We are 60!

Paola Borri, Liza Herrera Diez, Qing Hu, David L. Price, Hongping Zhao, and Lesley F. Cohen[4]

Here we are midway our 60th Anniversary year.

Since I last wrote quite a few things have happened with the journal and AIP publishing. Firstly of course AIP Publishing have signed up to the Declaration on Research Assessment (DORA), aligning well with the mantra which has always been a core principle in Applied Physics Letters (APL) – the quality and clarity of the manuscript, the contribution it makes to the field, the potential it offers for new applied physics opportunities are key for us – not the immediacy of its impact or trend following. Having said all that, I am proud that the impact factor of the journal continues to increase and that communities of applied physics researchers are discovering or returning to the journal.

On the topic of bringing new researchers to the journal, one of the most exciting developments ushered in by our new journal manager Jenny Stein, is the setting up of the 'Applied Physics Rising Star Award' – see https://aip.scitation.org/apl/info/risingstars. We are inviting lead authors who are within ten years of their PhD to flag their status as Early Career Researchers when papers are submitted. The top 20 papers will form a special 'Rising Star' collection of papers each year with a dedicated web page and the top selected paper will make journal cover page. To assess these papers we have formed an Early Career Editorial Advisory Board, populated by Natalia Ares (University of Oxford), Ke Deng (Southern University of Science and Technology), Simone Fabiano (Linköping University), Pan He (Fudan University), Laura Kim (University of California, Los Angeles), and Maki Kushimoto (Nagoya University). They together with APL editors and EAB members will make the final selection for the Rising Stars collection and award. We plan the first announcement in July 2023. I am very much looking forward to seeing this develop and working closely with our Early Career Editorial Advisory Board.

We decided to celebrate the APL 60th birthday in print by inviting our editors to reflect on their experience as editors and APL authors. Please see the first of these contributions published earlier this year. This time we have further contributions from Applied Physics Letters Deputy Editors Qing Hu and David Price and Associate Editors Paola Borri, Hongping Zhao, and Liza Herrera Diez. Please read on.

Deputy Editor, Qing Hu

To say that APL is my home journal is by no means an exaggeration. I started subscribing to APL in the late 80's while I was doing postdoc at Berkeley. I believe that I have browsed through almost every issue since then (thankfully I have been receiving the hard copies for free since 2003). This habit has helped me to stay informed in the large field of applied physics. I still remember vividly when I was offered a faculty position in the MIT EECS department, the EE Associate Department Head told me that the department was not hiring someone only working on superconducting devices (that was my entire research career by then), but an **Applied Physicist**. That departmental wish perfectly aligned with my own research plan. I did my Ph.D. research on Josephson junctions, focused on basic physics. My postdoctoral research was on quantum-limited superconducting heterodyne receivers, which naturally dealt with the applied aspect of physics and also involved heavy engineering. Going forward from there, my inclination was to choose projects with a strong physics flavor, but with potential applications. Looking back over more than three decades, that has been the pattern of my research career.

With the focus on applied physics and developing novel devices based on new physics, APL naturally became the journal of many of my key publications. Back in 2003, MIT EECS department was celebrating its centennial (after a group of physicists was kicked out of the Physics Department 100 years ago because their work was considered too applied, this group formed an EE department that instantly became the largest one in MIT). A book came out of this centennial celebration. At its end, each of the >120 faculty member was asked to list a single publication that he/she considered the most impactful. Coincidentally, our group just developed terahertz quantum cascade lasers (THz QCLs) based on resonant phonon scheme, and that APL paper[1] was my natural choice for the centennial book. After that breakthrough, rapid-fire developments followed and several of them were published in APL.[2-4]

With so many of my key papers published in APL, after the promotion to full professor, I decided to return the favor to the journal. At the time, my colleague late Prof. Millie Dresselhaus was the President of the American Institute of Physics (AIP), so I expressed to her my interest to volunteer my service to APL. Shortly after, Nghi Lam, the Editor-in-Chief (EiC) of APL at the time, invited me to join the editorial board of APL/JAP and I served the term of 2003-2006. At the end of my term, Nghi invited me to become an Associate Editor working in the trenches. I happily accepted the invitation. The journal then was transitioning to electronic version, and I may be the first remote editor hired during this transition. In 2014, Reuben Collins (Nghi's successor) convinced me to take on a larger role of Deputy Editor, which has been my role to this day. As a reader, author, editorial board member, and Associate/Deputy Editor, I wholeheartedly say happy birthday to APL on its 60th birthday. It has made a huge impact in the field of applied physics and it will continue to do so indefinitely.

PS from the EiC

Quantum Cascade lasers (QCLs) a field which Deputy Editor Qing Hu has been so instrumental developing, has remained a critically important area of technology in the intervening years. QCLs operate in the mid-IR and THz region of the spectrum and sources play an important role for areas such as biological sensing, trace gas spectrometry, and industrial process control. APL remains the journal of choice for leading papers in QCL research including those from Qing Hu himself. See for example his paper on split-well direct phonon THz QCLs [5] and examples such as thermoelectrically cooled QCLs operating at 210K [6], room temperature surface emission on large area photonic crystal QCL [7], narrow linewidth characteristics of power efficient mid-IR interband cascade lasers [8], route to carrier leakage suppression for high power QCL operation [9] , THz [10] and mid-IR frequency combs [11], theoretical treatment of double longitudinal intra-well depopulation[12], properties of rf mounted interband cascade lasers[13], high responsivity quantum cascade detectors[14], electroluminescence from Ge-SiGe quantum cascade structures [15] and last but not least external cavity QCL with graphene opto-electronic mirror [16]. These papers demonstrate that QCL research remains a vibrant area of applied physics research that is of high relevance to a number of societally important technologies. Looks like an area ripe for a new special topic collection.

Deputy Editor, David Long Price

APL's 60th Anniversary gives me the occasion to reflect on its 50th Anniversary, when I also had the privilege to be a member of APL's editorial team, and to realize what a difference 10 years makes. APL's 50 years were celebrated by an evening symposium at the Fall 2012 MRS Meeting in Boston in which distinguished representatives of seven especially topical fields were invited to give a presentation "covering the progression of their field in general with some specific examples of APL articles that had impact in modern technologies." The topics in question were:

- Luminescent Nanoscale Silicon (Leigh Canham, Birmingham, UK)

- Bandgap Engineering, Quantum Cascade Lasers and Wavefront Engineering (Federico Capasso, Harvard)
- The Light Emitting Diode (Russell Dupuis, Georgia Institute of Technology)
- Programming Nanoscale Assembly (Oleg Gang, Brookhaven)
- Glassy Metals (William Johnson, California Institute of Technology)
- Metal Spintronics (Stuart Parkin, IBM Almaden)
- Organic Electronics (Ching Tang, Rochester)

Like everything else in the world, applied physics has evolved dramatically over the last ten years, and the choice of topics for such a symposium today would look very different as well as our gender and geographic representation. To meet the considerable changes in science and the scientific publishing landscape, APL has seen many developments since 2012. The page limit has been dropped in favour of a 3000 word word-limit, the review process has been made more rigorous with acceptance now predicated on two positive recommendations, and the categories in which authors suggest to place their papers has evolved considerably, with the titles changed to emphasize current scientific directions and two new items added in January: Phononic, acoustic and thermal properties, and Metasurfaces and metamaterials.

As a result of these developments, and despite the daughter journals that have been spun off from APL (Bioengineering, Materials, Photonics, Machine Learning, and Energy), the journal impact factor continues to rise. Thanks to its vigorous community of authors and reviewers, APL can look forward to being a major player in the world of applied physics for the next ten years and beyond.

Associate Editor, Paola Borri

I have joined *Applied Physics Letters* as an Associate Editor in January 2020, and I enjoy applying my interdisciplinary research experience in this role. A solid-state physicist by training, I spent my PhD and early postdoctoral research career investigating semiconductor nanostructures (quantum well and quantum dots) in the coherent nonlinear light matter interaction regime. Realising that the instrumentation involved in those experiments had much in common with multiphoton microscopy for bioimaging, and with a passion for developing novel technologies, in 2004 I started switching my research direction toward biophotonics. The development of innovative optical microscopy technologies for bioimaging is an area gaining increasing attention within the *Applied Physics Letters* community, and I am pleased that our 2008 paper on coherent anti-Stokes Raman scattering (CARS) microscopy [17] contributed significantly to the field. When joining the CARS community, we soon realised the importance of simplifying microscope set-ups to facilitate their widespread use in the life sciences. To that end, we designed a method whereby broadband femtosecond laser sources, commonly used in e.g. two-photon fluorescence microscopy, could also provide a spectrally narrow CARS excitation, using glass blocks of known group-velocity dispersion to chirp pulses in a simple and efficient way [17]. It is exciting to see that this idea has been taken up by many labs and is applied not only to CARS but also stimulated Raman scattering (SRS) microscopy.

When looking at the list of recently published works, I find particularly interesting the paper titled “How many photons does it take to form an image?” [18], which addresses a fundamental question in imaging. The authors offer a short perspective ranging from using quantum states of light to adopting machine learning approaches. These are fascinating considerations, and their application in the context of biophotonics is highly appealing.

As an Associate Editor for *Applied Physics Letters*, I manage manuscripts across several sections in biophysics, interdisciplinary physics, semiconductor materials and photonics. I have particularly enjoyed the “brain storming” discussions in the Editor’s meeting days where we can suggest new special topics and launch new sections. It is exciting to be able to support scientific dissemination of the highest quality in such an editor role, and I was pleasantly surprised by the creative process in it. I am very much looking forward to next steps in this journey.

PS from the EiC

Paola has also been instrumental suggesting the special topic collection in Advances in Optical Microscopy for Bioimaging, open for paper submission till 30 September 2022.

Associate Editor, Hongping Zhao

Hongping Zhao has been an Associate Editor with APL since 2016. In the last few years she has suggested three exceptionally successful special topic collections associated with the emerging area of wide bandgap semiconductors.

See Ultrawide bandgap semiconductors which closed September 2020, Wide- and ultrawide-bandgap electronic semiconductor devices, which closed January 2021 and Ultraviolet and deep-ultraviolet light emitters which has just launched for submissions. Here, Hongping talks about the first of these special topics and the papers in the collection.

Ultrawide bandgap (UWBG) semiconductor materials and devices are considered as the building blocks for next generation electronic, optical, sensing and quantum device technologies. Advancements in the field evolve rapidly that require prompt dissemination of research findings. Known for rapid publication of new experimental and theoretical papers in applied physics, APL launched the Special Topic on “Ultrawide Bandgap Semiconductors” in 2020, with the support from the external guest editors including Drs. Masataka Higashiwaki, Robert Kaplar, and Julien Pernot.[19] This Special Topic attracted the submissions of about two hundred manuscripts with three representative UWBG material systems: AlGaN and related UWBG nitrides, gallium oxide (Ga_2O_3) and alloys, and diamond. More than twenty papers published on AlGaN consider the growth, crystal structure, doping, and defects of AlGaN, AlGaN/GaN based high electron mobility transistors, and AlGaN-based UV LEDs and laser diodes. Studies of UWBG nitrides other than AlGaN such as BAlN and ScAlN are also reported. Over forty papers on Ga_2O_3 are reported in this Special Topic, covering a broad spectrum of novel epitaxial growth technologies (molecular beam epitaxy, metalorganic chemical vapor deposition, and halide vapor phase epitaxy) of Ga_2O_3, defects and doping in Ga_2O_3 and AlGaO, and Ga_2O_3 based field effect transistors (FETs) and diodes. Fifteen original papers dealing with research challenges on diamond are reported, including the realization of large size diamond substrates, defects, doping and charge transport in diamond, and diamond-based FETs. The collection of articles captures the recent advancements in UWBG materials, physics, and devices, serving as a platform to stimulate more research interest and thus further advancements in the field. I would like to take this opportunity to thank all authors for their submissions to this special topic as well as all reviewers for their tremendous efforts and time.

Associate Editor, Liza Herrera Diez

I am one of the new faces in the editorial team, but I have been a reader and author of APL since the beginning of my scientific career in spintronics. It was therefore with great enthusiasm that I joined the team in 2021, to experience what it is to be on the other side of APL. It was a great pleasure to discover how close the editorial team is to the real research world. All decisions are taken by active scientists who understand what it is to be a young PhD student or PostDoc who, like me, has often spent more time than I care to admit refreshing the ‘article-status’ page of the submission website.

In terms of the scientific milestones that have been communicated to the scientific community through APL in 60 years, there is obviously plenty to talk about. I will choose to mention one paper that came out when I was busy being an 11-year-old girl, but was going to define the start of my career in spintronics many years later: '(Ga,Mn)As: A new diluted magnetic semiconductor based on GaAs' H. Ohno et al., Appl. Phys. Lett. 69, 363 (1996).[20] (Ga,Mn)As is one of the most well studied ferromagnetic semiconductors, since it provides an exceptional playground for physics enabled by the existence of hole-mediated ferromagnetism. Bringing together semiconductor properties and magnetism was, and still is, of enormous technological interest, and (Ga,Mn)As presented an exciting path towards linking charge carrier density and ferromagnetism. The observation and study of the link between carrier density and magnetism in (Ga,Mn)As gave a boost to the quest for efficient gating of magnetism in spintronics devices. Today, electrostatic and ionic gating of magnetism in nanostructured metals constitutes a fast-developing field with promising perspectives for energy efficient spintronics, for which APL has just launched a dedicated special topic. '(Ga,Mn)As: A new diluted magnetic semiconductor based on GaAs', with almost 3000 citations, is part of the 'classics' paper collection from APL. It has been, and continues to be, extremely influential to the spintronics community.

As an editor, I'm excited to have the privilege and the responsibility of handling some of the potential APL classics of the future. As an author and reader, I wish APL will continue bringing excellent science and innovation to the spotlight for many more years to come.

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