

Minds, Mapped: A Season of the Brain

Charting the New Frontiers of Neurology and Neuropsychiatry

“Every man can, if he so desires, become the sculptor of his own brain.”

— Santiago Ramón y Cajal, *Father of Modern Neuroscience*

We did not set out to publish a 'Brain' issue. There was no call for papers on Neurology, no theme announced to authors, no quiet nudge from the editorial desk in that direction. And yet, when we sat down a few weeks ago to take stock of what had arrived for this issue, nine of the ten manuscripts on our desk turned out, in one way or another, to be about the brain. A cerebellum bruised by an insecticide. A prefrontal cortex studied for the scars left by a common industrial chemical. A narrative review tracing the invisible thread between gut and mind. A fable, of all things, used to explain to frightened families why a seizure need not be a lie. A quiet reconsideration of what we mean when we say a family's emotions can heal or harm.

It felt less like coincidence and more like a signal, and perhaps it should not have surprised us as much as it did. This journal entered Volume 11 having already declared its direction. The Golden Heart that carried us through four issues of cardiovascular and metabolic medicine in 2025 gave way, on the cover of our January-March 2026 issue, to the Golden Brain, *Aurum Cerebri*, a translucent anatomical form with its cranial vault opened to reveal the cerebral cortex, the limbic circuit, the thalamus, and the cerebellum rendered in luminous gold against black. That transition was announced as an intention, an expansion of this journal's gaze from the organ that sustains survival to the organ that defines the person surviving. What arrived on our desk this quarter was not, then, an accident colliding with that intention. It was the intention beginning to fulfil itself, submissions finding their way to a journal that had already told the world, quite deliberately, where its attention now lay.

Something in the wider scientific conversation, and perhaps in the clinical instincts of the researchers who write for this journal, has turned unmistakably toward the brain. This issue's Recent Medical Advances section, curated separately from these submitted papers, tells the same story: twenty summaries this quarter, and every one of them touches neurology, neuropsychiatry, or brain health in some form. An issue that was never conceived as themed has become one anyway, gathered under a cover that had already named its subject before a single manuscript arrived. We hope you will forgive the immodesty of calling it a 'season', but between the gold on our cover and the nine papers in these pages, it plainly is one.

As we read through these manuscripts one after another, we found ourselves struck by how differently each author had chosen to approach the same underlying organ. One team reached for molecular pathways and oxidative stress markers. Another reached for a 16-segment cardiac-style model borrowed and adapted for the cerebellum. A third reached, almost disarmingly, for a folk story about a bear in a forest. That range is, we think, exactly what a healthy field looks like at a given moment: not a single dominant method sweeping all before it, but many honest attempts converging on the same target from different directions, each willing to be tested against the others. Editing this issue felt less like assembling a themed collection and more like watching a shared conversation take shape without anyone having planned it.

Brain Neuroplasticity

It is worth beginning with the idea that made much of what follows possible: that the adult brain is not a finished structure but a living, rearranging one. For most of the twentieth century, neurology operated on the quiet assumption that the brain you had at twenty-five was, more or less, the brain you would keep. Neurons died; they did not regenerate. Circuits were laid down in childhood and adolescence and then largely fixed. That assumption has not merely been revised. It has been overturned.

We now understand plasticity as a feature of the brain across the entire lifespan, not a privilege of early development. It shows itself in unexpected corners of ordinary life. One of the summaries in this issue's Recent Medical Advances section looks at new fathers, tracking measurable changes in brain structure across the first six months of fatherhood, changes that plausibly underlie the shift in attention, vigilance, and emotional responsiveness that new parents describe. Another looks at bilingualism, and the possibility that the lifelong cognitive exercise of operating in two languages builds a kind of structural reserve against Alzheimer's disease in men. Neither of these findings would have been considered plausible research questions a generation ago, because neither would have assumed the brain capable of that kind of change in response to ordinary life experience.

Plasticity is not always benign, of course, and one of the more sobering entries in this issue's advances section makes that point clearly: a study linking night shift work to measurable shrinkage in key brain regions. The same property that allows the brain to grow new connections in response to love, language, or fatherhood also allows it to be worn down by circadian disruption, occupational stress, and chronic sleep debt. Plasticity, in other words, is not a one-way street toward improvement. It is simply the brain's capacity to change, and whether that change helps or harms depends heavily on what we ask of it and how we protect it.

This dual nature of plasticity runs through several of the full research papers in this issue as well. The *Tetrapleura tetraptera* study, testing a West African plant extract against aluminium-chloride-induced cognitive decline in a rat model of Alzheimer's disease, is fundamentally a plasticity story, an attempt to determine whether a natural compound can support the prefrontal cortex's capacity to resist and recover from neurodegenerative injury. So too is the gut-brain axis review in this issue, which surveys the growing evidence that the microbial populations in our intestines can influence neuroinflammation and, through it, the brain's own resilience. Once you begin looking for plasticity, it turns up almost everywhere in contemporary neuroscience, quietly underwriting both the damage we now understand and the recovery we now believe is possible.

There is also a quieter, more clinical dimension to plasticity that deserves mention: rehabilitation medicine has, in many ways, been built almost entirely on the premise that damaged neural circuits can be coaxed into reorganising around an injury rather than simply accepting the deficit it leaves behind. Constraint-induced movement therapy after stroke, intensive early intervention in paediatric brain injury, and the graded exposure protocols used in post-traumatic stress work all rest on the same underlying wager, that repeated, structured demand on a circuit can change its function over time. What has shifted in recent years is not the wager itself but our confidence in it. Where plasticity-based rehabilitation was once offered somewhat apologetically, as a supportive measure alongside the "real" pharmacological treatment, it is increasingly understood as a primary intervention in its own right, with a measurable biological mechanism behind it rather than a vague appeal to hope and effort.

Brain Research Breakthroughs: From Lab Discoveries to Real-World Patient Impact

If plasticity supplies the underlying premise, the last few years have supplied an extraordinary volume of discovery built on top of it, and the pathway from laboratory bench to patient bedside has never moved faster. Consider biomarkers first, because biomarkers are what allow a disease to be caught before it introduces itself through symptoms. This issue's advances section includes a study on blood mitochondrial DNA changes associated with midlife cognitive decline, work that points toward a blood test capable of flagging risk decades before memory loss becomes clinically obvious. Alongside it sits a paper on a blood test ratio that improves detection of Alzheimer's amyloid pathology, part of a broader movement away from expensive PET imaging and invasive lumbar punctures and toward diagnostics a general practitioner could plausibly order during a routine visit.

Imaging itself continues to mature in parallel. One of this issue's summaries describes brain scans that reveal how depression appears to trap the mind in rigid, difficult-to-escape mental states, a finding that reframes depression not simply as low mood but as a kind of computational stuckness in the brain's own dynamics. This sits comfortably alongside our own submitted narrative review on psychogenic non-epileptic seizures, which surveys what anthropometric, microscopic, and neuroimaging markers can and cannot tell us about a condition long dismissed as purely psychological. The honest message of that review, that structural and functional imaging increasingly reveal genuine, measurable correlates of a condition still too often treated as imaginary, is precisely the kind of finding that changes how a clinician speaks to a frightened patient in clinic.

Gene and cell therapy remain the frontier furthest from routine practice, but the direction of travel is unmistakable. Basic science continues to refine our understanding of exactly which circuits govern attention and arousal. This issue's advances section highlights work identifying an ancient brainstem circuit, our built-in attention switch, that helps explain why focus can be so fragile and so trainable at once. Elsewhere, a study on infection and dementia risk from Finnish national registry data adds weight to the growing suspicion that some proportion of what we call neurodegeneration may have an immune or infectious component rather than a purely proteinopathic one, a suspicion echoed in another summary proposing that Alzheimer's disease may begin in the body's immune system rather than in the brain itself. These are not small revisions. They are the kind of findings that, if they hold up, will eventually reshape prevention strategy as much as treatment.

Gene and cell therapy, more specifically, is edging closer to neurology's oldest ambition: not merely slowing a degenerative process but reversing or replacing what has already been lost. Viral vector delivery systems are steadily improving their ability to cross the blood-brain barrier with useful genetic cargo rather than being trapped at its edge. Stem-cell-derived approaches to Parkinson's disease, still experimental, are inching toward the kind of controlled trials that could eventually make cell replacement a genuine clinical option rather than a laboratory curiosity. None of this is close to routine practice yet, and we would caution any clinician reading this editorial against overpromising these therapies to a hopeful patient. But the trajectory is real, and it is worth watching closely over the coming decade rather than dismissing as perpetually five years away, a phrase gene therapy researchers have heard, not unfairly, for far too long.

Clinical research, meanwhile, is delivering results that matter immediately rather than eventually. A trial of Factor XIa inhibition for secondary stroke prevention represents a genuinely new pharmacological approach to one of neurology's oldest and most stubborn problems, the prevention of a second stroke in a patient who has already survived a first. And in psychiatry, a trial of high-dose psilocybin for treatment-resistant depression missed its primary endpoint but still eased symptoms meaningfully, a result that is

scientifically more interesting than a clean win would have been, because it forces a more careful conversation about who psilocybin actually helps and why. A companion case report in this same issue, describing temporary cognitive gains in a patient with advanced Alzheimer's disease after high-dose psilocybin, adds a provocative, still-anecdotal thread to that same conversation. None of this is settled science. All of it is real movement.

It is worth pausing here to note how differently these two trials illustrate what a null or partial result can still teach us. A stroke-prevention trial that clearly beats its comparator gives clinicians a straightforward new tool to reach for. A depression trial that misses its primary endpoint while still easing symptoms in a meaningful subset of patients gives something arguably more valuable to a field as heterogeneous as psychiatry: a reason to ask which patients responded, and why, rather than treating the entire trial population as a single undifferentiated group. Some of the most useful clinical science of the next decade will likely come not from bigger trials but from smarter, more honest interrogation of the trials we already have.

Neurotechnology Advancements in Clinics: Smarter Tools for Safer, Wider Access

Discovery is only half the story. The other half is whether a discovery ever reaches a patient who needs it, and here neurotechnology has quietly become one of the most consequential areas in all of medicine. Real-time brain monitoring, once confined to intensive care units and epilepsy monitoring wards, is steadily becoming lighter, cheaper, and more continuous, allowing clinicians to observe brain activity as it unfolds rather than reconstructing it after the fact from an occasional scan.

Brain-computer interfaces have moved from science fiction demonstration to genuine, if still narrow, clinical tool. Their most mature clinical cousin, deep brain stimulation, continues to expand well beyond its original home in Parkinson's disease, now reaching into treatment-resistant depression, obsessive-compulsive disorder, and a widening circle of movement disorders, as electrode targeting and stimulation algorithms grow more precise. What excites us most, though, is the way neurotechnology is beginning to escape the neurology ward altogether. This issue's advances section includes a randomised trial combining virtual reality with electrical nerve stimulation to help stroke survivors regain hand and arm function, and a separate trial of magnetic brain stimulation that improved social communication in autistic children. Neither of these interventions requires an operating theatre. Both point toward a future in which meaningful neurotechnology sits in an outpatient rehabilitation clinic, or eventually a patient's own home, rather than a specialist neurosurgical suite.

Remote patient monitoring completes this picture. Wearable sensors that track tremor, gait, sleep architecture, and seizure risk are turning the interval between clinic visits, once a black box to the treating physician, into a continuous, reviewable stream of data. For a specialty that has long depended on a patient's imperfect memory of symptoms between appointments, this is not a minor convenience. It is a genuine shift in what a neurologist can know about a patient's day-to-day reality, and it matters enormously for patients in rural or under-resourced settings who may see a specialist only once or twice a year.

There is a quiet but important engineering story running underneath all of this, one that rarely makes it into clinical summaries. Every advance described above depends on batteries lasting longer, sensors drawing less power, and wireless transmission protocols becoming more reliable in precisely the low-connectivity settings where remote monitoring would matter most. A brain-computer interface that needs to be recharged every ninety minutes is a laboratory demonstration. One that lasts a week between charges is a device a patient could plausibly live with. The clinical literature tends to celebrate the neuroscience of these tools

while treating the underlying hardware as a solved problem, but for many of the physicians and educators reading this journal, particularly those practising in settings where reliable electricity and connectivity cannot be assumed, the hardware is very much still the story.

AI in Neurology: Transforming Diagnostics, Prediction, and Everyday Care

Artificial intelligence deserves its own section here, not because it is fashionable to include one, but because it is genuinely reshaping how neurological disease is caught, predicted, and managed at every stage. Diagnostic imaging is the most visible example. Algorithms trained on thousands of scans can now flag subtle white matter changes, early amyloid deposition, or the faint asymmetries of an evolving stroke faster and, in some well-validated settings, more consistently than a fatigued clinician at the end of a long shift.

Prediction is where the technology becomes genuinely transformative rather than merely efficient. One of the more striking findings in this issue's advances section, that handwriting speed during dictation may help detect early cognitive decline, is a small but telling illustration of what AI-era diagnostics increasingly look like: not a dramatic new scanner, but a pattern buried in ordinary behaviour, extracted with tools sensitive enough to notice a decline no human observer would catch. The same logic underlies efforts to combine genetic, metabolic, and clinical data to flag which patients are likeliest to progress from mild cognitive impairment to dementia, or which stroke patients are likeliest to benefit from aggressive early intervention.

Everyday care is where these advances will ultimately be judged, and the honest picture is mixed but encouraging. AI-assisted triage tools are beginning to help emergency departments prioritise suspected stroke patients within the narrow treatment window where intervention matters most. Natural language processing is being used to scan clinical notes for early warning signs of delirium or depression that might otherwise go undocumented amid a busy ward round. None of this replaces clinical judgement, and it should not. But used well, it narrows the gap between a subtle early sign and the moment a clinician acts on it, which in neurology is very often the gap between a good outcome and a permanent one.

We would be doing this section a disservice, however, if we did not also name the honest limitations. Algorithms trained predominantly on data from wealthier, whiter, and more thoroughly documented populations do not automatically generalise to the patients most of this journal's readership actually treats. A stroke-detection model validated in a well-resourced Western emergency department may perform very differently on a scan acquired on older equipment, from a patient population with a different burden of untreated hypertension and diabetes, in a hospital where the algorithm's training data has never been meaningfully represented. This is not a reason to reject the technology. It is a reason to insist, as a matter of basic scientific and ethical practice, that validation studies be conducted in the populations where these tools will actually be deployed before we trust them with a patient's diagnosis. A journal like this one, publishing from and for clinicians across Africa, South Asia, and beyond, has a genuine role to play in demanding exactly that kind of validation rather than simply importing tools built elsewhere and assuming they translate.

Neurology Innovations for Patients: Faster, Personalized, and More Accessible Care

For all this technological momentum, we want to return the conversation to where it ultimately belongs, which is the patient in front of the clinician. Speed matters enormously in neurology because so much of the specialty's damage is time-dependent. Faster diagnosis of stroke, faster recognition of status epilepticus,

faster identification of a treatable cause behind an otherwise unexplained cognitive decline: these are not incremental gains. They are, quite literally, the difference between a preserved life and a diminished one.

Personalisation is the second thread, and it runs through much of what this issue has to offer. This issue's advances section carries a piece asking why Alzheimer's risk hits women harder than men, and a companion piece on how ADHD manifests differently across the sexes, both pointing toward a future clinical practice that treats sex and gender as genuine variables in diagnosis and treatment rather than an afterthought buried in a subgroup analysis. Our own submitted review on expressed emotion within families makes a similar case from a different angle, arguing that how families themselves respond to a relative's psychiatric illness, criticism, warmth, over-involvement, is not background noise but a measurable clinical variable that shapes relapse and recovery, and one that deserves to be assessed and addressed as deliberately as any medication.

Accessibility, finally, is where we think the field still has the most honest work to do. A gene therapy or an implanted brain-computer interface means very little to a patient who will never see the tertiary centre that offers it. This is precisely why the more modest, low-resource interventions in this issue matter as much as the high-technology ones. Our submitted paper on the Bear Fable, a simple narrative device used to help families understand dissociative and conversion symptoms without accusing the patient of fabrication, requires no equipment, no specialist training beyond a compassionate clinician, and no funding beyond the time it takes to tell a short story well. It is, in its own quiet way, exactly the kind of innovation this section is meant to celebrate: unglamorous, inexpensive, and genuinely transformative for the family sitting across the desk from a confused and disbelieving relative.

This journal receives a considerable proportion of its submissions from clinician-researchers working in precisely the resource-constrained settings we described in the previous section, and we think that vantage point produces a particular kind of innovation that deserves more recognition than it typically receives in the wider literature. It is easy, from a well-funded academic centre, to propose a solution that assumes a functioning cold chain, a stable electricity supply, and a specialist pharmacist available for consultation. It is a different and, in some ways, more demanding kind of ingenuity to design an intervention that works without any of those assumptions holding. The two toxicology papers in this issue, examining how a natural extract might counter the neurological and renal harms of a common insecticide and an industrial chemical respectively, sit squarely in that tradition: practical, low-cost, locally relevant science aimed at exposures that disproportionately affect exactly the populations least equipped to seek specialist treatment after the damage is already done.

The Future of Neuroscience: Trends That Will Transform the Health Journey of People

Where does this leave us as we look ahead? We would resist the temptation to predict a single dramatic breakthrough, because the pattern across every section of this editorial has been convergence rather than a single decisive discovery. Biomarkers are becoming more accessible, imaging more interpretable, neurotechnology more portable, and artificial intelligence more woven into the ordinary rhythm of clinical decision-making. None of these trends alone would transform neurological care. Together, layered onto one another the way this issue's papers layer onto one another almost by accident, they plausibly will.

We would also note, gently but firmly, the two submitted papers in this issue that examine environmental threats to the brain, the cerebellar effects of a common insecticide, and the nephrotoxic and neurotoxic burden of another widely used agent, alongside this issue's advances piece on air pollution and neonatal seizure susceptibility through the Nrf2-ferroptosis axis. Brain health in the coming decade will not be

determined solely in hospitals and research laboratories. It will be determined just as much by air quality, occupational chemical exposure, and the countless environmental variables that most neurology curricula still treat as peripheral. A field that has spent a century mapping the brain's internal architecture is now being asked, urgently, to map its external vulnerabilities as well.

And we would end on the human note that Cajal's epigraph opens this piece with, because it feels like the right closing thought as much as the right opening one. For most of medicine's history, the brain was the one organ we treated with a kind of respectful helplessness, examined, described, mapped in exquisite anatomical detail, but rarely touched with real therapeutic confidence. That helplessness is ending. Not everywhere, not evenly, and not without the setbacks that every genuine frontier produces along the way, but ending nonetheless. The nine papers that arrived on our desk this quarter did not know they were part of anything larger. They simply did what good science does: asked a narrow question honestly, and answered it as far as the evidence allowed.

A cerebellum can be protected. A frightened family can be spoken to differently. A fable can do work that a lecture cannot. None of these is a cure. All of them are progress, the unglamorous, cumulative kind that rarely makes a headline but slowly changes what is possible in a clinic. That is how a golden brain earns the metal on its cover: not through a single discovery bright enough to justify it, but through issue after issue of researchers, most of them working in the settings this journal has always served best, refusing to accept that the mind's fragility is beyond medicine's reach.

The heart taught this journal, and this profession, how to intervene. The brain is now teaching us how to protect, restore, and, where we can, prevent the need for intervention altogether. That is the real story of this issue, and we suspect it will be the real story of several more to come.

A handwritten signature in black ink that reads "R. Bangur". The signature is written in a cursive, slightly stylized font. A long, horizontal line is drawn underneath the signature, extending from the left side of the signature towards the right.

(Ravindra Bangar)
Editor