

# Karl Karlovitch Klaus

## THIRTY YEARS OF RESEARCH ON THE PLATINUM METALS

By Donald McDonald

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This article might equally well have been headed "Carl Ernst Claus" but, although his origins were German, he was born in Russia, all the work of his lifetime was carried out there, and he died there. So perhaps the Russian style is the more appropriate.

He was born in Dorpat (now Tartu in the Estonian SSR) on January 11th, 1796. His father, a talented painter, died when he was four and his mother, after a second marriage to another artist, also died two years later. The artistic keynote that characterised his infancy evolved in him something that enabled him to surmount the difficulties of the circumstances that ensued. An interest in painting and sculpture on the one hand and in poetry and the drama on the other helped him through an orphan childhood and avoided Freudian complications that might have affected his education. From the beginning he was a brilliant scholar at both local and secondary schools and when, at the age of 14 and obliged to earn a living, he became the pupil of a pharmacist in St Petersburg, he was able to apply himself in his spare time to the theoretical side of this profession.

In 1815 he returned to Dorpat and passed the examination which qualified him as a pharmacist. Returning to St Petersburg for a while, he was attracted to the botanical side of the science and moved in 1817 to Saratov for more access to the country in the steppes. He spent ten years there and was as successful professionally as scientifically, saving enough money to be able to move to Kazan in 1826 and to open his own pharmacy there. Before very long this was recognised as the best in the town, and at the same time he had acquired a considerable



**Karl Karlovitch Klaus**  
1796—1864

*Professor of Chemistry at Kazan and later at Dorpat (now known as Tartu), Klaus discovered ruthenium and carried out extensive researches on iridium and rhodium*

scientific reputation as an authority on the botany and ecology of the steppes. Soon he began to wish to devote more time to the scientific side of his work and in 1831 he sold his pharmacy and moved back to Dorpat to become an assistant in the Chemical Department of the ancient university there. At once he proceeded to widen his scientific scope by taking up the study of chemistry and (presumably) physics and passing the examination for Bachelor and, in 1837, that for Master. In 1836 he accompanied his professor on a visit to the salt steppes beyond the Volga from which two large volumes of report emerged illustrated by drawings by Klaus. For this he received an Academy prize.

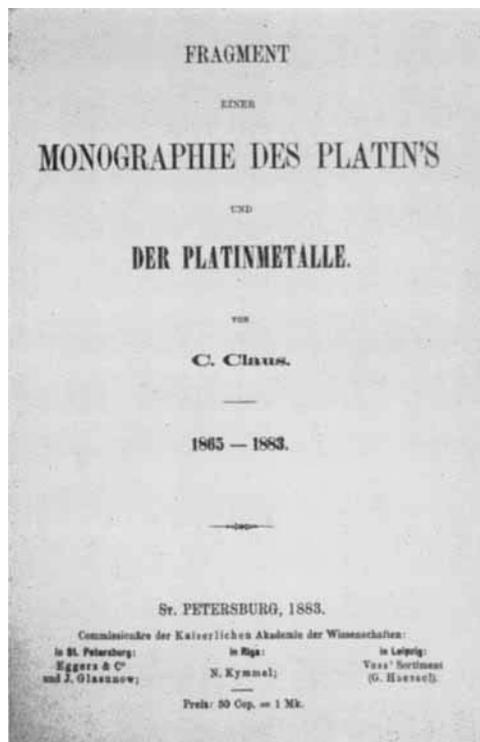
Having now obtained his degree of Master,

he applied for the vacant Chair of Pharmacy at the University of Kazan, but was called, not to it, but to the new Chair of Chemistry there. This event, which looks like a cast of chance, seems to have turned him from a pharmacist and botanist into a chemist and he threw himself into his new profession with the greatest vigour. He had to reorganise the department, to find accommodation for it and to spend a grant of 10,000 roubles in equipping it. The result of his enthusiasm was that the Chemical Laboratory of the University of Kazan, opened in 1838, was soon hailed as one of the best in Russia.

Later in 1838 he was sent to examine certain mineral waters and presented his report as a thesis for the degree of Doctor of Pharmacy. This was accepted and he was appointed Extraordinary Professor at the end of 1839 and Ordinary Professor in 1844.

In the meantime, he was actively engaged in chemical research on various subjects, but from 1840 he concentrated his attention on the insoluble residues from the refining of native platinum. The latter, found in the Urals, was being refined in St Petersburg for minting into coins, and there were accumulating quantities of these residues, which appeared to be waste. In 1828 they had been investigated by Berzelius and Osann. Berzelius found only the well-known rhodium, palladium, osmium and iridium, but Osann (a former Professor of Chemistry at Dorpat from 1823 to 1828) announced what he believed to be three new metals, named by him *pluran*, *ruthen* and *polin*. It was this conflict of opinion between two distinguished chemists that Klaus wished to resolve.

He obtained two pounds of the residues and proceeded diligently to repeat the work of his predecessors. He found the four platinum metals reported by Berzelius, but was shocked to find also up to ten per cent of platinum itself. He at once (1842) reported this to the Minister of Finance, who provided him with a further quantity of residues so that his work might be continued. It went on for two stubborn years, which yielded



The title page of Klaus's monograph on platinum and the platinum metals, eventually published in 1883

much new knowledge and six grams of a new platinum metal which, in honour of his country and in memory of Osann, he proposed to call *ruthenium*. He sent a sample of this to Berzelius and followed it up with more material containing it, and eventually, in January 1845, Berzelius publicly accepted it as a new chemical element. After that, Klaus continued research on the platinum metals at Kazan and in 1854 assembled the result of nearly twenty years of research on ruthenium, rhodium, iridium and osmium in the important "Beiträge zur Chemie der Platinmetalle", published in honour of the fifty-year jubilee of his University.

Meanwhile, in 1852, he had moved back to Dorpat to occupy a newly-founded Chair of Pharmacy, but still managed to continue his work on the platinum metals and he now had the idea of writing a full monograph on the history, chemistry and applications of these metals. Already his work had

brought him a corresponding Membership of the Academy of Sciences, awarded to him in 1861, shortly before he was to set off on a visit to Western Europe to familiarise himself with the work on platinum that was going on there and to study its history in the great libraries. His start was delayed and he eventually left in May 1863. In Berlin he met the great German chemists and physicists of the day and was elected a member-correspondent of the Prussian Academy of Sciences. The works and laboratories of Heraeus at Hanau and of Desmoutis Quennessen in Paris were opened to him and Menshutkin, in his classic biography, says that he also visited Johnson Matthey in London, although no record of such a visit has so far been found on this side. He certainly, however, made a very detailed examination of the work of Deville and Debray in Paris "where not so long ago Matthey had melted a platinum ingot of 240 kilograms, shown at the World Exhibition", and it may be that he met George Matthey there.

Klaus returned to Dorpat with all his accumulated knowledge in January 1864 and set about its collation and writing up. But a short time later he received an invitation to attend and take part in, as a highly honoured guest, an important meeting of the St Petersburg Pharmaceutical Society. He felt compelled to accept this and travelled to the then capital to attend. But on his way home he caught a chill, fell ill and on March 12th, 1864, he died. There is no better epitaph for him than Menshutkin's: "So ended the life of one of the most outstanding savants, who followed his own independent road exclusively, benefiting causes with his support and persistence, possessing such uncommon strength of will and enormous energy that he was able with great success to achieve all his aims".

Unfortunately he had not proceeded very far with the preparation of his book on platinum, but the manuscript of the first three chapters of his history was found among his papers by his colleague, Professor

C. Schmidt, in 1864 and sent to the Academy of Sciences. There it was examined by two prominent Academicians, Fritzsche and Jakobi, who decided that it should be printed in 300 copies under the title "Fragment einer Monographie des Platins und der Platinmetalle". The first two sheets were already printed and two more were in proof form when, for some reason unknown, the printing was stopped. The work was put aside, Fritzsche and Jakobi both died and the papers disappeared until 1883, when it was again asked what was to be done with them. But this time they came into the hands of Klaus's pupil and successor at Kazan, A. M. Butlerov. By then some more of the manuscript had been lost, but Butlerov managed to make up a reasonable book by adding to the fragment of the history a completed (to the sixties) bibliography of the platinum metals and an almost completed third section on their metallurgy.

The book was published in St Petersburg in 1883 under the original title, presumably in the 300 copies mentioned, and in due course the bibliographical section was used by Professor J. L. Howe as the foundation for his own well-known bibliography of the platinum metals, published first in 1897.

### References

In writing the above article the author has drawn heavily and gratefully on the admirable and comprehensive biographical paper on Klaus published by B. N. Menshutkin in the *Izvestia Instituta po Izucheniyu Platini*, 1928, Volume 6, pages 1 to 11. This, in its turn, was based on the obituary address delivered by Klaus's colleague, Professor C. Schmidt, at Dorpat in 1864. The only other reference to be noted is to Professor Butlerov's preface to the published edition of the "Fragment".

### Note

In 1946, after a long, intensive and world-wide search, it appeared that the only copy of Klaus's "Fragment" still in existence outside Russia was Professor Howe's own copy in the library of his Chemical Department in the Washington and Lee University at Lexington, Virginia, U.S.A. With the consent of his successor this was microfilmed and photocopies were presented by Johnson Matthey to the libraries of the British Museum, The Royal Society, The Chemical Society and The Institute of Metals.