



WORLD NEUROLOGY

THE OFFICIAL NEWSLETTER OF THE WORLD FEDERATION OF NEUROLOGY

First Central Asian Course on Neuroepidemiology

The inaugural course featured a program based on the Erice International Courses on Neuroepidemiology.

BY PIERRE MARIE PREUX
AND CARLOS N. KETZOIAN

The First Central Asian Course on Neuroepidemiology in Bishkek, Kyrgyzstan, featured the theme of “Advancing Neuroepidemiology for a Healthier Central Asia.” This course was organized by the International Higher School of Medicine in Kyrgyzstan, the I.K. Akhunbaev Kyrgyz State Medical Academy, and the World Federation of Neurology (WFN) Specialty Group on Neuroepidemiology.

The need for reliable data, modern research methods, and evidence-based approaches in neurology in Central Asia is especially pressing. This course brought together experts, early career researchers, clinicians, and public health professionals Dec. 1-5, 2025, to strengthen regional capacity in neuroepidemiology, an essential discipline for understanding, preventing, and managing neurological diseases.

Both the structure and the content of this First Central Asian Course on Neuroepidemiology are based on the Erice International Courses of Neuroepidemiology and other similar courses conducted in Latin America and Africa.

The course was coordinated by Dr. Kenesh Dzhusupov, head of the Department of Public Health at the International Higher School of Medicine.

Twenty-six participants from different countries in the region — mainly Kyrgyzstan, Uzbekistan, Kazakhstan, and Tajikistan — took part in five intense and enriching days of learning. One



Attendees of the First Central Asian Course on Neuroepidemiology.

participant came from outside of the region (Denmark).

Profs. Walter A. Rocca (United States), Giancarlo Logroscino (Italy), Jeremiah A. Aakre (United States), and Drs. Thibaut Gelle and Andrea Erazo (France) were part of the teaching team.

The course opened with the participation of Prof. Stalbek M. Akhunbaev, rector of the International Higher School of Medicine.

Participants and teachers had in-depth discussions on the different aspects of the clinical-epidemiological methodology for the study of neurological diseases. The program included lectures, analytical sessions, and practical workshops delivered by leading international specialists in neurology, public health, epidemiology, and health

policy. Participants explored modern epidemiological methods, study designs, data interpretation, and the integration of neuroepidemiological findings into clinical practice and health system planning. This full-immersion course format allowed total focus on the subjects.

The course was evaluated by the participants following completion. Academic interest, research activities, professional development, and the opportunity to network were listed as the main reasons for taking part. The quality of the course and its organization were rated as excellent.

This inaugural course established a vital platform for advancing neuroepidemiological research and practice across Central Asia, with a clear pathway for future growth and

collaboration. It successfully laid a foundation for an ongoing professional development in the region.

Consequently, a Second Central Asian Course on Neuroepidemiology in Almaty, Kazakhstan, has been proposed to expand regional reach. This subsequent course aims to build on the established momentum of the first course, further strengthen the regional network of neuroepidemiology professionals, and address the identified need for regular (e.g. annual) advanced training opportunities.

This kind of course corresponds to the objectives defined by the WFN’s Specialty Group on Neuroepidemiology. •

Prof. Pierre Marie Preux and **Prof. Carlos N. Ketzoian** are the chair and past chair of the WFN Specialty Group on Neuroepidemiology.

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WORLD NEUROLOGY

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PRESIDENT'S COLUMN

WFN Member Societies at the Forefront

Upcoming *World Neurology* feature will detail history, ongoing work, and plans from member societies.

BY STEVEN L. LEWIS, MD

I'd like to warmly welcome all neurologists — and anyone interested in neurology and brain health worldwide — to the March-April 2026 issue of *World Neurology*, the official newsletter of the World Federation of Neurology (WFN).

In my **inaugural President's Column** in the January-February 2026 issue, I mentioned that the WFN is a federation of 126 neurological societies, advocating for neurologists and neurological care globally, with our long-stated mission being: "To foster quality neurology and brain health worldwide, a goal we seek to achieve by promoting global neurological education and training, with the emphasis placed firmly on underresourced parts of the world."

Each of the WFN's member societies represents the backbone (and *raison d'être*) of our federation, and the critical local professional voice of neurologists and neurological care in their countries. The WFN would like to acknowledge the tremendous work each of these societies performs by initiating a "Member Society Spotlight" column in upcoming issues of *World Neurology*.

We will soon send invitations to the leadership of each of the 126 WFN member societies inviting them to submit an article highlighting their history, organization, ongoing work, and plans for the future. We hope this new and highly



STEVEN L.
LEWIS, MD

illustrative *World Neurology* feature will provide useful information about best practices and increase innovation and collaboration in our common goals for neurology, neurological access and care, and brain health nationally, regionally, and globally.

The WFN and its trustees are also pleased to introduce the logo for World Brain Day 2026 (See below.) This year's event is chaired by Prof. Tissa Wijeratne and co-chaired by Prof. David Dodick. The event is devoted to "Brain Health: Access for All." The 2026 World Brain Day will take place on July 22. Please check the **WFN website** and the next issue of *World Neurology* for the World Brain Day toolkit and additional information.

Mark your calendars for the **WFN Digital Neurology Update** course, which will be held virtually Oct. 28-29, 2026. This course will feature a series of broad, clinically relevant one-hour updates on

a wide array of the major neurological subspecialties, presented by renowned experts from around the globe.

The WFN Congress Committee is actively planning the next **World Congress of Neurology (WCN)** to be held Oct. 23-25, 2027, in Cape Town, South Africa. This outstanding scientific and clinical neurological event will bring thousands of neurologists together for the first WCN to be held in this vibrant African city.

As I attend the United Nations (UN) Economic and Social Council (ECOSOC) **Multistakeholder Forum on Science, Technology, and Innovation** and the WHO's **World Health Assembly (WHA)** in May, I look forward to helping represent the neurological community in these global institutions. I want to thank Prof. Alla Guekht, past WFN trustee and the current president of the International League Against Epilepsy, who has been so helpful in mentoring and guiding me in these processes. I will provide updates on the WFN's work in these important global venues for global brain health in the next issue of this newsletter.

In closing, I want to wish all neurologists the very best in their professional endeavors, whether in patient care, research, education, advocacy, or any capacity where we may optimize neurologic and overall brain health globally. We also all look forward to informative updates from our member societies in upcoming issues of *World Neurology*. •



WORLD FEDERATION
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WORLD BRAIN DAY

Brain Health: Access For All



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A Brief History of *Neurological Sciences*

The journal of the Italian Society of Neurology (SIN) has provided 47 years of neurological insight and education.

BY ANTONIO FEDERICO

Neuroscientists from Italy and around the world gathered for the 2026 International Conference on Neuro-Symbolic Systems (NeuS). The conference, which took place March 26-27 in Milan, Italy, was organized by *Neurological Sciences*, the journal of the Italian Neurological Society (SIN), and by the SIN itself, to stimulate international exchanges between Italian and foreign neuroscientists and promote the *Neurological Sciences* journal.

In addition to other international guests, Prof. Wolfgang Grisold and Prof. Marianne De Visser attended on behalf of the World Federation of Neurology and as active members of the *Neurological Sciences* editorial board.

Following is an overview of the opening lecture, which focused on the history of *Neurological Sciences* and its goals. View the [complete program](#) for the meeting.

The Italian Society of Neurology and its Journals

The first journal historically linked with the SIN was the *Rivista di Patologia Nervosa e Mentale*, founded in 1896 by Eugenio Tanzi and Enrico Morselli. This journal was promoted at the founding of the SIN in 1907.

It wasn't until the 1970s that the SIN created a journal directly affiliated with the society. It was created by Prof. Renato Boeri, scientific director of the Besta Neurological Institute, who actively participated in a restructuring movement within the SIN, becoming its secretary under Prof. Fabio Visentini, president.

That journal, called *The Italian Journal of Neurological Sciences*, would become

see **NEUROLOGICAL SCIENCES** page 10



From left to right: Prof. Mario Zappia, president of the Italian Society of Neurology; Prof. Antonio Federico, former president of SIN and past editor-in-chief of *Neurological Sciences*; Prof. Marianne De Visser; Prof. Wolfgang Grisold; and Dr. Fabrizio Tagliavini, current editor-in-chief.



Table 1. The key aspects of the journal.

Content Types: original articles, short communications, reviews, editorials, and letters to the editor.

Focus Areas: a broad range of topics, including neuromuscular diseases, dementia, epilepsy, stroke, neuroimaging, and neurogenetics.

Special Sections: "History of Neurology" and "Neurological Digressions," which covered cultural topics related to the neurosciences.

Topical Focus: topical collections by international guest editors on emerging themes including rare neurological disorders.

Review Articles

Special Editorials

The most relevant articles are open to free access via the web during Rare Diseases Days, Brain Weeks, and other occasions.

Table 2. Journal by the numbers.

In 2012, the journal received **917** articles. By August 2025, that number increased to **2,700** with a peak reached during the COVID-19 pandemic.

The journal accepted **280** articles in 2012 versus **480** in 2025.

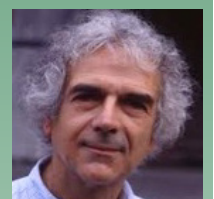
There were **223,297** full text article downloads in 2012. That number rose to **850,000** in 2022 and **2.2 million** in 2025.

The 2-year impact factor of the journal increased from **1.315** in 2011 to a peak of **3.8** in 2021. The journal saw a slight decrease to **3.3** in 2022 and **2.7** in 2023. It stabilized to **2.4** and **2.5** in 2024 and 2025, respectively.

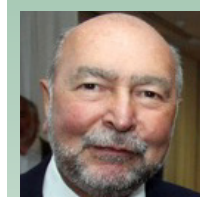
The editors-in-chief of the *Italian Journal of Neurological Sciences* throughout its history.



Renato Boeri
Founder
Editor-in-Chief
1979-1993



Giuliano Avanzini
Editor-in-Chief
1993-2011

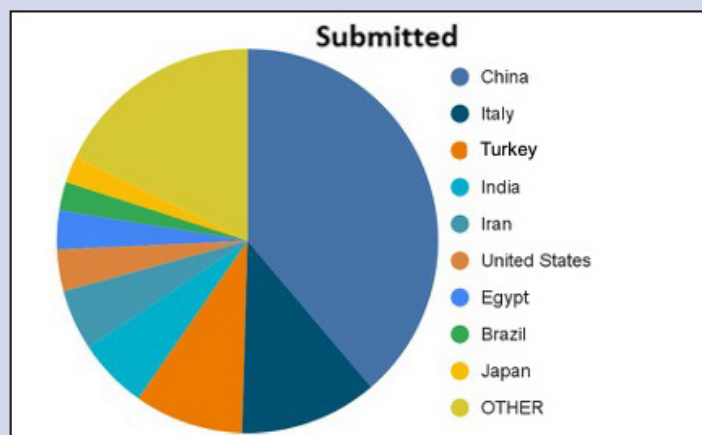


Antonio Federico
Editor-in-Chief
2012-2021

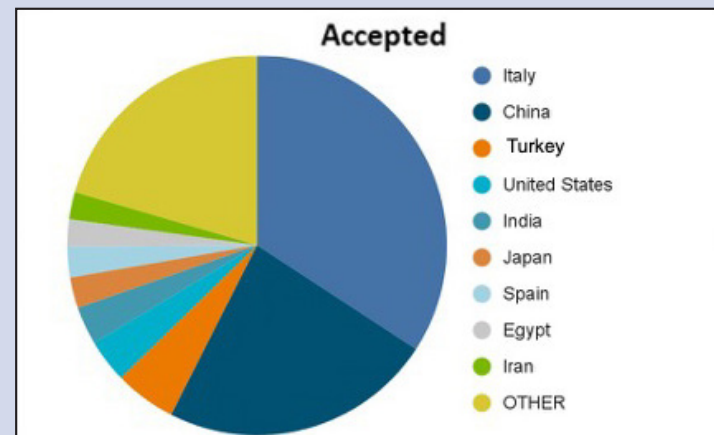


Fabrizio Tagliavini
Editor-in-Chief
2022-

The countries of origin for the main authors of submitted and accepted manuscripts in 2024.



China, Italy, Turkey, and India account for 2/3 of total submissions



Italy, China, Turkey, and the United States account for 2/3 of total acceptances

WFN Treasurer Awarded the Order of Ontario

Canada's highest civilian honor has been given to Prof. Morris Freedman in recognition of distinguished service and extraordinary achievement.

Prof. Morris Freedman, treasurer of the World Federation of Neurology (WFN), has been named one of the 2025 recipients of the Order of Ontario.

The Order of Ontario is the Canadian province's highest civilian honor and recognizes those whose distinguished service and extraordinary achievements have helped build a stronger Ontario and Canada. Established in 1986, it is awarded to individuals from various fields who have made exceptional contributions to the province, Canada, or globally.

As noted by Edith Dumont, lieutenant governor of Ontario and chancellor of the Order of Ontario: "The 2025 Order of Ontario appointees represent the very best of our province. Through their exceptional dedication and achievements, they have made profound contributions that have touched lives across Ontario and beyond. May their remarkable examples continue to inspire us all to work together for the greater good."¹

Prof. Freedman, who is also medical director of the Pamela and Paul Austin Center for Neurology and Behavioral Support at Baycrest Health Sciences, was lauded by Dumont as "an internationally recognized authority in dementia care, research, and education. For over four decades at Baycrest Health Sciences and the University of Toronto, he has advanced early diagnosis and treatment through innovative models, global collaborations, and over 200 publications. His initiatives, including the Virtual Behavioral Medicine model and international knowledge-sharing platforms, have expanded access and improved outcomes worldwide."² •

References:

1. <https://news.ontario.ca/en/release/1007022/province-honours-2025-order-of-ontario-appointees>
2. <https://news.ontario.ca/en/backgrounder/1007023/2025-order-of-ontario-appointees>



Michelle Cooper (left), member of the Provincial Parliament for Ontario and parliamentary assistant to the Minister of Finance, and Deb Galet (right), president and CEO of Baycrest Hospital and Long-Term Care, present Prof. Morris Freedman, WFN treasurer, with a certificate recognizing his appointment to the Order of Ontario.

The 158th Session of the WHO Executive Board

The World Federation of Neurology speaks out on global neurological and brain health priorities in Geneva, Switzerland.

BY KSENIA POCHIGAIEVA, ALLA GUEKHT, AND STEVEN LEWIS

The World Federation of Neurology (WFN) participated in the **158th session of the WHO Executive Board (EB158)** as a nonstate actor in official relations with the World Health Organization (WHO). The meeting took place Feb. 2-7 in Geneva, Switzerland.

Preparation for this event was completed by Prof. Steven Lewis, WFN president, and Prof. Alla Guekht, with WFN intern Dr. Ksenia Pochigaeva attending in person. The WFN's participation focused on advocating for the integration of neurological and brain health priorities into the WHO's strategic discussions and program agendas.

The executive board session began with the opening and adoption of the agenda, followed by reports from the director general and specialized WHO committees. Several days of the meeting were dedicated to discussions of health-related agenda items. These included:

- The continuous development of health care systems, including universal health coverage and primary health care

- Addressing and preparing for emergencies
- Health promotion

Several key agenda items were selected for one-minute verbal interventions aimed at advocating for the recognition of neurology as a critical component of sustainable health care systems.

One of the interventions was a follow-up to the political declaration of the high-level meeting of the General Assembly on the prevention and control of noncommunicable diseases (NCDs). This agenda item received high interest from the member states, and the WFN statement was well received.

The WFN also made a verbal intervention during the discussion of agenda item seven (mental health). This item was of particular significance to the WFN because the WHO director general's report on mental health issues also mentioned the progress of the implementation of the **Intersectoral Global Action Plan (IGAP)** on epilepsy and other neurological disorders 2022-2031 (decision **WHA75.11 (2022)**). This part of the report showcased WHO support for IGAP



Dr. Ksenia Pochigaeva addresses agenda item 10 on primary health care on behalf of the WFN.

implementation in Ghana, Kenya, the Republic of Moldova, South Africa, and the United Republic of Tanzania. It also highlighted measures for improving access to medicines for neurological disorders in Côte d'Ivoire, Ethiopia, and Zambia.

Finally, the WFN delegate was given the opportunity to make a statement during the discussion of agenda item 10 on primary health care. The statement highlighted the belief that primary health care is vital to the implementation of preventive strategies against brain diseases and NCDs. It also addressed modifiable risk factors driving the incidence of stroke, dementia, and other chronic neurological conditions.

The final days of the meeting focused on agenda items related to WHO governance, budgeting, and organization-related issues. One of the sessions was dedicated to engagement with nonstate actors, including those in official relations with the WHO. At this time, the WFN was one of the organizations whose official relations status with the WHO was extended through 2026-2028. •

Dr. Ksenia Pochigaeva is WFN Intern, **Prof. Alla Guekht** is past trustee of the WFN and current president of the International League Against Epilepsy (ILAE), and **Prof. Steven Lewis** is the president of the WFN.

JUNIOR TRAVELING FELLOWSHIP REPORT

Attending the WCN 2025

Recipient of a Junior Traveling Fellowship reports on her attendance at the World Congress of Neurology in Seoul, South Korea.

BY SOMYA SINGHAL

I wish to express my sincere gratitude to the World Federation of Neurology (WFN) for awarding me the 2025 Junior Traveling Fellowship (JTF), which enabled me to attend the World Congress of Neurology (WCN), Oct. 12-15, in Seoul, South Korea. I am deeply honored to have been selected for this prestigious fellowship.

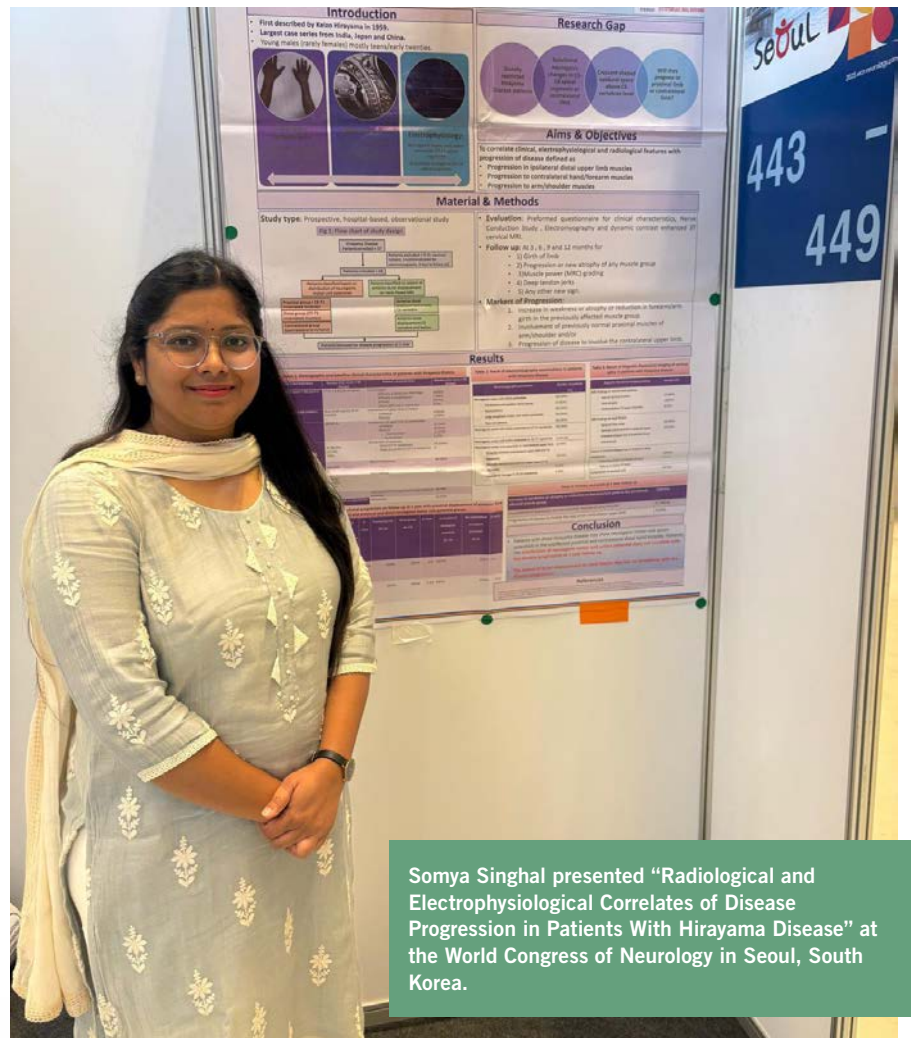
Attending WCN 2025 was an academically enriching and professionally rewarding experience. The congress provided an excellent platform to engage with international experts, gain exposure to recent advances in neurology, and participate in high-quality scientific deliberations. I was privileged to present my research work as a poster during the congress. This allowed me to share my findings, receive valuable feedback,

and engage in meaningful academic discussions with peers and senior neurologists from around the world.

The JTF award played a crucial role in facilitating my participation by alleviating financial constraints and encouraging early career neurologists to actively engage in global scientific forums. This experience has significantly contributed to my academic development and has further motivated me to pursue clinical research and academic excellence in neurology.

I sincerely thank the WFN for its continued support of young neurologists and for providing such invaluable opportunities for professional growth. •

Somya Singhal is an assistant professor in the Department of Neurology at Sanjay Gandhi Postgraduate Institute of Medical Science in Lucknow, Uttar Pradesh, India.



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28-29 OCTOBER 2026



Empowering Minds,
Advancing Neurology:
Education and Advocacy for
a Healthier Tomorrow



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HISTORY

The Homunculus: From Paracelsus to Penfield

Exploring the dual meanings of homunculus and its role in the history of neurology.

BY PETER J. KOEHLER

The German internist and Paracelsus biographer Dieter Kerner (1923-1981) wrote “Neither Paracelsus nor Goethe inaugurated the homunculus motif; rather, they represent stages in a long series of developments that continues to the present day.”¹ Despite this, Paracelsus and his medical alchemy are usually referred to when we are looking for the origin of the term homunculus.

Two Meanings

Homunculus has two meanings. It can refer to either an artificial human created through alchemy (see Figure 1) or a tiny human being. The first meaning refers to the German physician and alchemist Paracelsus, whose real name was Theophrastus von Hohenheim

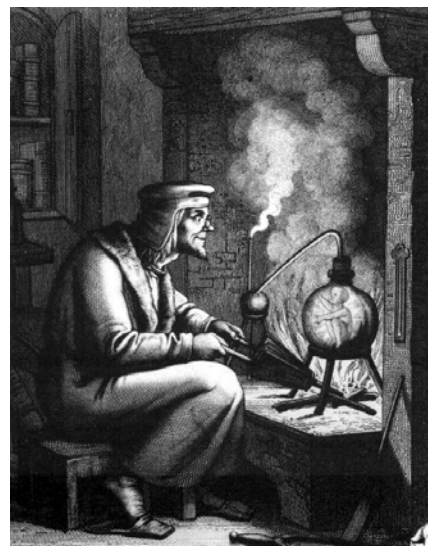


Figure 1. 19th-century engraving for Goethe’s “Faust,” depicting an alchemist creating a homunculus (public domain).

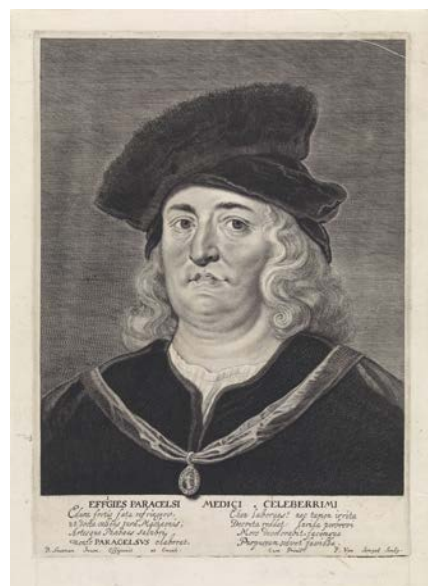


Figure 2. Portrait of Paracelsus, engraving (1644-1650) by Pieter van Sompel after design of Pieter Claesz. Soutman, Rijksmuseum Amsterdam, obj. no. RP-P-OB-59.692; <https://id.rijksmuseum.nl/200257515> last accessed Dec. 29, 2025 (public domain).

(c. 1493-1541; see Figure 2). Paracelsus is supposed to have written about the “chymicall homunculus” in a treatise, “De Natura Rerum [Of the Nature of Things]” in 1537. The book was translated into German by the German personal physician to Count Palatine of Veldenz in Pfalzburg, Lucas Bathodius (1540s-c. 1598),² in 1584.³ (See Figure 3a.)

A century later, in 1650, a translation from Latin into English was produced by “J.F. MD,” likely a reference to the English physician and chemist John French (c. 1616-1657). This book also contains a translation of the work “Novum Lumen Chymicum [A New Light on Alchemy];” (see Figure 3b) by the Polish alchemist and physician Michael Sendovogius (1566-1636).⁴

There is doubt about the authenticity of “De Natura Rerum,” in particular the first chapter “Of the generations of Naturall things,” including the description of the homunculus. The issue was extensively studied and described by the Swiss physician Urs Leo Gantenbein, who noted that since ancient times, and especially since Aristotle, the spontaneous generation of certain animals from inorganic matter had been a recognized fact that was hardly ever questioned. Paracelsus, however, rejected this doctrine, undoubtedly one of the first to do so. Furthermore, in other authentic texts, such as “De Vita Longa” (1527), Paracelsus referred to the homunculus as “a small statue made of wax, intended to ward off evil spells.”⁵

At the time, the possibility of the creation of artificial life and especially of an artificial human being in the form of a homunculus had fascinated humankind, from Aristotle through the Arab philosophers to the medieval myth of the golem.⁵ The author of the first book (chapter) of “De Natura



Figure 4. Antonie van Leeuwenhoek, painting (1680-1686), 56 x 47,5cm, by Jan Verkolje (I), Rijksmuseum Amsterdam, obj. no. SK-A-957; <https://id.rijksmuseum.nl/200108635> last accessed Dec. 29, 2025 (public domain).

Rerum” wrote that an artificial human could be formed alchemically from human sperm, by a kind of parthenogenesis (a natural form of asexual reproduction in which the embryo develops directly without need for fertilization). “Let the Sperm of a man by itself be putrefied in a gourd glasse, sealed up, with the highest degree of putrefaction in Horse dung, for the space of 40 days, or so long untill it begins to bee alive, move, and stir, which may easily be seen... This wee call Homunculus, or Artificiall [Man?].”⁶

Some authors go even further back and note that the homunculus was already mentioned in the Arabic “Kitāb al-Nawāmis [Book of the Cow]” from the end of the ninth century. They incorrectly claimed that this is a work by Plato. It has been suggested that Paracelsus, or whoever wrote the first chapter of “De Natura Rerum,” had read this text. Some other medieval authors may also have referred to the homunculus, including the Catalan physician Arnold of Villanova (c. 1240-1311), who was believed to have succeeded in creating a homunculus himself.⁶ A related concept, to which Kerner was referring, goes back to biblical sources and the Hebrew term golem — a human figure from Jewish legend made of clay and brought to life by a rabbi.

The second meaning, tiny human being, is the one usually referred to in medicine. If we go back to the 17th century and the discovery of the “microworld,” the two most important persons associated with this were the English naturalist Robert Hooke (1635-1703), who used a compound microscope and published his *Micrographia* in 1665, and the Dutch cloth merchant Antonie van Leeuwenhoek (1632-1723; see Figure 4).

Van Leeuwenhoek, Hartsoeker, and Sperm Animals

In contrast to Hooke, van Leeuwenhoek used a seemingly primitive microscope with one lens, but his instrument could magnify many times greater than the compound microscopes of his time. He made more than 500 microscopes, mostly with a single lens clamped between two metal plates. He also made the lenses himself. They were usually ground, sometimes blown. He was able to increase the magnification from 30 to several hundred times. The strongest specimen had a magnification of 270 times.⁷

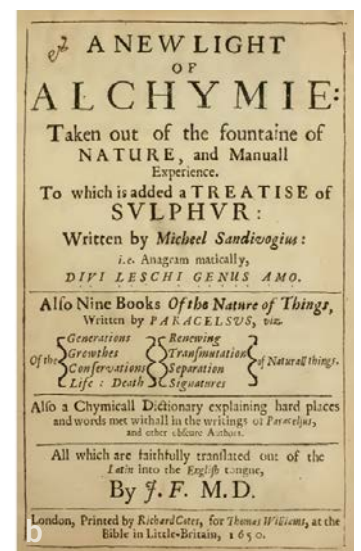


Figure 3. (a) *De Natura Rerum* 1584 German and (b) 1650 English translation.

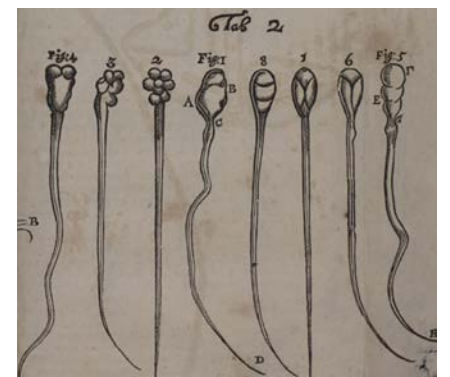


Figure 5. Van Leeuwenhoek’s drawing of sperm cells as published in the *Philosophical Transactions of the Royal Society*.⁹

Van Leeuwenhoek corresponded about his observations with the Royal Society from 1673. In 1677, together with the student Johannes Ham (c. 1651-1723), he observed sperm cells, which he described in remarkable detail and called “zaad dierkens [sperm animals].”

In the summer of that year, he sent their observations to the mathematician and president of the Royal Society, William Brouncker (c. 1620-1684).⁸ The observations were published in *Philosophical Transactions* in 1679, after he had had the text translated into Latin.⁹ (See Figure 5.) Because sperm cells move using their tails, he considered them to be carriers of life. The female reproductive organs serve only to provide nourishment to the organisms already present in the sperm. He continued his research into sperm cells and the question of reproduction for more than 20 years.

Van Leeuwenhoek may be considered a preformist, believing that “animals, plants, and humans are preformed, created by God at the Creation as a miniature of the eventual adult it will become.”¹⁰ Some believed this occurs in ovaries (ovism) while others, like van Leeuwenhoek, believed this occurs in the

HISTORY

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first male of each species (animaculism). The man’s seed alone, he reasoned, forms the fruit (fetus), and all that the woman can contribute is to receive or nourish the male seed. In 1699, he wrote that it was inconceivable “that human ingenuity will penetrate so deeply into that great secret that, by chance or by the dissection of the animalcule in the semen, we will come to see the entire man.” However, he had no doubt that the entire man — in whatever form — was there.¹¹

The Dutch naturalist Nicolaas Hartsoeker (1656-1725; see Figure 6) was another proponent to animaculism. He visited van Leeuwenhoek in early 1672 or 1673 and was inspired by him to study medicine and exact sciences. He is said to have discovered living creatures in human and animal semen in 1674, using a homemade microscope. He wrote about it in his 1694 book “*Essay de Dioptrique*,”¹² in which he said he published on it in the 30th *Journal des Sçavans* of 1678 and included a figure. (See Figure 7.) He later got into a dispute with van Leeuwenhoek about the priority of this discovery, which he called *animaux spermatiques*.

Searching for the 30th *Journal des Sçavans* of 1678, there is indeed an extract of a letter discussed on Monday, Aug. 29, 1678: “Extrait d’une lettre de Nicolas Hartsoeker écrite à l’Auteur du Journal touchant la manière de faire les nouveaux Microscopes, dont il a esté parlé dans le journal il y a quelques jours [Excerpt from a letter written by Nicolaas Hartsoeker to the author of the journal concerning the method of making new microscopes, which was discussed in the journal a few days ago].”

The two-page excerpt begins with a comment about the new microscopes that “M. Huguens” had brought from the Netherlands. This is referring to the Dutch mathematician and astronomer Christiaan Huygens (1629-1695), who became the first scientific director of the Académie Royale des Sciences in Paris in 1666. After

a description of the microscope, we find how Hartsoeker found “petits animaux [small animals]” in urine.

Moreover, “Il en a trouvé dans la semence du Cocq, qui ont paru à peu près de cette mesme figure qui est fort differente, comme l’ont voir de celle qu’ont ces petits animaux dans la semence des autres qui ressemblent, comme nous l’avons remarqué, à des grenouilles naissantes [He found some in the semen of the rooster, which appeared to be almost identical in shape, which is very different, as we can see, from that of these small animals in the semen of other animals, which resemble, as we have noted, newborn frogs].”¹³ The image included in the excerpt is not of the homunculus, but of the new type of microscope.

Looking at Hartsoeker’s image in *Essay de Dioptrique* of 1694, we must realize that he and van Leeuwenhoek did not claim to have seen tiny homunculi or fetuses in human spermatozoa. This common misconception is based on the fact that both Hartsoeker and van Leeuwenhoek once included drawings of homunculi in their writings, but they did so only to suggest their possible appearance (Hartsoeker) or to refute claims that they existed (van Leeuwenhoek).¹⁴

Wilder Penfield and the Montreal Procedure

About 240 years later, the term homunculus was reintroduced into medicine, particularly in neurology, where it usually refers to the projection of motor and sensory functions onto brain models. For this type of homunculus, we must discuss the work of the American-born Canadian neurosurgeon Wilder Graves Penfield (1891-1976). After having spent some years with neurophysiologist Charles Scott Sherrington (1857-1952) in Oxford, neurosurgeon Harvey Cushing (1869-1939) in Boston, Otrif Foerster (1873-1941) in Breslau (the present Wrocław, Poland), and histologist Pío del Río Hortega (1882-1945) in Madrid, Penfield became neurosurgeon in



Wilder G. Penfield (1958); © NLM (unique ID: 101426096).

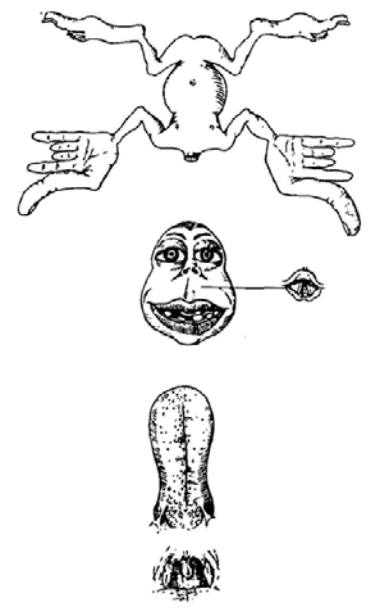


Figure 9. Homunculus, made by medical illustrator Hortense P. Cantlie-Douglas.²⁰

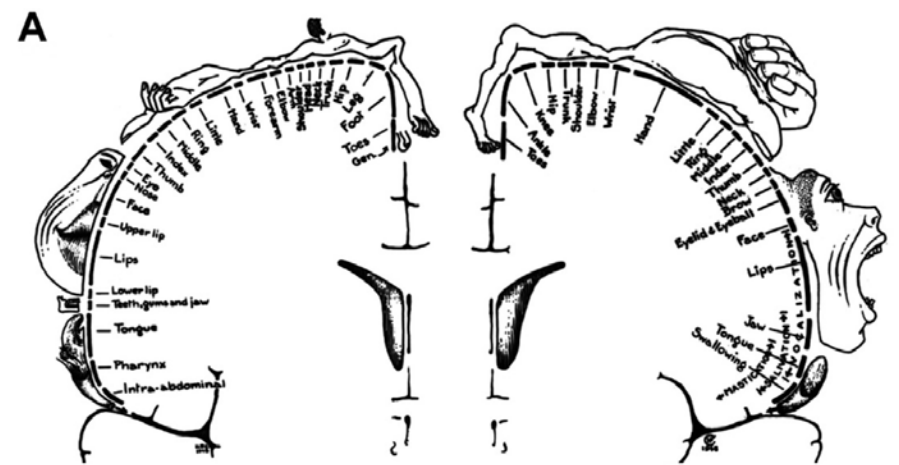


Figure 10. Homunculus, made by medical illustrator Eleanor A. Sweezey, as represented in the 1950 book “The Cerebral Cortex of Man,” by Penfield and Rasmussen.²¹

Montreal (1928).

Later, he became chair of McGill University’s newly created Department of Neurology and Neurosurgery (1930) and director of the Montreal Neurological Institute (1933).¹⁵ He became well known for his research on epilepsy surgery and brain mapping. The latter was important for localizing the epileptogenic zone in the cerebral cortex, but also for mapping functionally eloquent areas. He applied electrical stimulation of the brain under local anesthesia (awake craniotomy) to distinguish normal and pathological tissue.

Penfield was not the first to work in this area as his teacher Sherrington had mapped brain functions of monkeys and Foerster mapped the motor functions of humans.^{16,17,18,19} In 1937, Penfield, in cooperation with his resident Edwin Boldrey (1906-1988), published an important article on the subject in *Brain*, in which they mapped both motor and sensory functions. It was the result of a study involving 126 patients who had undergone surgery under local anesthetic between 1928 and 1936.²⁰ Although general anesthesia was applied in the early days of modern neurosurgery, awake craniotomy was generally applied beginning in the 1910s, first by Thierry de Martel (1875-1940) in 1913 and then by Cushing in 1917.

The homunculus Penfield and Boldrey presented in their 1937 article (see Figure 9) was generated from 170 summary maps of the number and location of stimulation points for each body part, each sketched by Boldrey from Penfield’s operation notes, photographs, and drawings. The drawing was made by medical illustrator Hortense P. Cantlie-Douglas (1901-1979), who had studied at John Hopkins University under the German medical illustrator Max Brödel (1870-1941). He worked for physiologist Carl Ludwig (1816-1895) in Leipzig and moved to Baltimore in 1894. Cantlie-Douglas had obtained a certificate in art as applied to medicine in 1926.

The Cantlie-Douglas homunculus is different from the one Penfield and Rasmussen drew for their 1950 book “The Cerebral Cortex of Man.”²¹ (See Figure 10.) That drawing was made by another medical illustrator, namely the later president of the Association of Medical Illustrators (1961-62) Eleanor A. Sweezey (1915-2007). Several more homunculi (thalamus, supplementary motor, etc.) were drawn for the book “Epilepsy and the Functional Anatomy of the Human Brain” that Penfield wrote in cooperation with clinical neurophysiologist Herbert H. Jasper (1906-1999) in 1954.²²

Information on how Penfield and his



Figure 6: Nicolaas Hartsoeker, painting (1682), 49 x 40 cm, by Caspar Netscher, Louvre Paris, <https://collections.louvre.fr/ark:/53355/cl010064577> last accessed Dec. 29, 2025 (public domain for scientific purposes).

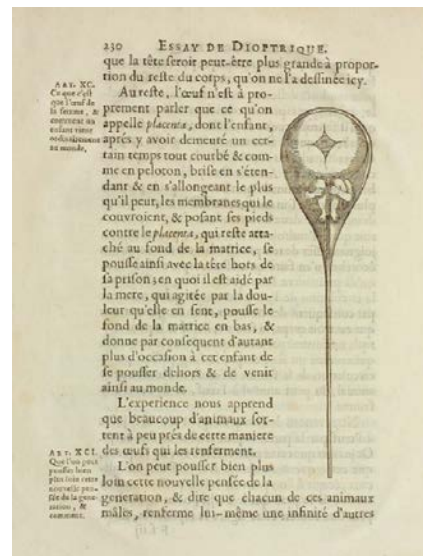


Figure 7. From Hartsoeker’s “*Essay de Dioptrique*” (p. 230) sperm cell, in which he assumed the presence of a tiny human being.

BOOK REVIEW

‘Struck Down by the Gods: Causes and Prevention of Stroke’

Author Peter Gates challenges conventional wisdom regarding stroke risk and prevention.

BY PROF. TISSA WIJERATNE

Readers of *World Neurology* may remember “Cure for Neurophobia,”¹ a game-changing book that helped many clinicians rethink how we teach and learn neurology. The same author, Peter Gates, has now delivered another gem.

This time, the focus is stroke prevention.

Stroke remains one of the leading causes of death and disability worldwide. We have long known that up to 90% of strokes are preventable, at least in theory. Yet prevention continues to fail at scale. This book asks a

confronting question: Is there something fundamental we have been missing?

This is an engaging and challenging book. It explains the different types of stroke in clear language. It also describes medical conditions that are often mistaken for stroke. The book is written

for nonmedical readers, but it has strong value for health professionals at all stages.

A central theme is atherosclerosis. This process causes most heart attacks and many strokes. Gates challenges the idea that smoking, obesity, high cholesterol, diabetes, and high blood pressure are the direct causes. He explains that while these factors increase risk, they do not fully explain why atherosclerosis begins. Strong autopsy evidence shows the process can start decades earlier, sometimes even before birth.

The book offers rich historical insight. It traces how ideas about vascular disease have evolved over centuries. Concepts such as absolute and relative risk are explained simply and clearly. This helps readers better interpret medical research and public health claims.

Importantly, the author does not minimize risk factors. Smoking and obesity are highlighted as powerful markers of risk, especially in today’s obesogenic environment. Practical advice is provided on what individuals can do to reduce their risk of stroke and heart attack.

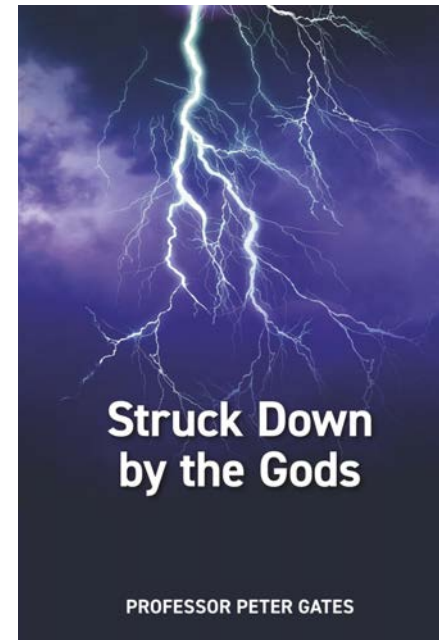
A particularly strong feature of the book is its call for greater transparency in medical research. Gates argues for independent data monitoring, clear disclosure of industry funding, and honest reporting of benefit and harm. He encourages reporting absolute risk, numbers needed to treat, and cost–benefit analyses. His argument that new treatments should be compared with existing effective therapies, rather than placebo, is provocative and carefully reasoned.

This book informs, challenges, and empowers.

It is recommended for lay readers, medical students, early career clinicians, and experienced neurologists alike. It is an enjoyable read, but more importantly, it encourages clearer thinking about stroke, prevention, and evidence in medicine. I read this book from cover to cover. It is an easy and engaging read. It has earned a permanent place on my bookshelf, along with “Cure for Neurophobia.” That is a strong recommendation. •



TISSA WIJERATNE



Prof. Tissa Wijeratne, OAM, MD, PhD, is an elected trustee of the World Federation of Neurology.

Reference:

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HISTORY

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colleagues made the homunculus from the cortical stimulation experiments can be found in an article by Gandhoke et al.²³ It is important to realize that in clinical situations, the homunculus provides only a rough estimate of the likelihood that the neurosurgeon will find the activation of specific body parts. According to neuroscientist Marco Catani, there is no doubt that Penfield and Boldrey were aware of this.¹⁶

Catani compared the homunculi from 1937 and 1950 and noted that the original version was not proportionally scaled according to the dimensions mentioned in the 1937 article. He noted that, for example, the size of the tongue was clearly exaggerated in the earlier homunculus, a misrepresentation that Penfield corrected in 1950. Furthermore, he mentioned that Penfield warned against attributing “too much significance ... to the shape and comparative size.”

The homunculus was criticized by Queen Square neurologist Francis Walshe (1885-1973) at an Anglo-American Symposium in London in 1958: “Even today cortical cartography is eagerly pursued as new modes of electrical stimulation uncover fragments of electrical excitability in new cortical territories. Nor are the moderns content

with maps, for *homunculi* and *simiusculi* have now made their horrid appearances, lineal descendants of Lewis Carroll’s Jabberwock, purporting to depict the fair face of nature, but in fact achieving something quite unnatural.”²²

According to Catani, Penfield was in the audience. He opined that it is evident from Penfield’s publications before and after this meeting that he never tried to promote his homunculus as the bearer of a new principle of brain organization. He concluded his paper by noting that the homunculus “gained popularity as a brilliant aide-mémoire and for this reason it will probably never lose its place in textbooks.”^{16,22}

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NEUROLOGICAL SCIENCES

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the official journal of the SIN, and was open to the international neurology community. Although it was written in English, it also featured contributions from the Italian neurological community. It maintained similar standards to the main international journals and promoted a multidisciplinary vision.

Prof. Boeri, with the approval of the SIN committee, developed an agreement with publishing company Masson to publish the journal. The SIN maintained ownership of the journal and was free to decide the editorial strategies and choose the editor. The first issue was published in November 1979. (See Figure 1.)

Prof. Boeri was named editor-in-chief. Carlo Loeb, Paolo Pinelli, Giorgio

Macchi, and Luigi Amaducci — all eminent authorities in the history of the SIN — were named associate editors. The advisory board was comprised of 30 neuroscientists and Italian professors of neurology. Thirteen representatives from Australia, Europe, and the United States served on the board. Many of these individuals were Italian neuroscientists working abroad.

The journal was published every three months from 1980 to 1986. Due to a growing number of articles, the number of issues per year increased to six (1986-2012) and later to nine (1992-1995). In 1996, the journal changed to a larger format. Its frequency was increased to monthly in 2013.

In 1994, Prof. Giuliano Avanzini, a former collaborator with Prof. Boeri, was appointed editor-in-chief, and some

changes were made to the publication. At the end of 1997, the SIN board decided to change publishers, signing an agreement with Springer Italia, which resulted in a new cover design. (See Figure 2a.) In 2000, to present a clearer internationalization of the journal, the SIN and the editorial board decided to name it *Neurological Sciences*, eliminating *The Italian Journal*. (See Figure 2b.)

Prof. Antonio Federico took over as editor-in-chief at the end of 2011. In 2012, the journal editors opted to change colors and add a number of international scientists to the list of associate editors. (See Figure 3.)

Conclusions and Personal Considerations

It was an honor to serve as editor-in-chief of our journal, and to participate in its

development over the years. My colleagues and I dedicated all our efforts to this job, promoting international and Italian clinical neurological and neuroscientific research through this journal. But we also saw the journal as a representation of the reputation of Italian neurology.

Neurological Sciences has been published for 47 years, and we hope for a fantastic future for it and for international scientific research in a world of peace and harmony. •

Prof. Antonio Federico is an emeritus professor of neurology at the University of Siena, past editor-in-chief of *Neurological Sciences*, and chair of the WFN Subspecialist Group on Rare Neurologic Diseases.

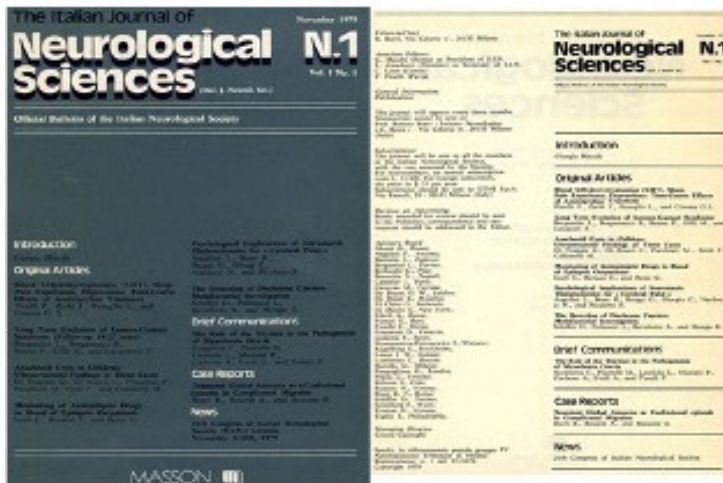
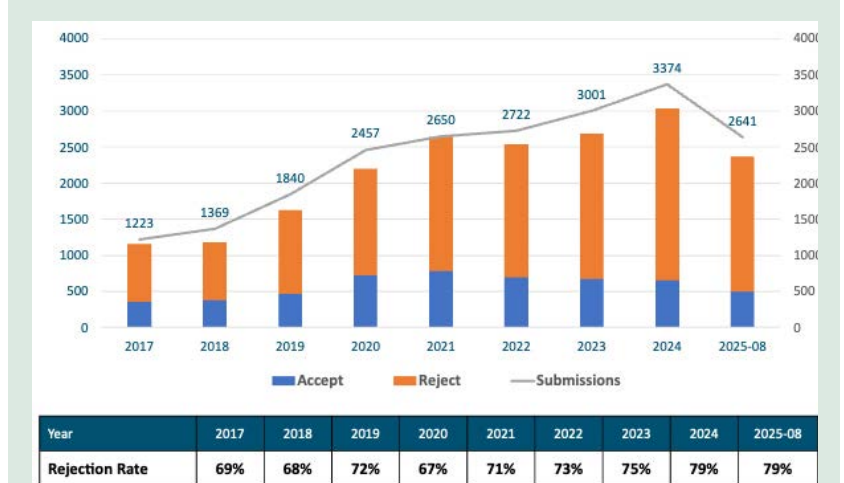


Figure 1. The first issue of the Italian Journal of Neurological Sciences.



The number of articles submitted to *Neurological Sciences*, with acceptance and rejection rates (2017-2025).



Figure 2a. The first issue of the journal published by Springer.

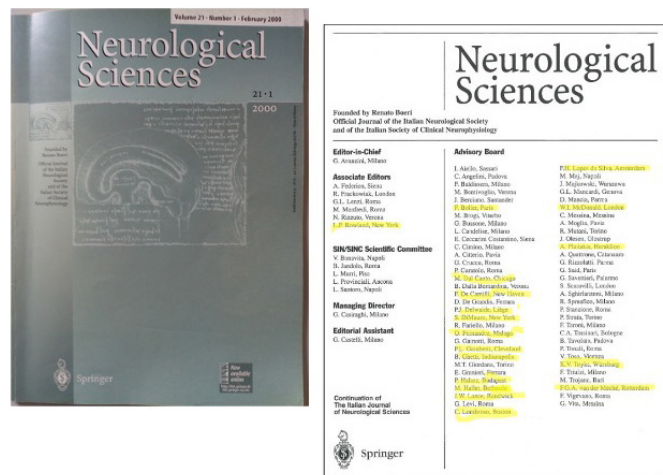


Figure 2b. The first issue featuring the title Neurological Sciences, with the list of associate editors and the advisory board.

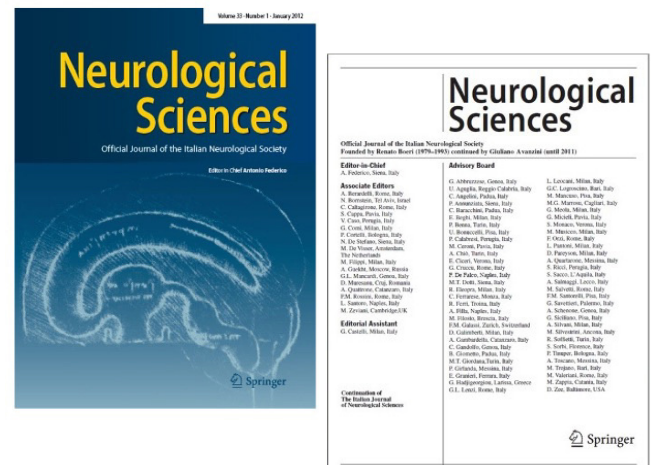


Figure 3. The updated cover and new management committee (2012).



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