EAN congress highlights challenges — predict, prevent, repair

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After going virtual, the European Academy of Neurology 2020 Congress became the biggest neurology meeting in history. The overarching theme was 'Time for action: predict, prevent, repair' — three upcoming Reviews in *Nature Reviews Neurology*, written by speakers at the congress, highlight the importance of the theme across neurology.

The European Academy of Neurology (EAN) had planned for its May 2020 annual congress to take place in Paris, but these plans were severely disrupted by the COVID-19 pandemic. Rather than cancel the congress, the EAN board decided in March 2020 to switch to a virtual congress, despite having only 2 and a half months left to prepare. COVID-19 was severely affecting Italy, Spain and an increasing number of other European countries, and neurologists were being drawn into frontline care, so it was difficult to judge whether clinicians would be able to participate as speakers, educators and delegates. The neurology community rose to the challenge, and the result was the largest neurology meeting ever to have taken place, with > 42,500 registered delegates from 180 countries. With 2,436 submitted abstracts, the Virtual Congress included a wealth of scientific content, and delegates were highly engaged — 13,000 tuned in to watch the highlights session live. In all, 93% of the original programme for the Paris Congress was retained and pre-recorded for the Virtual Congress — a remarkable feat given the tight time frame, and thanks to the commitment of all speakers and the EAN Head Office. The congress content remains online and accessible to EAN members indefinitely.

The success of the Virtual Congress highlights a hunger for education and teaching in clinical and basic neuroscience, as well as the massive opportunity provided by use of digital technology to reach people in low-income and middle-income countries as well as people who lack time or resources to attend a face-to-face congress. Of particular note, thousands of students and residents from around the globe attended (one third of all registrants), providing a unique opportunity to educate and enthuse the next generation about neurology and neuroscience. As a whole, the congress provided a large variety of educational opportunities, including a joint session with the president and other representatives of the American Academy of Neurology to discuss the latest findings about COVID-19, including the neurological complications, the impact on those with pre-existing neurological conditions and ethical considerations.

In the opening session of the congress, president Claudio Bassetti outlined the strategic priorities of the EAN for the next 4 years[1] — science, education, membership and advocacy — and the actions taken by the EAN to foster international collaborations to promote knowledge, information and research about the COVID-19 pandemic[2]. The highlight of the session was the lecture from Yann LaCun, a world-renowned computer scientist who is considered to be a godfather of artificial intelligence and deep learning and who shared the 2019 Alan Turing prize[3]. He talked about how the organization of the visual cortex inspired his work on convolutional neural networks and went on to describe practical applications of artificial intelligence and computer vision, such as interpretation of medical images.

The overarching theme of the Virtual Congress was 'Time for action: predict, prevent, repair'. This theme was intended as a 'call to arms' in light of the growing burden of neurological diseases, which are a leading cause of mortality and morbidity worldwide but are under-resourced with respect to clinical services and research investment[4]. To reduce this burden, we must be able to predict who is at risk of disease or adverse outcomes throughout the patient journey, we need better therapies and public health strategies for the prevention of disease and adverse outcomes, and we must develop therapies to repair the nervous system after injury and to halt and, hopefully in the future, reverse degenerative diseases. The resonance of these principals has increased in recent months as we apply them to the COVID-19 crisis as we must predict those at risk, prevent the spread through 'track and trace' programmes and repair our health and social care systems and our economies. *Nature Reviews Neurology* and the EAN have again collaborated to bring you three Reviews from speakers at the Virtual Congress, highlighting advances that align with the overarching theme. These Reviews will be published over the coming weeks and will be available in an online collection.

The first of these Reviews, from Lubetzki et al.[5], (in the same issue as this Comment) highlights how elucidation

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of fundamental neurobiology is key to improving our ability to prevent degeneration and promote repair in neurological conditions. Lubetzki et al.[5] focus on the nodes of Ranvier in multiple sclerosis (MS), which enable rapid conduction along myelinated axons. The functions of these nodes in the PNS have largely been identified, but their functions in the CNS are poorly understood. The research discussed in the Review means that the nodes of Ranvier are now known to have a role in fine-tuning conduction velocities through variation in their lengths and diameters, thereby strengthening and synchronizing circuits to meet information processing needs. They are also important sites of glial–neuronal interactions, known as an 'axo-glial hub'. Our understanding of protein assembly at CNS nodes has increased substantially, as has our understanding of how these processes are affected by demyelinating diseases. Changes in gene expression and clustering of ion channels along axons might contribute to neurodegeneration, raising the possibility of treatments that target specific sodium or potassium channel subtypes to prevent the degeneration.

The second Review, from Sun et al.[6], focuses on inflammatory mechanisms. Inflammation is fundamental to primary inflammatory nervous system diseases and neurological infections, and is important in cerebrovascular, degenerative and other neurological diseases. For example, a lecture in the overarching theme plenary session of the Virtual Congress covered the importance of inflammation in atheromatous plaques[7], how it increases the risk of stroke and how treatments that target inflammatory mechanisms could prevent stroke. However, Sun et al. discuss another area in which our understanding is advancing rapidly: the autoimmune CNS autoantibody-mediated diseases, including autoimmune encephalitis and neuromyelitis optica spectrum disorders. These conditions involve production of pathogenic autoantibodies to neuro-glial surface antigens. An ever-increasing number of such antibodies act as biomarkers of disease and can inform therapy. Delayed therapy is associated with poorer outcomes, so effective therapeutic strategies can prevent unnecessary deterioration. Sun et al.[6] review our rapidly advancing knowledge of B cell immunobiology, which is critical to our understanding of the pathogenesis of these conditions and to the development of new treatment paradigms. They describe elegant experiments that indicate a breakdown of immune tolerance checkpoints, resulting in pathogenic autoantibody-producing B cells that evade these checkpoints. They also describe how long-lived plasma cells migrate to the CNS, where they produce pathogenic autoantibodies, explaining high antibody titres in the CSF. They discuss new treatment targets to investigate, including B cell migration, differentiation and survival in the CSF milieu.

In the third Review, Nabbout and Kuchenbuch[8] address predictive, preventative and precision medicine strategies in epilepsy. Though epilepsy is a common condition that affects 50 million people worldwide and a range of seizure types and syndromes are recognized, the underlying aetiology (genetic, metabolic and structural) and pathophysiology remains poorly understood. Through worldwide collaborative efforts[9], we have made some progress in our understanding of the genetic aetiology of some epilepsies, particularly the severe childhood epilepsies for which monogenic causes have been found. This progress has resulted in targeted treatment, such as avoiding sodium channel blockers in *SCN1A*-associated Dravet syndrome, using sodium channel blockers in epilepsy associated with *SCN2A* gain-of-function mutations and avoiding them in epilepsy associated with loss-of-function mutations. The challenge is to turn these discoveries into new therapeutic options for these rare and catastrophic epilepsies, and to identify the genetic variants associated with the common epilepsies[10], including the development of polygenic and multimodal risk scores.

In switching to a virtual congress, the EAN has demonstrated itself to be a vibrant and adaptable organization and has delivered the largest neurology congress to date. We will now rise to the challenge of delivering hybrid physical and virtual meetings in future. Only by working together and addressing such challenges can we raise the profile of neurological diseases and tackle the grand challenges across neurological disciplines, illustrated in the Reviews — to predict, prevent and repair.

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Competing interests
The authors declare no competing interests.