

## **Nobel Prize in Chemistry 1939**



**Adolf Friedrich Johann Butenandt**



**Leopold Ruzicka**

The Nobel Prize in Chemistry 1939 was divided equally between Adolf Friedrich Johann Butenandt "*for his work on sex hormones*" and Leopold Ruzicka "*for his work on polymethylenes and higher terpenes*".

### **RESEARCH INFORMATION:**

#### **Exploring the Sexual Divide**

For centuries, philosophers, writers and musicians have all mused upon the differences between the sexes, but to scientists this can be largely explained by the actions of a variety of chemical messengers, or sex hormones, that influence the development of masculine or feminine characteristics. Very little was known about the origin of these sex hormones until the independent chemical explorations of Adolf Butenandt and Leopold Ruzicka converged to form an understanding of how they are created.

The discovery that pregnant women's urine contains unusually high quantities of female sex hormones provided Adolf Butenandt with the essential starting point for unlocking their chemical secrets. From thousands of litres of urine, he successfully extracted milligrams of pure crystals of a female sex hormone, a form of oestrogen called oestrone. At around the same time another researcher Edward Doisy accomplished the

same feat, but Butenandt also worked out the chemical structure of oestrone. Butenandt then went on to isolate pure crystals of the male sex hormone androsterone from men's urine, and from extracts of pig ovaries he isolated progesterone, which plays an important part in the female reproductive cycle. By analysing these isolated hormones Butenandt could see that they have similar chemical structures, which, in turn, bear a striking resemblance to sterols or steroids, a group of biologically important compounds, of which cholesterol is the best-known member.

At around the same time, Leopold Ruzicka had switched his attention from studying the structures of the active components of natural musk perfumes to studying their chemical relations. He proposed that the huge family of chemicals called terpenes, with members ranging from rubber to cholesterol, were in fact related through all being created from a common building block – in this case the small carbon-containing compound isoprene. His suspicion that the ring-like chains of carbon atoms that form the structural backbone of compounds like cholesterol provide the starting basis for constructing sex hormones proved to be correct. By tweaking and manipulating specific parts of the cholesterol molecule Ruzicka successfully created molecules of androsterone, and on the basis of this, Butenandt and Ruzicka independently showed how testosterone, the primary hormone responsible for male characteristics, could be synthesized from cholesterol. With the structures and blueprints for construction in their hands, scientists at last had the fundamental information they needed to understand the roles of sex hormones in human sexuality and reproduction.

**For more details please visit:**

[http://www.nobelprize.org/nobel\\_prizes/chemistry/laureates/1939/speedread.html](http://www.nobelprize.org/nobel_prizes/chemistry/laureates/1939/speedread.html)