compounds and with viscosities ranging from liquid to glassy.

Greatest achievement
Developing the first analytical methods to measure the acidity of atmospheric aerosols, both spectroscopically and colorimetrically, with more methods in the pipeline! These novel approaches are transforming our understanding of aerosol acidity, which drives haze and smog formation globally, but has traditionally been deemed too difficult measure.

Objective
My hope in the next decade is for improved predictions of aerosol impacts on global health and climate through greater understanding of aerosol chemistry. This will be enabled by rapid improvement in spectroscopy and mass spectrometry of aerosols, and my goal is to play a major role!

Prediction
Methods that enable spectroscopic analysis of complex samples under environmental conditions at spatial resolution not easily accessible in the past (<100 nm). For example, photothermal infrared spectroscopy is rapidly advancing and will enable vibrational spectroscopy of far smaller particles, materials, and biological systems than previously.

Nominator comment: "Andrew has quickly established himself as a leader in developing and applying spectroscopic methods to study atmospheric aerosols – critical for addressing global health and climate change."

Matthew J. Baker

Reader in Chemistry, Department of Pure and Applied Chemistry, University of Strathclyde, UK.

Research
My focus is to impact upon people's lives by understanding the composition and behavior of molecules in complex media. I aim to detect or identify disease, toxic chemicals and pathogenic bacteria via spectroscopy and translate these methods to real-world settings.

Greatest achievement
In January of this year we were able to put a FTIR spectrometer in the Western General Hospital, Edinburgh, that is fitted with the new accessories that we have developed via my spinout (www.clinspecdx.com). We were able to collect serum spectroscopic data from people attending for a CT, finally translating something invented in the lab to the clinic.

Objective
I hope to have fully regulated spectroscopic tests that are FDA/MHRA approved, used in daily practice and cover a wide range of diseases. This will not only benefit patients but also expand our field.

Prediction
The infrared spectroscopy area is very interesting at the moment with the use of new light sources and new techniques coming, such as nanoscale IR and thermal-based analysis.

Zachary S. Breitbach

Senior Scientist, Analytical Research and Development, AbbVie Inc., Chicago, Illinois, USA.

Early inspiration
I was always interested in figuring out how things work and how to make them better. Analytical science is one of the few professions that gives you the advanced tools to really understand complex problems.

Greatest achievement
The launch of AZYP, along with the development and commercialization of superficially porous particle-based chiral stationary phases. It is exciting to be in an industrial setting now, where these columns have transformed chiral separations.

Scientific heroes
I worked with my graduate advisor, Daniel Armstrong, for over 10 years and he is one of the most intelligent researchers in analytical chemistry, as well as an extremely effective teacher.

Advice
Work hard: put in the extra time and be persistent, it will pay off. Work fair: collaborate and recognize colleagues, you can't do it all alone. Have fun: enjoy what you are doing.

Nominator comment: "Breitbach is the young star of separation science. Among his numerous awards is the 2018 ACS Young Investigator Award in Separation Science."

Ken Broeckhoven

Associate Professor, Department of Chemical Engineering, Vrije Universiteit Brussel, Brussels, Belgium.

Early inspiration
I can only thank/blame my former promotor, Gert Desmet, for dragging me into the field of liquid chromatography – not a typical choice for a chemical engineer, but one I don't regret.

Greatest achievement
Building and running our very own extremely high-pressure LC system (3000 bar) that can handle the flow rate of typical (2.1mm ID) UHPLC columns, with no serious injuries or accidents in the process (besides some dents in the casing!).

Objective
As part of the Belgian ChIMiC research consortium, we hope to achieve a paradigm shift in the quality of chemical composition measurements of vapors, mixtures, cells and tissues – by developing innovative hardware and software solutions.

Advice
Investigate the unexpected! If your experiments do not give the results you had planned or hoped for, often interesting new things can be learned by figuring out why.

Nominator comment: "Ken is a talented researcher with a deep understanding of the fundamentals of chromatography. He is also a passionate teacher, and an excellent presenter at conferences."
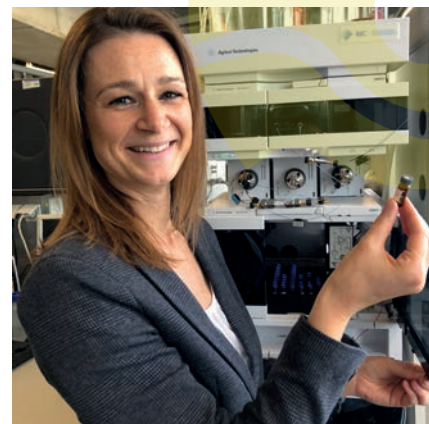
Deirdre Cabooter

Associate Professor, Department of Pharmaceutical and Pharmacological Sciences, University of Leuven (KU Leuven), Leuven, Belgium.

Research
We are looking into new ways to rationalize and automate liquid chromatographic method optimization for complex samples by developing new software and hardware tools.
Plus, together with Gert Desmet, we continue our work on trying to better understand mass transfer phenomena in liquid chromatography.

Greatest achievement
I'm grateful to have been given a permanent position at the University of Leuven, giving me the space, tranquility and freedom to explore new research ideas. I'm also very proud of my current research group, consisting of smart, enthusiastic people that work together in a very constructive way.

Scientific hero
Gert Desmet, who is my mentor, my friend and my greatest source of inspiration. He is incredibly intelligent, extremely dedicated and one of the most original analytical scientists I know.

Advice
Work hard, be persistent and don't give up too easily! Take every opportunity you can to learn, and collaborate to expand your horizons.

Francesco Cacciola

Associate Professor of Food Chemistry, Department BIOMORF, University of Messina, Italy.

Research
The application of innovative analytical techniques, in particular comprehensive two-dimensional liquid chromatography, for the characterization of bioactive molecules in food and natural products.

Greatest achievement
The successful development of comprehensive two-dimensional liquid chromatography by using reversed phase in both separation systems for the characterization of food bioactive polyphenolic compounds.

Scientific heroes
Luigi Mondello and Paola Dugo, my mentors and former promoters, who introduced me to the world of chromatography with great enthusiasm. Plus, Pavel Jandera, an extraordinary scientist and my official supervisor when I started my PhD at the University of Pardubice, who pioneered 2D-LC separations of polyphenols in wine and beer.

Objective
To keep pushing forward with the application of 2D-LC separations in the field of food and natural products analysis with the aim of sharing my enthusiasm and passion for research with young researchers.

Nominator comment: "Cacciola is an outstanding researcher in the field of comprehensive two-dimensional liquid chromatography. His findings have enabled significant evolution in the field, especially in food analysis."

Cecilia Cagliero

Assistant Professor, Department of Drug Science and Technology, University of Turin, Italy.

Early inspiration
As soon as I started work in a research laboratory, I saw that an academic career allows you to combine the most challenging elements of the human experience: the possibility of following your natural curiosity through research activity, and transmitting knowledge and passion to younger generations.

Research
Developing new technologies and strategies for the definition of the composition of volatile and nonvolatile biologically active secondary metabolites of plants and plant products of interest in the pharmaceutical, cosmetic and food fields.

Greatest achievement
I was very honored to receive the Leslie Ettre Award during the ISCC meeting in Riva in 2016; however, I think that my best achievement is with regards to the people (colleagues and students) I have worked with.

Advice
The best advice that I can give to a young scientist is to always work with passion: passion helps keep the mind "alive" and active and, even more importantly, a passionate scientist is able to infect everyone in contact with them with their enthusiasm.

Nominator comment: "Despite her young age, Cecilia is a highly creative, motivated, and rigorous scientist."

Tomas Cajka

Associate Professor, Department of Metabolomics, Institute of Physiology CAS, Prague, Czech Republic.

Research
Developing novel strategies using cutting-edge LC–MS technologies to merge untargeted and targeted metabolomics methods, expanding the coverage of spectral libraries and identification of unknowns by using in-silico fragmentation software, and applying these tools in biomedical research to ultimately improve human health.

Objective
In untargeted metabolomics, it is estimated that only 20 percent of features can be identified – a sad balance indeed. Hopefully the field will move toward a higher identification rate of metabolites thanks to open-source MS/MS libraries for more meaningful data interpretation. I would like to contribute a few pieces to this big metabolomic puzzle.

Advice
Make use of every opportunity and challenge! Easy to say, much harder to do, of course. However, solving seemingly intractable problems has always forced me to think outside the box and consequently influenced the direction of my future research.

Nominator comment: "Tomas is the most meticulous, creative and imaginative analytical chemist that I have ever met."

Anna Laura Capriotti

Associate Professor, Department of Chemistry, University La Sapienza, Roma, Italy.

Research
We develop new analytical methods and tools, based on liquid chromatography coupled to high resolution mass spectrometry, for the characterization of proteins and peptides important in life sciences and food analysis.

Greatest achievement
Receiving the EuChemS Lecture Award 2017 really boosted my visibility, which makes this job all the more enjoyable.

Scientific heroes
Aldo Laganà gave me a chance to work in his research group, and taught me to rely on dedication, self-sacrifice and collaboration to reach my goals. No one can become a great scientist without a great research group!

Advice
Never stop believing in your dreams and stay focused on your objective.

Nominator comment: "She is a brilliant young scientist full of energy, enthusiasm and curiosity."

Jennifer Chen

Associate Professor, Department of Chemistry, York University, Toronto, Ontario, Canada.

Early inspiration
I chose academia because of my passion for research, teaching and mentoring. I enjoy the freedom to tackle a problem and to come up with a solution. I find it rewarding to be able to make a difference in students' lives and see them grow into mature scientists.

Research
Developing nanostructures and methodologies for detecting biomolecules down to the single-cell level, thereby enabling rapid and economical interrogation of cellular heterogeneity and microenvironment.

Scientific heroes
I have great respect for Arnold Beckman's contribution in developing analytical technologies that advanced many fields of science, and for his entrepreneurship, involvement in policy, and philanthropy.

Advice
Stay curious, as learning is a life-long journey. Be flexible and open-minded – different career paths may be attractive at different points in one's life.

Nominator comment: "Jen has built an innovative and multifaceted research program in analytical chemistry, which comfortably resides at the interface of materials research, next-generation sensor development and biomedical diagnostics. She and her team are rapidly establishing a center of research excellence in the area of plasmonic sensors."

Lynn Dennany

Senior Lecturer, Department of Pure & Applied Chemistry, University of Strathclyde, UK.

Early inspiration
I wanted to undertake research that makes a difference, and analytical science represented the most challenging and fulfilling way for me to achieve this. That's why I chose this career path; I do the science I love, have an impact on society and share my enthusiasm with younger scientists.

Greatest achievement
My biggest achievement was showing that electrochemical sensors can be successfully utilized in complex matrices such as blood. Prior to this, they had been dismissed for real-world analysis by many. This represented a game-changer and cemented electrochemical research as part of the mix for portable analysis and real-world applications.

Prediction
Current research is focused on portable sensing for applications in personal medicine, process analysis and forensic science. The biggest challenge for all of this innovative research is translation into active use in these fields. If we can overcome this hurdle, advances in all of these industries will be achievable.

Advice
Collaborate at every opportunity. This can help you direct and shape your area of research while visiting different countries and laboratories. It also gives you a brilliant support network of scientists and friends.

Nominator comment: "Lynn has pioneered the fundamental understanding of electrochemiluminescence to facilitate the translation of electrochemical sensors into the clinical arena and showcase its potential for a variety of other applications. She has written agenda-setting papers, developed new sensor platforms and made advances toward continuous monitoring."

Livia S. Eberlin

Assistant Professor, Department of Chemistry, University of Texas at Austin, Texas, USA.

Nominator comment: "I believe Eberlin is unique among the many talented analytical chemists, specifically mass spectrometrists, under the age of 40. In her short career, she has worked on medically related topics with the aim of improving medical decisions via molecular measurements. Her work (and that of her lab) is exemplified in the development of the MasSpec Pen for intraoperative cancer diagnosis."

Flavio Antonio Franchina

Postdoc researcher, Division of Organic and Biological Analytical Chemistry, University of Liège, Belgium.

Research
As part of a challenging project involving other excellence centers (Bruxelles, Leuven, Ghent), we aim to evolve and establish innovative analytical methods, making them accessible and straightforward for environmental/life science applications.

Greatest achievement
Receiving the Phillips Award for my contribution to the field of comprehensive two-dimensional gas chromatography (GC×GC). It is a tribute to my mentors, who made it possible with their teaching and passion.

Objective
Consolidating advanced analytical methods with robust sample preparation and improving our understanding of the already information-rich data we collect with modern instrumentation.

Advice
Be solid with fundamentals first, then there is no fear in exploring new fields.

Nominator comment: "He is a very promising scientist in the field of comprehensive gas chromatography. Despite his young age, he is a great mentor and teacher for graduates and undergraduates entering the lab."

James Grinias

Assistant Professor, Department of Chemistry & Biochemistry, Rowan University, Glassboro, New Jersey, USA.

Early inspiration
As an undergraduate student, I planned on being a physician. I was lucky enough to be recruited to do research with an analytical faculty member (Heather Holmes) on a fundamental GC project, and I fell in love with the field of chromatography. I haven't looked back since!

Research
My lab has several separations-focused projects that revolve around the theme of "reduction": reducing the size and cost of instrumentation, reducing cycle time and generated waste of analytical methods, and reducing hurdles for new practitioners to learn about analytical chemistry.

Scientific heroes
There are far too many former mentors and colleagues to name just one or two. However, when I look at the authors on my book shelf, I realize how much all of us owe to many giants in the field, such as Giddings, Horváth, Kirkland, Snyder, Dolan and Neue.

Advice
Never stop trying. Research is often difficult when you are trying to make a new observation or discovery, but it makes the eventual success that much more satisfying.

Nominator comment: "Jim trained with two chromatography legends and is now independently successful, securing grants from the NIH and ACS (impressive for a new professor)."

Andrea Gargano

Tenure Track Assistant Professor, Centre for Analytical Science Amsterdam, van't Hoff Institute for Molecular Science, Amsterdam, the Netherlands.

Early inspiration
A lucky set of circumstances got me on a plane to Berkeley at the end of my Master's degree. I haven't quite figured out why Frank Svec accepted a young and quite (scientifically) illiterate Italian as an intern in his group but my experience there was great – it was there I discovered my enthusiasm for science.

Research
My research area is the separation and mass spectrometric analysis of large molecules. Currently, I am working on solutions to analyze proteoforms using LC-MS and I'm starting to look at the characterization of synthetic polymers.

Prediction
In the field of LC-MS, the hyphenation with other detection strategies to allow for more direct quantitative analysis. More generally, in analytical chemistry, maybe something coming from unexpected candidates, like pH meters.

Advice
I benefitted a lot from working in different work environments, so I would suggest everyone try such experiences (and maybe do it multiple times). There are many things that can be learned from seeing different labs, from research vision to lab safety.

Leandro Wang Hantao

Assistant Professor, Institute of Chemistry, University of Campinas, São Paulo, Brazil.

Early inspiration
I had really great advisors that motivated me. Mine has been a dynamic and challenging path that balances teaching, coaching, and research.

Research
Our focus is separation science applied to bioanalysis and the oil and gas industry.

To solve such complex problems, we rely on miniaturized techniques for sample preparation and comprehensive two-dimensional gas chromatography coupled to mass spectrometry.

Objective
My group and I hope that our students continue to persevere and find the best opportunities in life. We also intend to expand our research opportunities by diversifying our funding sources to create a solid environment for continuous growth.

Advice
Find balance in your life. Pick a research team that you enjoy working with and that pushes you to be your best self.

Nominator comment: "Leandro has been influential in developing novel, inexpensive modulators for GCxGC and encouraging the adoption of GCxGC as a technique, through a number of high-profile collaborations in Brazil."

Cheng-Chih Richard Hsu

Assistant Professor, Department of Chemistry, National Taiwan University, Taiwan.

Research
We use mass spectrometry platforms to explore the chemistry of complex biological systems. In particular, we focus on technical advances that help develop better understanding of how microorganisms interact with the human body. Plus, we implement ambient ionization mass spectrometry for clinical sciences.
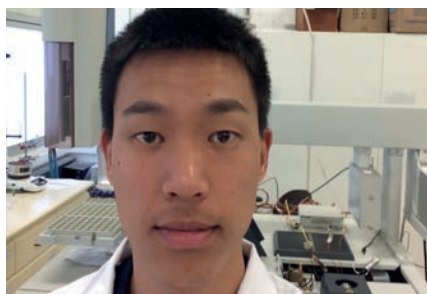
Scientific heroes
Richard Zare, my postdoctoral advisor, for his pioneering work and technical breakthroughs in analytical science – and for his never-ending passion for his research and mentorship of younger scientists.

Prediction
The most game-changing advance we could see in the next five years would be an algorithm that could rapidly and accurately determine the chemical structures of compounds based on their spectroscopic and spectrometric features.

Advice
Stay passionate when you discover nothing, and stay calm when you find something.

Anneli Kruve

Humboldt Fellow, Institute of Chemistry and Biochemistry, Freie Universität Berlin, Germany.

Early inspiration
I got started in organic synthesis but quickly joined a biomedical lab that needed students to operate a HPLC. From there, moving to LC/MS was a natural step. The ability to incorporate various skills from IT to synthesis with mass spectrometry-based research has kept me motivated to stay on this path.
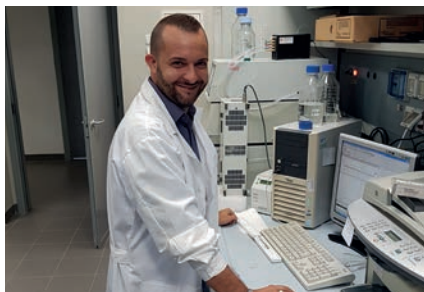
Research
My field is structural and quantitative characterization of compounds with LC/ESI/IMS/MS. A key focus of mine is developing the possibility of giving a quantitative context to non-target LC/HRMS data without the need for standard substances.

Greatest achievement
I have already seen many students moving from our lab to the workforce and receiving positive feedback from their employers – that definitely makes a former supervisor happy!

Prediction
Mass spectrometry has already changed almost everything; its impact will increase further, as we make non-target screening more efficient with effective algorithms, and make it quantitative. I also have a dream technique: I sometimes wonder what the world would look like with MS-(gas phase) NMR…

Marcello Locatelli

Assistant Professor in Analytical and Bioanalytical Chemistry, Department of Pharmacy, University "G. d'Annunzio" Chieti-Pescara, Chieti, Italy.

Research
I work on the development and validation of innovative (micro)extraction (FPSE, MEPS, MIPs) procedures and instrumental analysis both in biological matrices (for clinical and pharmaceutical applications) and in natural matrices and foods/food supplements.

Objective
I would like to be able to make a contribution in my field and to transmit this desire to future generations.

Prediction
In the next five years, the most game-changing technology or advance will be represented by increased performance, and online or automatic techniques.

Advice
Have fun and "play" with skills and knowledge. Be open to all areas of science, to develop a complete vision of both the problem and the solution.

Nominator comment: "Marcello is an excellent researcher, with many publications, a vast knowledge in his area of expertise, coupled with great networking skills and insightful ideas for future research projects."
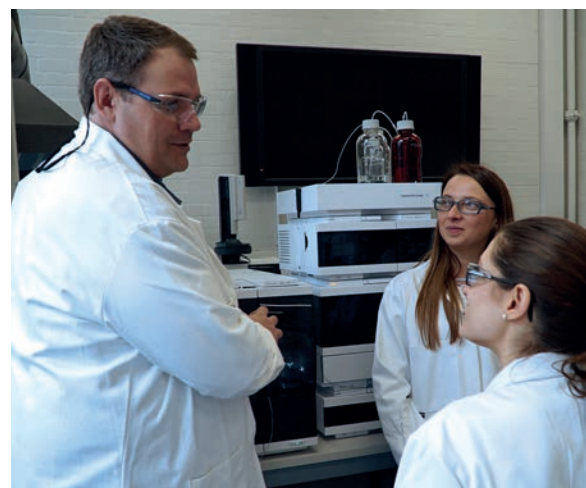
Panagiotis Manesiotis

Senior Lecturer in Analytical Chemistry, School of Chemistry and Chemical Engineering, Queen's University Belfast, UK.

Early inspiration
Growing up, I was always curious to discover the inner workings of everyday items. As a researcher, I worked beside inspirational academics who ignited my passion to convey knowledge and communicate science. An academic career in analytical chemistry means I can do what I love as my day job!

Research
I work on the development of materials and sensors to tackle some of the biggest present and future challenges, such as water quality, nutrient management and sustainable chemical and agri-food production, using my expertise on the interface of analytical, materials and supramolecular chemistry, and collaborating with microbiologists and environmental engineers.

Greatest achievement
The development of a handheld, inexpensive, disposable sensor for phosphate, made predominantly using biodegradable materials. It is able to signal the presence of the nutrient in concentrations under 1mg L-1 in soil, agri-food waste and water streams via a real-time color change and without the requirement of additional chemical reagents or power.

Jean-Francois Masson

Full Professor, Département de Chimie, Université de Montréal, Canada.

Early inspiration
After high school, I was training as a lab technician when an internship hooked me on analytical chemistry research. Plasmonics was emerging in the early 2000s; working on this topic provided an attractive opportunity to contribute to a new analytical field.

Research
I work on surface-enhanced Raman scattering (SERS) optophysiology to monitor metabolite release from cells and neurons. This stimulating project lets me learn more about cell biology, physiology and machine learning data processing. I also work on field-deployable sensors for bioprocess monitoring, energetic materials and, as a true Canadian, maple syrup analysis.

Objective
To make innovations from my lab mature into technologies that will have a long-lasting impact in analytical sciences and in the community.

Advice
Networking is key. The analytical community is very supportive of early career scientists, and senior researchers in the field will gladly help you – so don't be afraid to approach them. You will find new collaborators, generate ideas, create job opportunities and learn a lot.

Nominator comment: "Masson is a very prolific and creative scientist on all levels and a leading authority in portable instrumentation."

Matthew R. Lockett

Assistant Professor, Department of Chemistry, University of North Carolina at Chapel Hill, North Carolina, USA.

Early inspiration
I have always been interested in applying chemical principles to quantify biological systems. Academia has afforded me the chance to work with creative and driven colleagues and students, who continually inspire me to work harder and learn more, as we tackle hard questions at the interface of chemistry and biology.

Research
We are developing a paper-based 3D culture platform, to determine how components of the microenvironment affect cellular behavior (for example, hormone sensitivity or drug resistance). To best quantify the extracellular environment and intracellular responses in these 3D spaces, we are developing new sensors and methods of bioanalysis.

Scientific heroes
I have been very fortunate to interact with a number of very supportive mentors and colleagues, each pushing the field of analytical sciences in new and exciting directions. I am forever indebted to my PhD advisor, Lloyd Smith, who has always encouraged me to pursue hard problems and dream big.

Advice
Love science, even when it does not love you back.

Nominator comment: "Matthew is doing fantastic work developing new tools to analyze cellular behavior in 3D cultures with defined micro environments and gradients."

Christopher C. Mulligan

Associate Professor, Department of Chemistry, Illinois State University, Normal, USA.

Early inspiration
I have always been interested in science and aspired to a career where I could help others. It wasn't until very late in my education (and after some encouragement from those close to me) that I even considered an academic career. But I'm very glad that I did.

Research
By leveraging portable MS technologies and ambient ionization methods, my group aims to provide the first-response and forensic communities with chemical information on-demand, in a platform that is simple, reliable, and court-admissible.

Prediction
I think advances in miniaturization will eventually yield the consummate, Tricorder-like device that many analytical chemists have sought to create. When this technology joins the "Internet of Things," the data produced could revolutionize fields like medicine and public safety.

Advice
Work hard, but also work smart. Play to your strengths in research, and minimize your weaknesses through effective collaborations. Finally, protect your research and writing time like it's a valuable commodity, because it is.

Nominator comment: "Mulligan has dedicated his professional career to empowering law enforcement agencies with the appropriate analytical instruments and methods to combat crime efficiently."

Sergio C. Nanita

Principal Investigator, DuPont Industrial Biosciences, Wilmington, Delaware, USA.

Early inspiration
I chose industry because its fast-paced R&D delivers products that improve quality of life. It has been gratifying to contribute fit-for-purpose innovations in analytical sciences, while experiencing the entire product commercialization process.

Research
As a mass spectrometrist, my current research focuses on developing state-of-the-art analytical methods and providing chemical structure elucidation expertise for the discovery, development, and support of products from various businesses segments of DuPont Industrial Biosciences, from Biomaterials to Animal Nutrition.

Scientific heroes
My most influential mentor is R. Graham Cooks (Purdue University, USA).

Objective
Develop and apply effective analytical chemistry solutions to advance DuPont R&D programs and deliver renewable bio-based products that benefit society and the environment.

Nominator comment: "Sergio has established himself as a leader in the analytical sciences. He is well-known for his efforts toward demonstrating flow injection MS methods, particularly in quantitative analysis of pesticides. He truly enjoys what he does and makes time to mentor other people within Dupont and outside of the company."

Gary J. Patti

Michael and Tana Powell Associate Professor, Department of Chemistry, Department of Medicine, Washington University in St. Louis, Missouri, USA.

Early inspiration
I think obsessed is a good word. It's the feeling of getting halfway through a jigsaw puzzle and then having to stop. There's an irresistible urge to find that missing piece. That's how I've felt about science for the last 20 years.

Research
Metabolomics and all things related to cellular metabolism. The difference between a good measurement and an excellent measurement could be a missed diagnosis.

Advice
Have the courage to say no. No to collaborations that don't excite you. No to conference invitations that aren't interesting. No to prospective students that aren't a good fit for your lab.

Nominator comment: "Patti has pioneered technologies in the burgeoning field of metabolomics. In particular, he has developed analytical methods for coupling metabolomics with isotope tracing."

Juris Meija

Research Officer, Metrology, National Research Council Canada, Ottawa, Canada.

Research
I explore the reliability of analytical data with a focus on isotope-based methods of quantitation. In a sense, it is all about the attention to detail in chemical measurements.

Greatest achievement
Being elected Chairman of the IUPAC Atomic Weights Commission at age 33 and being part of the team to draft the new definition of the mole.

Prediction
We live in the era of big data, which often favors quantity over quality. This has undesirable effects on the reliability of chemical testing results. I believe that metrology will guide us away from the reproducibility crisis in analytical chemistry.

Advice
Nurture your social skills and be someone others will want to work with.

Katelynn A. Perrault

Assistant Professor of Forensic Sciences and Chemistry, Laboratory of Forensic and Bioanalytical Chemistry, Forensic Sciences Unit, Chaminade University of Honolulu, Hawaii, USA.

Early inspiration
My career as a Professor allows me to balance three things I love: teaching, research, and outreach. Teaching helps me guide others to paths that bring them fulfillment. Research leads me to exciting discoveries that can improve our world. Outreach fosters a personal connection with my community through science.

Research
I develop advanced chromatographic strategies for detecting volatile organic compounds (VOCs) that comprise odors. In forensic science, we can use odor as an investigative tool. Though odor is invisible evidence that has long been overlooked, it has the potential to bring a vast amount of information to forensic casework in the future.

Objective
I hope to become internationally recognized as an expert in my field for the quality of my work and dedication to my discipline. I aspire to advance alongside the cutting-edge developments in separation science so I can continue to advocate for new technology implementation in the forensic science community.

Advice
Learn to wear different hats. Don't be limited by defining yourself as one single type of scientist. We live in a world where multidisciplinary research, collaboration, and innovation are paramount to forward movement. Imagination does not grow when we constrain ourselves by a single perspective on something.

Nominator comment: "Kate's career thus far has been a tour de force, changing the way we understand odor evidence in forensic science. She leads dynamic programs in teaching, research, and outreach that are more effective than any I have seen before. Kate understands that quality science needs quality communication."

Kerri Pratt

Seyhan N. Ege Assistant Professor, Department of Chemistry, University of Michigan, Ann Arbor, Michigan, USA.

Early inspiration
As soon as I began analytical/physical chemistry research as an undergraduate, I was hooked. Since then, I've wanted to inspire students and use novel instrumentation to pursue complex environmental questions.

Research
My group conducts logistically and analytically challenging measurements of complex mixtures of atmospheric trace gases and aerosols in the rapidly warming Arctic, improving understanding of the interactions between ocean, atmosphere, snowpack and sea ice. Using chemical ionization mass spectrometry, we have measured several atmospheric trace gases for the first time in the Arctic.

Greatest achievement
Using chemical ionization mass spectrometry, we measured atmospheric molecular iodine in the Arctic atmosphere for the first time and showed through lab-in-the-field experiments that it is photochemically produced in the snowpack! This molecule is important for climate impacts associated with ozone (greenhouse gas) and atmospheric aerosols.

Advice
Follow your passions and don't be afraid to be different. I've pursued in-depth training in both mass spectrometry and atmospheric chemistry, and combined it with first-hand knowledge of Arctic science, putting myself in a unique position to advance our understanding of Arctic atmospheric chemistry.

Rawi Ramautar

Assistant Professor, Leiden Academic Center for Drug Research, Leiden University, Leiden, The Netherlands.

Early inspiration
Trying to understand the molecular mechanisms of diseases is intriguing, and the use of reliable separation techniques is key for this purpose. Therefore, I decided to follow a career in the development of analytical techniques in metabolomics.

Greatest achievement
Enabling a deeper understanding of biological processes in sample-limited cases will constitute a real breakthrough in metabolomics. Therefore, I am happy that the Netherlands Organization for Scientific Research has recently chosen to fund this ambition of mine with highly competitive personal research grants, allowing me to set up my own research group.

Objective
I hope that the analytical technologies and workflows designed in my group for volume-restricted biomedical questions will be adopted in a clinical setting and used by medical practitioners for the prediction and/or diagnosis of diseases.

Advice
It is important to be a good team player, as research is a multi-disciplinary effort. Moreover, try to work with colleagues who are energetic and passionate about their research, and whose company you enjoy, as they will keep you motivated. Strive for the right work–life balance – family and friends matter!

Mikhail Savitski

Team Leader and Head of Proteomics Core Facility, European Molecular Biology Laboratory (EMBL), Heidelberg, Germany.

Early inspiration
My parents have PhDs in physics and always explained any questions I had in a fun and entertaining way. That drove me to seek out a path where conversations like this are the norm, and where the questions never stop.

Research
We study protein–drug, protein–metabolite, and protein–protein interactions, as well as regulation of disordered proteins, in the context of cellular perturbations and fundamental biological processes such as the cell cycle. To achieve that, we develop and apply novel proteomics technologies for measuring proteome-wide thermal stability and solubility.

Greatest achievement
To have developed a novel proteomics technology – thermal proteome profiling – that enables unbiased assessment of protein–drug interactions inside a living cell. Furthermore, we have shown that this technology uncovers a wealth of new biology in fundamental processes, such as the eukaryotic cell cycle.

Scientific heroes
Alexander Makarov, the inventor of the Orbitrap mass spectrometer. His work has transformed the proteomics field. He is also an incredibly good person and a great inspiration for people in the field.

Nominator comment: "Mikhail has made numerous groundbreaking contributions to the field of proteomics. In particular, thermal proteome profiling has had a significant impact on drug discovery."

Emma Schymanski

Associate Professor and Head of the Environmental Cheminformatics Group, Luxembourg Centre for Systems Biomedicine (LCSB), University of Luxembourg, Belvaux, Luxembourg.

Research
"Big data for small molecules" – non-targeted (mass spectrometry), cheminformatics and data analysis to identify small molecules in complex samples and apply this to tackle key questions in environmental, metabolomics, medical and forensics research.

Greatest achievement
Helping build and shape community thinking by publishing a well-received viewpoint article (DOI: 10.1021/es5002105) that has influenced an entire field, changed the way scientists consider and report identifications, become a de facto standard and, best of all, stimulated countless constructive discussions on future improvements.

Scientific heroes
The work of Antony J. Williams (currently USEPA) has inspired me for almost 20 years and it is a great privilege to collaborate with him to make (environmental) chemistry more open to the public and enable new analytical and cheminformatics approaches.

Prediction
As data science matures, we will see a revolution in the integration of analytical data with model-based predictions. Once non-target data analysis happens at the speed of data acquisition, new worlds of opportunity will open up for big concepts such as real-time monitoring, personalized medicine or predicting ecosystem trajectories.

Danilo Sciarrone

Associate Professor in Analytical Chemistry, CHIBIOFARAM Department, University of Messina, Messina, Italy.

Early inspiration
Since my student days I have been fascinated by mass spectrometry and chromatography, in particular by the multidimensional techniques that went on to become the focus of my career.

Research
The development of multidimensional chromatographic techniques coupled to the most innovative MS analyzers (QqQ, HRToF, IRMS) and the use of hyphenated LC and GC approaches for preparative purposes (LC-MDGC-prep). The aim is to collect highly pure components for structure elucidation and biological tests.

Greatest achievement
At the 2012 International Symposium on Capillary Chromatography (ISCC), I was presented with the Leslie Ettre Award, given to a scientist aged 35 or below for the most interesting original research in capillary gas chromatography in environmental and food safety.

Scientific heroes
I owe much to my mentor Luigi Mondello and key figures in the field like Pat Sandra, who inspired me and showed me how to face the challenges of research.

Hong Heng See

Associate Professor, Department of Chemistry, Faculty of Science, University of Technology Malaysia, Johor, Malaysia.

Early inspiration
I truly care about helping and sharing knowledge with people, and this career allows me to do that.

Research
Electrified sample preparation techniques in combination with chromatographic, electrophoretic, and microfluidic separation approaches.

Greatest achievement
Hooding my doctoral students upon the completion of their doctoral degree.

Scientific heroes
It has to be Michael Breadmore, an inspiring analytical scientist who transforms great ideas into reality, and an excellent mentor who always goes above and beyond to provide guidance to the scientists he mentors.

Jacob Shelley

Alan Paul Schulz Career Development Professor of Chemistry, Department of Chemistry and Chemical Biology, Rensselaer Polytechnic Institute, Troy, New York, USA.

Early inspiration
My excellent research mentors during my undergraduate degree, Diane Stearns and Jani Ingram, gave me the freedom to fix and tinker with instrumentation.

Research
We are developing new tools and approaches for mass spectrometry to simplify analyses and/or expand the range of detectable species. This includes everything from portable/fieldable atomic mass spectrometry to ubiquitous ionization sources for elemental, small molecule, and biopolymer detection to multimodal chemical imaging.

Prediction
The development of robust, easy-to-use, and inexpensive portable mass spectrometry will have a profound impact on analytical science, and society in general.

Advice
Work hard and stay focused, but more importantly, enjoy what you do.

Nominator comment: "Shelley has become world-renowned for his work in developing, testing, and application of novel plasma-based ion sources for mass spectrometry. One such source, the solution-cathode glow discharge (SCGD) has been found to be useful for a range of samples and to produce information ranging from elemental and isotopic composition, to molecular fragmentation, to peptide sequencing."

Hiroshi Tsugawa

Researcher, RIKEN Center for Sustainable Resource Science, Yokohama, Kanagawa, Japan.

Research
Computational mass spectrometry and computational metabolomics.

Greatest achievement
The development of MS-DIAL and MS FINDER packages.

Scientific heroes
Oliver Fiehn, UC Davis.

Objective
I want to better understand the mass fragmentation of small molecules to deepen our understanding of metabolism.

Prediction
The complete prediction of mass fragmentations, at least in some metabolite classes.

Advice
If you want to work in mass spectrometry-based omics science, learn programming.

Nominator comment: "In my laboratory, Hiroshi is referred to as 'genius'. He single-handedly upended the way untargeted LC-MS and GC-MS data processing is handled by programming MS-DIAL, software that is now used across the globe. He also programmed MS-FINDER, the first software that predicts mass spectra from rules and that integrates H-rearrangement in the algorithm."

Muhammad Farooq Wahab

Research Engineering Scientist-V, Department of Chemistry & Biochemistry, University of Texas at Arlington, USA.

Early inspiration
The question of how to determine the elemental composition of materials fascinated me as a young student. I collected hundreds of classic texts, including Hillebrand's "Inorganic Analysis" and Feigl's "Spot Tests" – books that got me addicted to analytical chemistry. At home, I did spectroscopy experiments in my mother's shoeboxes, and eventually published them.

Greatest achievement
Achieved world's fastest separations in 0.5-1 cm homemade columns, and developed "peak processing" mathematics. This allows chromatographers to operate columns above their peak-capacity, reducing long separations to a few seconds with intact quantitative information even when peaks partially overlap.

Prediction
3D printing of high-efficiency columns with custom chemistry and low-cost, high-resolution MS are in the foreseeable future. Coupling this with multidimensional chromatography would facilitate biological analyses, where millions of elusive molecules are to be discovered.

Advice
Don't be afraid to make mistakes –this allows you to think outside the box, and science has an excellent self-correction mechanism.

Nominator comment: "He is a brilliant young research scientist – few have his ability to formulate experiments to better understand chromatography and separation science."

Caroline West

Associate Professor, Institut de Chimie Organique et Analytique, University of Orleans, ICOA, France.

Research
I have not yet finished exploring supercritical fluid chromatography (SFC). This is an exciting era for SFC, with many people getting involved coming from different application fields, which is raising new questions and challenges.

Scientific heroes
The innovators, those who dare to think differently. Science is not a religion – every bit of knowledge lasts only until someone finds a new truth.

Objective
To do something that matters. I hope that I can propose something that will be useful to people.

Advice
Be modest in your achievements, and learn about the work of others before pretending to novelty.

Nominator comment: "Caroline has developed many tools for the understanding of supercritical chromatography and is a member of the University Institute of France, which is a high distinction."

Michael Witting

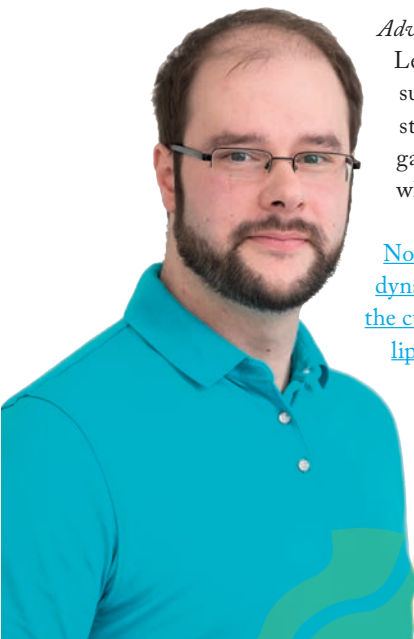Research Scientist, Research Unit Analytical BioGeoChemistry, Helmholtz Zentrum München, Neuherberg, Germany.

Research
Developing analytical methods for the analysis of metabolites and lipids from single Caenorhabditis elegans (959 somatic cells). Such methods will enable me and other scientists to study the metabolic heterogeneity of an otherwise isogenic animal to learn more about metabolism and its regulation.

Advice
Learn from both your failure and your success. All great scientists started as students and had to learn how to play the game. Do it your way and be authentic in what you are doing.

Nominator comment: "Michael is a dynamic young scientist working at the cutting edge of metabolomics and lipidomics. He is developing new methods for the analysis of the C. elegans metabolome and lipidome, as well as working on new approaches to data analysis."