

JACOBUS HENRICUS VAN 'T HOFF
1852-1911

Van 't Hoff was born on 30 August 1852 in Rotterdam, where his father was a general practitioner. He attended the HBS at Rotterdam and studied chemical technology at the Polytechnic School at Delft. At Delft Van 't Hoff became interested not only in Comte's positivism, but also in the writings of Whewell and Taine and in the poems of Lord Byron. After finishing his studies at Delft in 1871 he was exempted from an additional examination in Greek and Latin and matriculated at Leiden university, where he studied mathematics and natural science up to the bachelor's degree. He specialized in chemistry in Bonn with August Kekulé (1872-1873) and passed his doctoral examination in chemistry at Utrecht in December 1873. The next month Van 't Hoff went to Paris to study with Adolphe Wurtz for half a year. In December 1874 he took his doctorate at the University of Utrecht with an in itself undistinguished dissertation on cyanoacetic and malonic acids (*Bijdrage tot de kennis van cyanazijnzuur en malonzuur*). His supervisor was Eduard Mulder.

Three months before receiving his degree Van 't Hoff had published a small brochure with a very long title: *Voorstel tot uitbreiding der tegenwoordig in de scheikunde gebruikte Structuur-Formules in de ruimte; benevens een daarmee samenhangende opmerking omtrent het verband tusschen Optisch Actief Vermogen en Chemische Constitutie van Organische Verbindingen*. In 12 pages Van 't Hoff formulated the theory of the asymmetric carbon atom and laid the foundations of stereochemistry. But at first hardly anyone took notice of his *Proposal*. French and German translations met with skepticism and disbelief and only after a certain time more and more colleagues adopted his view. (An English translation was published in 1891).

In the meantime Van 't Hoff's career had taken off. After taking his doctorate he first earned a living with private lessons, but in 1876 he was appointed at the Veterinary School in Utrecht to teach physics. In 1877 he became lecturer in theoretical and physical chemistry at the University of Amsterdam and in 1878 he was appointed as ordinary professor of chemistry, geology and mineralogy. In his inaugural lecture, *De verbeeldingskracht in de wetenschap* (1878), he defended the role of imagination in science, thereby answering those critics who had deemed his *Proposal* too speculative. Shortly after his oration Van 't Hoff married Johanna Francina Mees. They had two sons and two daughters.

At Amsterdam Van 't Hoff first continued his research on the relation between the constitution and the chemical and physical properties of organic substances. He summarized his results in his *Ansichten über die organische Chemie* (1878-1881). Then he switched to another field, the thermodynamics of chemical reactions. He was primarily interested in the relation between the concentration of certain solutions and the speed of the reaction. He also studied the influence of temperature on reaction speed and the equilibrium in solutions, and chemical affinity. His *Études de dynamique chimique* (1884) summarized his findings in this field. Next came his theory of dilute solutions (1885). He was able to prove that the laws of thermodynamics were not only valid for gases, but also for dilute solutions. Together with his colleague Hugo de Vries, professor of botany, he studied osmotic pressure. In 1885 Van 't Hoff was elected a member of the Royal Academy of Arts and Sciences.

In 1887 Van 't Hoff and the German chemist Wilhelm Ostwald founded a new journal, *Zeitschrift für physikalische Chemie*. In the same year, Van 't Hoff was offered the chair of physical chemistry at the university of Leipzig. But the municipal government of Amsterdam offered him a new laboratory and so Van 't Hoff stayed in Holland. The new laboratory was inaugurated in 1892. In 1894 Van 't Hoff also declined the offer of a chair in Berlin, but when in 1895 he was offered a position at the Prussian Academy of Science, this was an offer he could not refuse. Some years before he had already complained that he had to teach too much and now he had a chance to devote himself totally to research. Although he also became an honorary professor at the University of Berlin he was expected to teach only one course.

Another indication of his international reputation was the fact that in 1901 Van 't Hoff received the first Nobel Prize for chemistry for his work on osmotic pressure in solutions and the laws of chemical dynamics.

In Berlin Van 't Hoff showed himself to be a very prolific researcher and author. In his research he concentrated on the analysis of oceanic salt deposits near Stassfurt. He had chosen this field not only for purely scientific reasons, but also because this research was of some interest to the German salt industry. From 1897 onwards he published many articles on his investigations and he summarized his ideas in his book *Zur Bildung der ozeanischen Salzablagerungen* (1905-

1909). A first series of his courses was published as *Vorlesungen über theoretische und physikalische Chemie* (1898-1900).

Van 't Hoff died in Steglitz near Berlin on 1 March 1911 of pulmonary tuberculosis. A compilation of his articles on the Stassfurt salt deposits and the text of another series of courses at the University of Berlin were published posthumously.

Primary works

Poggendorff, vol. 3, 644; vol. 4, 1553-1554; vol. 5, 1299; vol. 7A, Supplement, 291-295. *Voorstel tot uitbreiding der tegenwoordig in de scheikunde gebruikte Structuur-Formules in de ruimte; benevens een daarmee samenhangende opmerking omtrent het verband tusschen Optisch Actief Vermogen en Chemische Constitutie van Organische Verbindingen* (Utrecht, 1874) (Proposal for the extension of the formulas now in use in chemistry into space; together with a related remark on the relation between the optical rotating power and the chemical constitution of organic compounds), translated and extended as *La chimie dans l'espace* (Rotterdam, 1875) and *Die Lagerung der Atome im Raume* (Braunschweig, 1877); *Bijdrage tot de kennis van cyanazijnzuur en malonzuur* (Dissertation, Utrecht, 1874); *De verbeeldingskracht in de wetenschap* (Inaugural lecture, Amsterdam, 1878); *Ansichten über die Organische Chemie* (2 vols, Braunschweig, 1878-1881); *Études de dynamique chimique* (Amsterdam, 1884); *Dix années dans l'histoire d'une theory. Deuxième édition de 'La chimie dans l'espace'* (Rotterdam, 1887); *Zur Bildung der ozeanischen Salzablagerungen*, 2 vols (Braunschweig, 1905-1909); *Vorlesungen über theoretische und physikalische Chemie*, 3 vols (Braunschweig, 1898-1900, second edition 1900-1903); *Untersuchungen über die Bildungsverhältnisse der ozeanischen Salzablagerungen, insbesondere des Stassfurter Salzablagers* (Leipzig, 1912), with E. Cohen and H. Precht; *Die chemischen Grundlehren nach Menge, Mass und Zeit* (Braunschweig, 1912). A complete bibliography is to be found in Cohen's biography of Van 't Hoff (see below).

Secondary sources

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Jones, in: *Proceedings of the American Philosophical Society* 50 (1911) iii-xii; W. Ostwald, in: *Berichte der Deutschen chemischen Gesellschaft* 44 (1911) 2219-2252; F.G. Donnan, in: *Proceedings of the Royal Society of London* 86A (1912) xxxix-xliii; W.P. Jorissen and L.Th. Reicher, *J. H. van 't Hoff's Amsterdammer Periode 1877-1895* (Den Helder, 1912); E. J. Cohen, *Jacobus Henricus van 't Hoff. Sein Leben und Wirken* (Leipzig, 1912); J. Walker, in: *Journal of the Chemical Society* 103 (1913) 1127-1143; N.N. and others, in: *Chemisch weekblad* 48 (1952) 621-633; H.A.M. Snelders, 'The birth of stereochemistry. An analysis of the 1874-papers of J.H. van 't Hoff and J.A. le Bel', *Janus* 60 (1973) 261-278; *idem*, 'The reception of J.H. van 't Hoff's theory of the Asymmetric Carbon Atom', *Journal of Chemical Education* 51 (1974) 2-7; *idem*, 'Practical and theoretical objections to J.H. van 't Hoff's 1874-stereochemical ideas', in: O.B. Ramsay, ed., *Van 't Hoff-Le Bel Centennial* (Washington, 1975) 55-65; *idem*, 'J.A. Le Bel's stereochemical ideas compared with those of J.H. van 't Hoff', in: *ibid.*, 66-73; *idem*, 'J.H. van 't Hoff's research school in Amsterdam (1877-1895)', *Janus* 71 (1984) 1-30; *idem*, *De geschiedenis van de scheikunde in Nederland. Van alchemie tot chemie en chemische industrie rond 1900* (Delft, 1993) 113-146 (summary of several articles in Dutch by the same author). H.A.M. Snelders, in: *BWN*, vol. 1, 246-248; *idem*, in: *DSB*, vol. 13, 575-581.

[K.v.B.]