

The European Pharmacology: Twenty years of success

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Pharmacology as a science...

Pharmacology as a discipline ...

Pharmacology as a unique discipline **was established in Europe in the middle of the 19th century**, with a number of chairs and institutes of pharmacology being founded in several European universities. The formal beginnings of the discipline coincided with the scientific discoveries of the first defined drugs: **morphine** 1806, **glycerol trinitrate** 1849, **phenacetin** 1887, **acetylsalicylic acid** 1897, **heroin** (as a cough medicine) 1897, **cocaine** (as a local anesthetic) 1900, etc.

However, European Pharmacology as a concept was probably born in the Renaissance with **Paracelsus**. He was born in Switzerland and at the age of 16 started studying medicine at the University of **Basel**, later moving to **Vienna**. He gained his doctorate degree from the University of **Ferrara**.

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His name was actually Philippus Aureolus Theophrastus Bombastus von Hohenheim but he loved to make him call Paracelsus to indicate that he was "equal to or greater than" the famous Roman physician Celsus. He was somehow superb and arrogant and this is the reason why from his name Bombastus the English word *bombastic* comes, indicating a person who is high-sounding, high-flown, inflated, pretentious.

Paracelsus is probably the first modern pharmacologist and he also is a model for the European Pharmacology as a concept.

He was **really European** having got his MD in Italy, and worked in Switzerland, Austria, Denmark, Sweden, Germany, France, Spain, Hungary, Netherlands, and Russia.

Paracelsus was responsible for the creation of laudanum, the famous opium tincture, probably the first morphine formulation. For all pharmacologists, morphine is certainly the first medicine of the modern era.

Paracelsus, in particular, discovered that the alkaloids in opium are far more soluble in alcohol than water. Having experimented with various opium concoctions, Paracelsus came across a specific tincture of opium that was of considerable use in reducing pain. He called this preparation laudanum, derived from the Latin verb *laudare*, to praise.

Today, the context in which Pharmacology is taught, and the role and scope of Pharmacology in universities, where **research** and **teaching** take place, differs among European countries.

Austria

The formal history of Pharmacology in Austria began in the late 19th century with the setting-up of chairs of Pharmacology, in combination with other medical disciplines (Graz 1863, Innsbruck 1869). The **emancipation of pharmacology** as an independent discipline was followed by the establishment of university departments of Pharmacology in Vienna (1890/1891), Innsbruck (1892) and Graz (1903). APHAR was founded in 1995. At the moment (2012) APHAR has 168 members.

Denmark

In Denmark, Pharmacology is an integral part of the curriculum of medicine, dentistry, veterinary medicine, and pharmacy.

Scientifically, Pharmacology in Denmark focuses on protein pharmacology, receptor pharmacology, and clinical pharmacology in close collaboration with clinical departments.

Recently, the five different pharmacology societies established an umbrella organization, the **Danish Society for Pharmacology** that hosted the IUPHAR 2010 congress in Copenhagen.

Finland

Academic pharmacology in Finland has nearly 200 years of history – a professorship in pharmacology and pharmacy was established in 1844 at the Imperial Alexander University, which became the University of Helsinki with Finnish independence.

The **strongest research areas are neuropharmacology, cardiovascular pharmacology and immunopharmacology.** The Finnish Pharmacological Society was established in 1948. Today, the Society has more than 500 members.

France (1)

The discoveries of the first antihistamines by **Daniel Bovet and Paul Charpentier** (in the 1940's), the further development into the first neuroleptic drugs by **Henri-Marie Laborit, Jean Delay and Pierre Deniker** (in the 1950ies) and the discovery of hypoglycemic sulfonylureas by Marcel Janbon and Auguste Loubatières (in the 1940's) were some of the French seminal contributions to modern Pharmacology and drug discovery.

At present, Pharmacology is represented in all French universities.

France (2)

Many different areas are actively covered by French pharmacologists: **cardiovascular and neurobiology and renal pharmacology by tradition, anti-cancer drugs, clinical pharmacology, and pharmacovigilance** are some examples.

The first Association of Pharmacologists in France was founded in the sixties. The unified French Society of Pharmacology and Therapeutics (SFPT) presently have more than 600 members.



FIG. 5.

Daniel Bovet (1907–1992).
Courtesy of Professor Egidio
Miele, University of Sassari,
Sassari, Italy.

atypical results could only be characterized as empirical findings. In honor of his groundbreaking contributions leading to the discovery of synthetic compounds that selectively inhibit the action of endogenous substances, Daniel Bovet was awarded the Nobel Prize in 1957.

Germany (1)

German Pharmacology started in 1847 with the first department being founded by **Rudolf Buchheim** at the German-Baltic University of Dorpat in the city of Tartu in Estonia. He was succeeded in Tartu by other founding fathers of German pharmacology namely **Oskar Schmiedeberg and Rudolf Böhm**. The discoveries of the first **barbiturate barbitone** (Emil Fischer and Joseph von Mering, 1902), the anti-syphilis drug **salvarsan** (Paul Ehrlich 1909), the anti-malarial agent **mepacrine** (Werner Schulemann, 1932),

Germany (2)

the **antibacterial sulfonamides** (Gerhard Domagk, in the 1930ies) demonstrate the productivity of that period. Today, Germany has 37 departments of pharmacology in university medical schools and ten in pharmacy schools. In Germany, Pharmacology still remains an integral part of the curricula of medicine or pharmacy. In Germany, pharmacology is still considered an important component of medical and pharmacy training and has not been abandoned by any faculty of medicine or pharmacy.

Germany (3)

German academic Pharmacology in the 1960's and 1970's was largely **receptor Pharmacology**. Since the 1980-ies it became more molecular and was dominated by **signal transduction work and neuropharmacology**.

Today the spectrum is more diverse with pharmacology transgressing boundaries with related disciplines and **immunopharmacology, pharmacology of inflammation, or pharmacology of ion channels** playing an increasing role.



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FIG. 3.

Otto Loewi (1873–1961).
Courtesy University Archives of
Vienna (UAW Fotoarchiv:
106.I.1533).

work of Julius Axelrod and his colleagues some 40 years later. On the basis of these experiments, Loewi proposed that parasympathomimetic effects were mediated by ACh and sympathomimetic effects were transmitted by epinephrine.

Italy (1)

Pharmacology started officially in Italy with the foundation of the Italian Society of Pharmacology in 1939. Currently the Italian Society of Pharmacology has over 1,200 members. In the last twenty years, Italian pharmacology has gradually changed from a typical scientific community to a **kind of professional society** which, without severing its scientific roots, aims to promote pharmacology by fostering pharmacological education at universities and in non-university institutions.

Italy (2)

Founders of the modern pharmacology in Italy are names which remain in the history of medicine: Leonardo Donatelli, Emilio Trabucchi or Egidio Meneghetti. Not to be forgotten is the pioneering work of **Vittorio Erspamer** who discovered (in the 1930ies) an amine he named enteramine, which later became known as serotonin.

The major research fields today are those initiated by the fathers of modern pharmacology.

Italy (3)

Among them, one should include neuropsychopharmacology, cardiovascular pharmacology, endocrinepharmacology, biochemical pharmacology. In these areas, eminent Italian researcher have made exceptional contributions also in foreign countries: For example **Erminio Costa, Sandro Guidotti, Ezio Giacobini**, and more recently **Napoleone Ferrara** who received the 2010 Lasker- DeBakey Clinical Medical Research Award.



Napoleone Ferrara is credited with identifying the human VEGF gene and describing its proangiogenic properties, which formed the basis for the development of bevacizumab (anticancer drug) and ranibizumab (drug for the AMD). For his discovery, he won a Lasker Award in 2010 and in 2013 he was awarded the Breakthrough Prize in Life Sciences.

The Netherlands (1)

On May 2 1908, the Dutch Queen Wilhelmina appointed **Rudolf Magnus** (1873-1927) as Professor in the Medical Faculty of Utrecht for the specialty pharmacognosy and pharmacodynamics. This appointment was the first chair in pharmacology in the Netherlands. Since then pharmacological research has spread over almost all universities in the country.

At the Rudolf Magnus Institute in Utrecht psychopharmacologists investigate brain processes since at least 50 years.

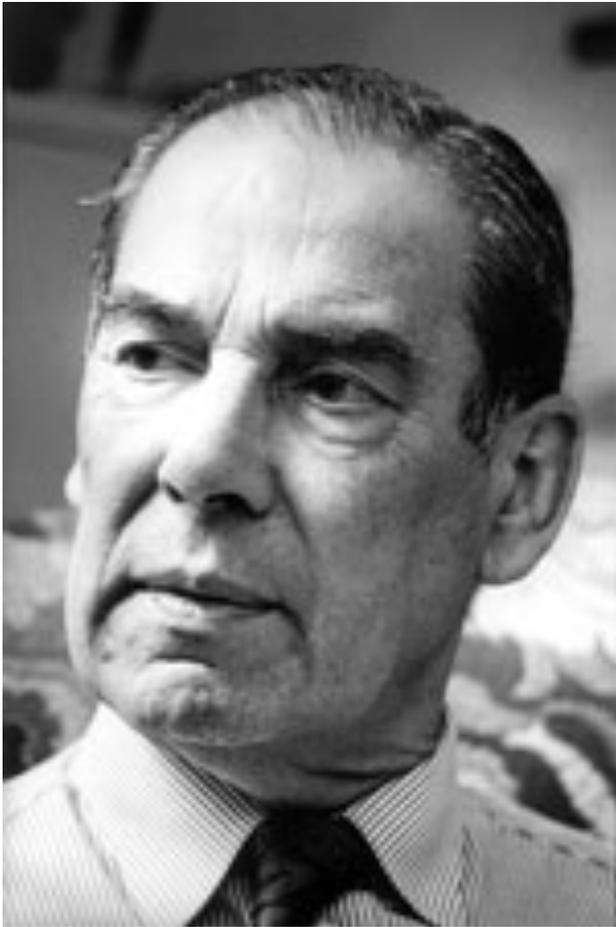
The Netherlands (2)

David de Wied was probably the most productive researcher in this field. At the Utrecht Institute for Pharmaceutical Sciences, new compounds targeting the immune system are investigated in allergy, inflammatory bowel disease, chronic obstructive pulmonary disease and asthma. In Groningen, research on immunological regulation mechanisms in asthma and chronic obstructive pulmonary disease aims at the development of novel pharmacotherapeutics.

The Netherlands (3)

The Erasmus Medical Center in **Rotterdam** and the **Maastricht** University Medical Center are devoted to a better understanding of the mode of action of drugs in diseases such as migraine, hypertension, myocardial ischemia, diabetes and heart failure.

Histamine and human/viral chemokine receptors are studied at the **Leiden-Amsterdam** Center of Drug Research. In Nijmegen scientific work focuses on molecular pharmacology of and on pharmacokinetic-pharmacodynamic (PK-PD) modeling.



David De Wied was a pioneer in the field of Neuropsychopharmacology for having discovered the role neuropeptides in the brain.

United Kingdom (1)

The **British Pharmacological Society** (BPS) was established in 1931 in Oxford, by the founding fathers of British pharmacology James Gunn (Oxford), Walter Dixon (Cambridge) and Henry Dale (Wellcome Research Laboratories, Nobel laureate 1936). The BPS is committed to promoting pharmacology in the UK and abroad. It supports pharmacology through various national and international initiatives for the benefit of its members (over 3000 biomedical scientists and clinicians in 60 countries).



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FIG. 2.

Sir Henry Dale (1875–1968).
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FIG. 9.

Bernard Katz (1911–2003).
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combating psychic, neurological, and cardiovascular disorders. In 1970, Julius Axelrod, Ulf von Euler, and Sir Bernard Katz shared the Nobel Prize in honor of their prodigious contributions to fundamental knowledge regarding the transmission of chemical messages in neuronal systems.

United Kingdom (2)

BPS owns and edits high quality international journals (British Journal of Pharmacology, British Journal of Clinical Pharmacology). The web-based BPS Guide to Receptors and Channels (GRAC) is being enhanced in collaboration with IUPHAR and their nomenclature database. A Guide to Target Validation is being explored as a key enabler for Open Innovation activities in global drug development, safety and clinical trials. Education is vital for sustaining and developing pharmacology as a discipline.



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FIG. 1.

John Newport Langley (1852–1925) is credited with postulating a "receptive substance" in nerve stimulation, although the concept of chemical transmission can be traced to Thomas Renton Elliott (1877–1961; not shown), Langley's brilliant and perhaps under-encouraged graduate student. Courtesy of the National Library of Medicine.

EPHAR was founded in 1990, in the occasion of the XIth IUPHAR Congress held in Amsterdam. The inspiration for such an organization was of two great men and pharmacologists, Börje Uvnäs from Sweden and Corneille Heymans (from Belgium, Nobel Laureate 1938-1939), who described the need for a special European organisation which could coordinate pharmacology activities in Europe. This need become stronger and more actual with the creation of the European Union.

The story of the EPHAR is somehow related to that of the European Union, that was founded in 1951 among six Countries (Germany, France, Italy, Netherlands, Belgium and Luxemburg). Indeed, four of these countries were the same represented in the first Executive Committee of the EPHAR: Germany by Prof. Scholz, France by Prof. Fillion, Italy by Prof. Paoletti (who was elected President) and Prof. Cattabeni, Netherlands by Prof. Strujker-Boudier. United Kingdom (that reached the European Union only in 1973, together with Denmark and Ireland) was represented by Prof. Bowman.

The **aim of EPHAR** is to advance research and education in Pharmacology and to promote co-operation between National Pharmacological Societies in Europe. In a more extensive view the EPHAR, representing all European Pharmacologists, **has become the road of interactions and encounters among scientists** who are free of moving, thinking, and working in a geographical body that resembles a single Nation.

“Ultimately a new generation of European pharmacologists will with common efforts fight in the scientific frontlines and make use of current developments to the benefit of pharmacology and the pharmaceutical industry”, Börje Uvnäs stated in the report of the Steering Committee which prepared the establishment of EPHAR, dated May 7 1990.

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In 1992, when EPHAR was taking the first steps, the Treaty on European Union is signed in Maastricht, setting clear rules for a single currency as well as for security policy and cooperation in justice and home affairs.

New goals and horizons wait for the EPHAR: we **must feel and carry the responsibility** of representing Pharmacology in a political body that is continuously growing and enlarging. We **must feel and carry the responsibility** of creating new generations of pharmacologists with an analytical and broadminded attitude who can be citizens of any and of all European Countries. We **must feel and carry the responsibility** of educating students for a better practice of Pharmacology in their professional activity.

EPHAR will further the development of a European scientific community without national barriers and foster a more intimate relationship between European National Societies and their members.

The members of EPHAR (currently 26) should cover all European Countries and go further the 27 actual members of the EU, among which Turkey is not yet been accepted while this Country is member of EPHAR since already a quite number of years and will host the EPHAR Congress in 2016.

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In the next 20 years EPHAR will growth parallel to Europe in a way that freedom of science and freedom of thinking will reciprocally support each-other.

Teaching safe and effective prescribing in UK medical schools: a core curriculum for tomorrow's doctors

Simon Maxwell & Tom Walley¹

Vice-President (Clinical), British Pharmacological Society, and Clinical Pharmacology Unit, University of Edinburgh, Western General Hospital, Edinburgh EH4 2XU, and ¹Chairman, Clinical Section Committee, British Pharmacological Society, and Department of Pharmacology and Therapeutics, University of Liverpool, Liverpool L69 3GE, UK on behalf of the BPS Clinical Section Committee

There is a pressing need for medical graduates to be fully prepared to take on the responsibilities of prescribing and to be able to respond to continual inevitable rapid changes in therapeutics. The curricula in UK medical schools were greatly influenced by *Tomorrow's Doctors*, published by the General Medical Council in 1993. This has recently been updated. While it highlights the management of disease and use of drugs as key learning objectives, it offers little specific guidance. In this document we expand on these broad statements, provide a view of how these learning objectives might be achieved, and identify the key elements of a core curriculum in prescribing and therapeutics.

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Core knowledge and understanding in *teaching pharmacology*

- **Clinical pharmacokinetics**
- **Monitoring drug therapy:**

The students should understand how to monitor drug therapy by and recording therapeutic responses directly, or indirectly by measuring pharmacodynamic responses or plasma drug concentrations

- **Adverse drug reactions**
- **Drug interactions**
- **Pharmacogenetics**

EPHAR initiatives for the coming years:

- The European Pharmacologist certificate
- Figuring chairs of Pharmacology throughout all Europe
- Regulatory and Institutional Bodies interchange
- Potentiation of Erasmus Program in Pharmacology
- Circulation of young pharmacologists in Europe
- European Parliament audit