From The Other Oil Field: Mendeleev, the West and the Russian Oil Industry

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ABSTRACT

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This thesis attempts to determine whether the Russian chemist, Dmitrii Ivanovich Mendeleev, was open to Western ideas and capital in the Russian petroleum industry. It does so by examining five of his trips to study this business, as either an advisor to the Russian government or a private consultant. These voyages took place between 1863 and 1886 and saw Mendeleev in France, the United States and the Caucasus. Each trip produced a combination of personal letters, diaries, and published articles. This work employs a mixture of published and unpublished archival documents. In the process, much is revealed about the history of this industry, its industrialists, as well as Mendeleev's personality.

The introduction outlines the general questions that this thesis aims to answer. Chapter one summarizes Mendeleev's life until he first worked in the oil industry in 1863. These formative years were crucial for Mendeleev. His youthful travels around Europe, studies in Germany and personal inclinations, made him a multi-lingual and cosmopolitan individual. The remaining five chapters examine Mendeleev's trips to study the industry. An epilogue briefly recounts his final years.

The conclusion of this thesis is that contrary to Soviet scholarship, Mendeleev was open to the West. His only requirement was that Western ideas and capital assist in the growth of the Russian oil industry and result in abundant and cheap kerosene for the Russian population.

Sommaire

La présente thèse vise à comprendre l'intérêt dont a fait preuve le chimiste russe Dmitri Ivanovitch Mendeleïev pour les idées et les capitaux de l'Occident en fonction de l'industrie pétrolière russe. Elle analyse ainsi cinq de ses voyages à l'étranger de ce dernier, soit à titre de consultant pour le gouvernement russe ou de consultant privé. Ces voyages sont survenus entre 1863 et 1886, et ce, en France et aux États-Unis ainsi que dans la région du Caucase. Chacun de ceux-ci a généré son lot de lettres personnelles, journaux intimes et publications d'articles. Notre ouvrage exploite cette variété de documents archivistiques publiés et non publiés. En cours de route, nous en apprenons beaucoup sur l'industrie pétrolière, ses grands acteurs tout comme sur la personnalité de Mendeleïev lui-même.

L'introduction de la thèse soulève les questions générales auxquelles nous nous proposons de répondre. Le premier chapitre traite de la vie de Mendeleïev jusqu'à ce que celui-ci entame son travail dans l'industrie pétrolière, en 1863. Ces années initiales seront cruciales pour Mendeleïev. Les voyages qu'effectuera alors Mendeleïev à travers l'Europe, ses études en Allemagne et ses qualités personnelles feront de lui un polyglotte et un esprit cosmopolite. Les cinq chapitres suivants de notre ouvrage abordent les voyages d'étude de l'industrie pétrolière effectués par Mendeleïev.

La conclusion de cette thèse est donc que Mendeleïev, contrairement aux études Soviétiques, était ouvert à l'Occident. Sa seule exigence était que les idées et les capitaux occidentaux devaient servir la croissance de l'industrie pétrolière russe et se traduire concrètement par un kérosène abondant et bon marché pour la

population de son pays. Ainsi, le penchant occidental de Mendeleïev se voyait nuancé par la conviction qu'avait celui-ci de ce que les emprunts à l'Ouest devaient pouvoir s'adapter

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A NOTE ON TRANSLITERATION

This thesis follows the Library of Congress style for transliteration.

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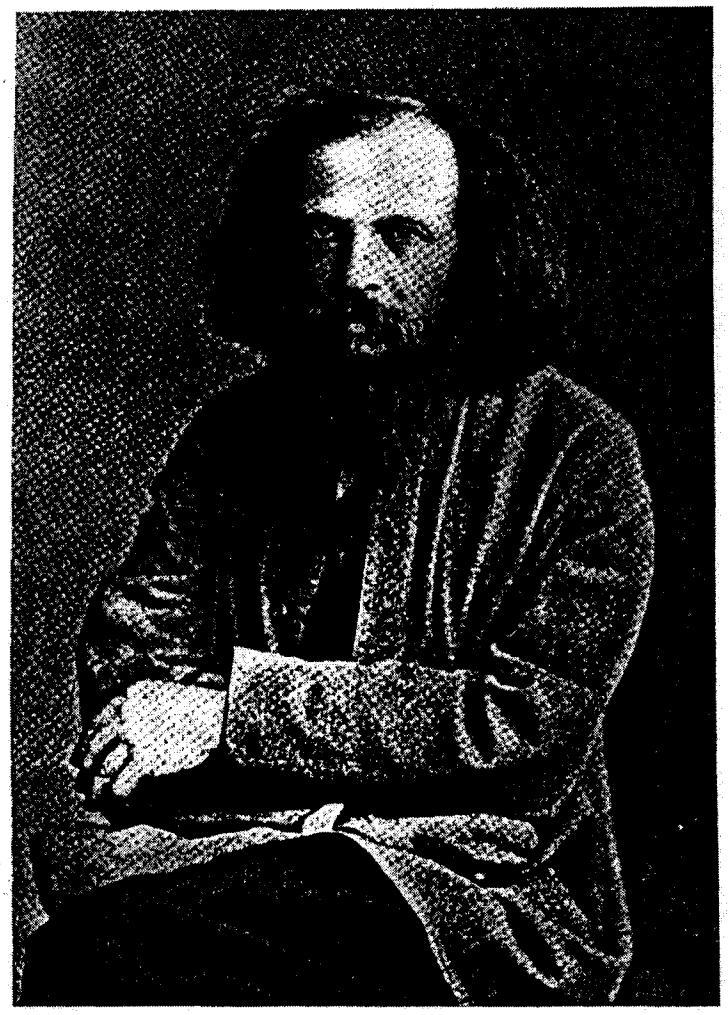


D. Mendeleev

D.I. MENDELEEV

SOURCE: D.I. MENDELEEV ARCHIVE AND MUSEUM

1886

Introduction

"[Mendeleev] is one of the greatest names in the history of science. In view of his fame it is ironic that today we know so little about him. . . . The main reason for this lacuna is not the complexity of his scientific thinking- Soviet historians of science produced some excellent analyses of his work on the periodic table- but the richness of his life. "

Loren R. Graham[1]

It is regrettable that although the great Russian chemist, Dmitrii Ivanovich Mendeleev is arguably the most important pre-Revolutionary Russian scientist, little is known about him in the West.[2] The contemporary popular Western view is that he discovered the Table of Elements and nothing more. This is unfortunate, not only because this breakthrough was only one of his many accomplishments, but also because he was well known in the West during his lifetime. Since his death in 1907, something changed in the West's memory of Mendeleev. Regardless of the reason for this historical lapse –the politics of the Cold War undoubtedly were partially responsible - it is appropriate that Western

scholars begin the massive work necessary in order to understand this scientist and his contributions to Russia and the scientific community.

Over the course of almost forty years, Mendeleev worked extensively for the Russian government on a wide variety of subjects, from meteorology, the metric system, mining, to agriculture, making him a crucial subject if scholars are to understand Russia during the last half of the nineteenth century. In fact, his Table of Elements represents but a very small portion of the great chemist's enormous professional output.[3] Mendeleev's many remaining years were dedicated to advising the Russian government on industrial and scientific matters. However, the single issue to which he devoted his entire professional life was the Russian oil industry.

His connections with the powerful and famous in Russia, whether it was Sergei Witte or I.S. Turgenev, also provide important insights into Russia. Furthermore, his personal life and personality were so very interesting: He was an emotional, tempestuous genius with many strengths, and many weaknesses, an outsized character with an overblown ego and a scandalous divorce. Jealous detractors and fawning hagiographers have a lot of material with which to work.

In many respects Mendeleev's career paralleled Antoine Lavoisier, the great French Chemist: Both were multi-talented geniuses that acted as public servants for their respective governments; both men obviously had strong interests in chemistry. Mendeleev and Lavoisier wrote standard textbooks, *Osnovy khimii* (Principles of Chemistry) and *Traité élémentaire de chimie*. Lavoisier was extremely interested in economics, as was his Russian counterpart. They were also very concerned about improving agricultural production and education. Mendeleev and Lavoisier were also interested in hot air ballooning.

The two chemists were primarily responsible for introducing the metric system to their respective countries. Both had an interest in lighting: Lavoisier first rose to prominence for his plan for illuminating towns; Mendeleev's interest in oil was primarily because one of its by-products, kerosene, could be used by peasants to light their huts. There was one major difference between the two men - their political views. Lavoisier was a liberal actively involved in the French Revolution; Mendeleev was, overall, conservative and would never have supported the Bolshevik Revolution.

Their similarities and differences were probably not happenstance. As a chemist, Mendeleev was undoubtedly aware of Lavoisier. Furthermore, Mendeleev's many trips to Paris, including the first at the young and impressionable age of twenty-five, in 1859, probably gave him exposure to the fame which the French chemist had generated. Finally, Mendeleev was both ambitious and possessed a burning desire to improve Russia. Lavoisier was a perfect role model. The reasons for their political difference are undoubtedly complex; however, Mendeleev's conservatism might have some roots in the fate of the French chemist, who died at the hands of the French Revolution

Mendeleev's twenty-five volume *Sochineniia* (Collected Works) are available in Western libraries. While these contain serious limitations regarding his work on the oil industry, it provides an excellent *beginning* for those wishing to study Mendeleev. Furthermore, the Mendeleev archive has been accessible to Western scholars in Leningrad for some time now; while there were undoubtedly political restrictions on its use during the Soviet era, this alone does not explain why, until recently, it has been completely ignored. Whatever the reason, the absence of Western works on Mendeleev is unfortunate. This is changing as a

few Western scholars are now beginning to study the chemist. Mendeleev's collected body of work is so vast that it will take an army of researchers a generation digging through the treasure trove of Mendeleev's archives to create a scholarly understanding of his life work. As Loren Graham writes "The task of the future scholar is daunting: The incomplete edition of Mendeleev's work runs 25 volumes, and the Mendeleev archives occupy several rooms of St. Petersburg University."[4]

The bulk of Soviet scholarship focuses on Mendeleev's work up to his discovery of the Table of Elements in 1869; yet, he lived productively for more than three decades after this. It is only conjecture, but one suspects the reason for this is that much of Mendeleev's work does not correspond to Communist ideology. Soviet scholarship on Mendeleev was very uneven - some of it poor, much of it respectable and some very good. As Graham warns, "many of the existing treatments of Mendeleev are filled with errors".[5] The only book on Mendeleev's work on the Russian oil industry, V. I. Parkhomenko's, *Mendeleev i russkoe neftianoe delo* (Mendeleev and the Russia Oil Industry) is respectable scholarship. There are two major limitations to this work. First, he employs only Mendeleev's published works. Second, he portrays Mendeleev as whole-heartedly anti-capitalist and effectively anti-Western in his relations to the oil industry. As I will show, this is incorrect.

The focus of this dissertation is Mendeleev's work in the oil industry and his attitude towards Western ideas, capital and investment. More specifically, it will focus on his research trips of 1863, 1867, 1876, (quite possibly 1877), 1880 and 1886. With the exception of the trips in 1863 and 1877, each yielded a published work which will be studied in some detail in an attempt to answer

these questions. This dissertation will use the letters, diaries, notebooks, and documents from the Mendeleev archive in order to understand his character and private life.[6] It is important to have some understanding of his personal circumstances because it influenced his work.

A scholar who studies Mendeleev's work on oil from his five trips abroad and within the Russian Empire faces a daunting list of issues: Did Mendeleev believe in private ownership? What was to be the role of government in the development of the industry? What was to be the role of science in industry? Was capital to be exclusively Russian, or Western, or a mixture? Was the oil to be only for Russian consumption? Should there be taxes on oil or its by-products? If there was, what type should they be? Export? Drilling? Sales? Refining? Were monopolies a danger? Should oil companies be jack-of-all-trades; or should they specialize in each stage of oil production, transport, and sale? How should it be transported to market? Rail, ship, or pipeline? Were there geo-strategic considerations involved? How could the oil from Baku further the development of Russian industry? Should Russia go at it alone intellectually, forsaking knowledge obtained by the West? Why was kerosene so important for Mendeleev? Did his views ever change? What role did personalities play? What about court intrigues? Was Mendeleev driven by an overarching philosophy? The host of questions continues, but a general idea of the complexities involved becomes apparent from this brief list. A further difficulty facing scholars is Mendeleev's willingness to change his mind if the facts or circumstances warranted it. However, while changing his mind, he never admitted that he was previously wrong.

The goal of this dissertation is not to focus on a single aspect of Mendeleev's thought, nor even primarily to focus on Mendeleev's technical recommendations, but instead to answer the question of how Mendeleev's attitudes to the West were formed. It will do so by examining the works which he produced during his trips for the Russian oil industry. Furthermore, reports from commissions and secondary sources -- unavailable outside of Russia -- will also be employed. It places Mendeleev in a specific political context, an environment where members of the Russian government, technical specialists and major industrialists battled, schemed, studied and argued about the shape of the Russian oil industry. Those involved in the debate, while mostly Russian, also included a few Armenians, Swedes, Germans and sundry other nationalities. If they agreed with Mendeleev on policy he was for them; if they were against, he attacked them.

While Western scholarship on Mendeleev is sparse, Soviet scholarship is, at times, problematic. Soviet scholars present Mendeleev as a great Russian scientist whose work they continued. They were accurate on both accounts: Mendeleev was a great scientist and the Soviet state's scientific policies did in some way continue Mendeleev's work. Perhaps most importantly, their policy of science and industry working together directly paralleled Mendeleev's work on the Russian oil industry. Yet, there were major differences.

First, Mendeleev unabashedly supported private ownership of the oil fields and refineries. In fact, he fought for their privatization in the 1860s - up until this period the Russian government had jealously guarded and underdeveloped this resource, keeping it as a lucrative source of revenue for state coffers. Although Parkhomenko overlooks this crucial fact, he was accurate in

arguing that Mendeleev was very concerned about monopolies, whether in drilling, refining, or transportation. While this focus is rather overdone, it is correct: Mendeleev did not trust businessmen. Egregiously Soviet scholars misrepresent Mendeleev's views on foreign ownership in the oil industry: They argue incorrectly that Mendeleev was against foreign involvement.[7] Mendeleev whole-heartedly supported Western involvement, as long as it resulted in the growth of the industry and in cheap kerosene.

Whereas the Bolsheviks at differing times and in differing degrees curtailed both travel abroad and the importation of foreign ideas, Mendeleev was the exact opposite. Mendeleev frequently traveled abroad for study, vacation and as an investigator for the Russian government. Returning home, he would introduce and suggest ideas imported from the West on how to improve Russian industry and science. He did not dismiss the value of Russian science and industry, but instead believed that much could be learned from the study of other approaches. Mendeleev's 1867 trip to Paris and subsequent 1876 trip to America in order to study their oil industries also demonstrate his open-mindedness towards different polities and cultures - except America's. While impressed with America's economic progress, he was aghast at everything else. He notes with great pride that the Russian way had produced a much more civilized society and that the American multi-party system was responsible for the great bloodshed of the civil war, while the Tsarist system successfully effected massive changes without great social disturbances. His views on France were much more positive: France was wealthy and civilized; America was wealthy and uncivilized. The trips to Baku reveal that Mendeleev supported Western involvement in the Russian oil industry.

A major reason for Mendeleev's openness to the West was Russia's need for capital to develop its oil industry. There was no way around the problem - Russian businessmen were neither willing nor able to make the massive and risky investment needed, and the cash-strapped Russian government was also limited in its ability to invest in the oil industry. Russia needed Western capital and Mendeleev knew it. Furthermore, Mendeleev welcomed it. In all of Mendeleev's many battles with the extremely wealthy Swede, Ludwig Nobel, over the direction of the Russian oil industry, he never once attacked the Nobel Prize founder's brother because he was not Russian. This is extremely interesting because in 1880, when the Nobel family was building an oil empire in Baku, Mendeleev viciously, and at times inaccurately, attacked him with any issue or fact that he could employ. Even in 1886 when battles raged over the construction of refineries at the port of Batum, Mendeleev was not troubled that Westerners were involved. This is interesting because, although he was an anti-Semite, he was not concerned that the Rothschilds would play a crucial role in its development. There was, however, a *caveat*: Mendeleev argued that Russian oil destined for export must be refined in Russia, in order to ensure that Russia and Russian industry received the maximum benefit from its natural resource.

Mendeleev's attitudes towards the West were probably shaped by a desire to solve a very Russian problem - improving the lot of the Russian peasantry. The driving force for Mendeleev's obsession with oil was to provide cheap kerosene for the peasants. While the issue of rural poverty was also a concern in the West, Russia's problems were, as usual, on an entirely different scale.

It is worthwhile to briefly consider several plausible psychological and historical reasons for his views. It should be stressed that these are not the focus of this dissertation; its focal point is what he thought and not why. Before delving into the deeper reasons for Mendeleev's beliefs, it is important that scholars have a solid factual understanding of them first. The sheer quantity of Mendeleev's work and the ellipses in his collected works makes it essential that scholars carefully reconstruct his life. This dissertation takes one portion of his life and attempts to do just this.

Born in Siberia, Mendeleev maintained a rather rough, at times tactless independent streak; he would never have fit into a Parisian salon, nor would he have wished to. His education, which began in Siberia, took him through St. Petersburg, Odessa, Germany (he read some of Alexander Herzen's work at the house of the writer's cousin in the early 1860s while studying in Hamburg) and back to the Northern Capital. This rarified, multi-regional and international education gave him a unique perspective on Russia. Mendeleev's peculiar mix of Russian and Western views was magnified by his frequent travels abroad. Traveling to Paris and Pennsylvania gave him insight into other non-Russian ways of doing things. Travelling to Baku on several occasions gave him insights into the realities of working in the Russian Empire's cultural *mélange*.

Mendeleev's character was also a factor affecting his views on the West and Russia. If he were prone to Russian self-loathing, he would have done everything possible to abandon his roots; if he were close-minded, and afraid of the unknown, he would never have learnt anything from his trips abroad, much less traveled so often. Mendeleev never abandoned Russia for greener pastures, nor would he have ever done so. A proud Russian – as a barroom scuffle in

Paris defending his *patrie* against drunken Frenchmen demonstrated - and a multi-lingual world traveler, the Siberian born scientist made St. Petersburg his home because he wanted to improve Russia. His dream was that Russian science, combined with some proportion of Western ideas and capital, was all that was necessary for Russia to obtain the maximum benefits from its oil fields.

Aside from these personal characteristics, two events arguably influenced Mendeleev's work on oil: the Decembrist Revolt and the Emancipation of the Serfs. The freeing of the serfs into abject poverty provided Mendeleev with perhaps his key reason to study Russian oil so intently. With tens of millions of grossly impoverished, semi-liberated citizens now semi-free and mostly illiterate still tied to their locale, the massive question had to be faced - what were they going to do? It was nearly impossible for them to move to urban centres because of their obligations to the village and the need for an internal passport. Furthermore, the type of industrialization that soaked up excess bodies from the countryside in the West was a few decades away. Perhaps a little quixotically, Mendeleev believed that they would become the vanguard of a massive cottage industry working late on sellable handicrafts deep into the cold dark Russian winter night. Electricity was at least a revolution away, so Mendeleev proposed kerosene lamps as the source of light. (He had seen these lamps when abroad and was impressed by them).

The availability of cheap kerosene - a product of crude oil – for the Russian peasantry was of the utmost importance to Mendeleev. All other questions or concerns regarding the oil industry were secondary; its development must be focused in such a way as to ensure that large quantities of kerosene were available in Russia. Taxation, investment, pipelines, location of refineries,

ownership were all issues that must be resolved in a fashion which would satisfy this primary goal. Once Russia had enough cheap kerosene, Mendeleev was willing to alter his approach to oil.

This was how Mendeleev approached the most daunting and eternal question of Russia: the countryside and its peasants. While Western countries have also faced problems with rural areas, Russia's peasants were - and are - problematic. Stalin attempted to resolve the question with typical doctrinaire fervour and made things much worse. Mendeleev wanted to alleviate their condition by making them into a petty bourgeoisie, working for their own profit by the light of a kerosene lamp. Had Mendeleev been born elsewhere, his near obsession with cheap and safe kerosene for the masses might not have existed. Russia's particular rural problems, massive geography, and long bitter winter nights gave the kerosene question an importance that did not exist in the West.

At first, it appears strange to argue that the Decembrists were crucial to Mendeleev's thinking on oil: After all, their uprising occurred in 1825, nine years before the birth of Mendeleev. However, exiled Decembrists inhabited the region surrounding Mendeleev's hometown. Mendeleev's earliest years were spent in a Decembrist milieu. Furthermore, one of Mendeleev's sisters married a prominent Decembrist.

Questions arise: How did this affect Mendeleev; where might Decembrist thinking be found in Mendeleev's copious writings on the Russian oil industry? The Decembrists, in the broadest sense, rebelled in order to re-orient Russia in a more Westward direction. They did so in order to 'improve' Russia - yet many uprisings' ostensible goals are this; both Lenin and Stalin wanted to 'improve' Russia. Thus, it is impossible to link Mendeleev's desire to improve the Russian

oil industry and the lot of the peasants to the Decembrists. Furthermore, Mendeleev never commented on the need for changing Russia's political structure in his writings on oil. This may very well be because the subject matter did not credibly lend itself to this type of thinking.[8] The fact is that Mendeleev supported the tsarist system. After all, he had been born into the lower middle class and risen to the top of the technical elite, received a modest income, traveled abroad and become quite famous.

Mendeleev's travels abroad might be the link with the Decembrists. The Decembrists had been abroad fighting in the War of 1812. Mendeleev was often out of the country for a variety of reasons, including trips for research on the oil industry in 1867 to France and 1876 to America. He traveled around these countries, studied various aspects of their oil industries, talked with their businessmen and scientists, read their oil journals and returned to Russia full of ideas and comments on what could be done to improve his home oil industry. He did not simply regurgitate Western ideas for his Russian audience. While the laws of chemistry, which govern petrochemical industries, are the same everywhere, Russia's physical and cultural geography were far different from those in Pennsylvania. Mendeleev was completely unperturbed by the thought of bringing foreign ideas to Russia, and, as long he believed they would work in Russia, he advocated them.

It is important to realize that in spite of his willingness to import Western ideas, Mendeleev was proudly Russian. He did not abandon Russia for more lucrative academic posts in the West. He did not become a Westernizer like his friend Turgenev. He preferred to speak Russian over German or French. His list of acquaintances was a Russian Who's Who: Repin, Shishkin, Lev Tolstoy, et al.

He read Herzen and played chess. Russia was his home and he did not disavow it for the West. His temperament prevented him from disappearing into the cloistered world of academia. Instead, he got his hands dirty in mud slinging, promoting his vision of the Russian oil industry. He engaged in ferocious rows with those who disagreed with him. There was also at least the hint of impropriety in some of his dealings in the oil business.

In addressing the issue of how Western or Russian were Mendeleev's ideas on the Russian oil industry, one must be aware of the ironies in this general thesis question: the Russian oil industry was arguably never Russian. The heartland of the Russian oil industry was in Baku, Azerbaijan. While it might be argued that Mendeleev was simply a Russian imperialist in the mold of the British and the French, Russia's "empire" was different. Its "colonies" were contiguous to the borders of Russia proper and there was a concomitant mixture of peoples and trade. There were also concerns about the stability of its frontiers. Furthermore, without the stability created by a lumbering and at times nasty Russian military, Baku oil would have never made it outside of its own borders. After all, the only geographically viable route out of the region was through such historically unstable regions such as Chechnya to Georgia. Only the Russian military sustaining a crude stability in this rough and volatile region could ensure that anyone would invest the massive capital necessary for oil wells, refineries and pipelines. This might be unjust, but it is true.

Because of the multi-cultural nature of the Russian oil industry, nationality and language should also be considered in Mendeleev's work. Chechens, Cossacks, Azeris, Tartars, Swedes, Germans, Armenians, Georgians, Ossetes and Russians all played some role in the development of this industry.

Finally, many decisions were made in St. Petersburg, the Russian capital, where French was the language of choice for the social elite and German for many of the scientists. These decisions affected a region which was not Russian and employed a wide variety of peoples where Russian was the *lingua franca* of business. This untidy ethnic and geographic mishmash is very Russian: Mendeleev's effortless ability to work in such a cultural melting pot is simple proof that he was Russian.

Finally, there is one factor that goes beyond his background, education, his social milieu and the books he read: his genius and personality. There was, in fact, a comprehensive plan to Mendeleev's work on oil. He viewed the oil needs of Russia and created a long-term programme that would satisfy them. The industrialists' short-term goal - maximum profit today - was anathema to Mendeleev. However, his genius did not preclude him from making mistakes, nor does it mean that there were no viable alternatives to his vision.

In spite of his proven genius, the Russian government, which had followed his recommendations from 1867 onwards, stopped following his advice in 1880 in favour of that proffered by Mendeleev's archrival, Ludwig Nobel. The industry continued to prosper. Moreover, in 1886, the Russian government chose once again to ignore Mendeleev's advice after having specifically sent him out to study the oil industry in Baku.

Why would the government after heavily relying on the chemist's advice for over twenty years no longer do so? It is true that his prognosis in 1880 that unless the government followed his advice the oil industry would be doomed was wrong. There is no documented reason as to why the government did not follow the famous Mendeleev's advice. However, almost without a doubt the

well-connected Nobel family prowled the corridors of power, shook hands, and smoothly chatted over tea with the decision makers. As well, there were undoubtedly other political machinations at work over the direction of the oil industry.

Yet, Mendeleev was wrong. In spite of the massive amounts of data and statistics he provided – all of which he believed proved beyond a doubt that Nobel's plans were doomed and would drag the Russian oil industry down with them - events would prove him incorrect. It is quite possible that the Russian government simply recognized that he was mistaken in 1880, unlike in earlier years. However, his personal life must also be considered. In 1880, his personal life was in a shambles as the result of a scandalous divorce and subsequent re-marriage to a much younger woman. In fact, at one point, according to Mendeleev's second wife, he contemplated suicide because of the turmoil. (Although frequently moody, Mendeleev was not prone to *such* dark thoughts and this moment must be considered an exceptional aberration.) Under such intense personal strain, anyone's work would suffer and it appears that his work on the oil industry did slip. Government officials might very well have recognized the errors in his writings and the accuracy of Nobel's claims. As well, Mendeleev's writings against Nobel's propositions became uncharacteristically nasty. Never one to mince words, his opinions until 1880 maintained a civilized if sharp tone. Sarcastic and vicious, he attacked Nobel incessantly, but never, it is interesting to note, because he was Swedish.

Although difficult to gauge, the scandal also probably diminished Mendeleev's influence. The powerful were aghast at this serious moral *faux pas*. At the very least it gave his enemies something to use against him. To put it

politely, Mendeleev's personality irritated many people. Those who earlier had had to pay homage to his fame could now afford to either ignore or attack him.

There is one other factor to consider when evaluating Mendeleev's personal writings, one which has little to do with prosaic, factual analysis or grand theories - his personality. Some people with intemperate personalities sometimes say or write things which upon second or third thought they no longer believe. While occasionally an obnoxious bully, Mendeleev was not coldly devious. More succinctly, what and how he said something was not necessarily reflective of his real views, or his tone of his personality; frequently it was his raw emotions expressing themselves without political considerations or concerns for the feelings of others.

Mendeleev's volatile and ebullient character met a challenge of immense importance driven by powerful forces. Oil, which was becoming important for Russia, was an exceedingly complex issue that few people understood. Furthermore, those involved in the oil industry were influential people not only in Russia but also around the world (The Rothschilds became involved in the Russian oil industry in the mid-1880s). Industrialists involved in the industry engaged in disreputable practices with little concern for Russia's well being.

Facing these tremendous forces, Mendeleev battled for Russia's interests, and his obstreperousness made him a perfect warrior in this cause. A true Siberian, Mendeleev seemed to be most at ease when confronting something or somebody; his brilliance and fame provided him with protection that others simply did not have. Of course, this personality type has its drawbacks: sometimes diplomacy and tact are the best approach to issues. Furthermore, warriors are not necessarily good builders and they are often obnoxious in

departmental meetings. Yet, in the forty-year long knock down, bare fisted struggle over the Russian oil industry, Mendeleev acted as a passionate, vigorous and unflinching voice – even if he was sometimes wrong - for its development in a way which would be beneficial for Russia. Battling the Rothschilds, Nobels, Rockefellers, Kokorev and Ragozin (he also, at times, worked for the latter two) and countless other wealthy and powerful industrialists over these many years, more tactful and diplomatic men would have probably given up – but not Mendeleev. Facing their onslaught of attacks - which in some cases were plain lies - he never flinched.

If Mendeleev's ambitions were to become rich, the president of the university or a bona fide member of the Russian elite, the Russian oil industry would have probably been in much worse shape. It would not have been impossible for Mendeleev to achieve these goals, as he had connections in high places from an early age. For example, while in Germany in 1863, he borrowed a thousand rubles from his classmate, the future Minister of Finance, I.A. Vyshnegradskii, in order to smooth over his indiscretions. Furthermore, his later fame due to his discovery of the Table of Elements also ensured that his connections to the powerful would flourish. Because of this, it is impossible to portray Mendeleev as a lone romantic railing against corrupt officials in league with evil industrialists. The fact is that Mendeleev rubbed shoulders with the rich and powerful, at times took their money and used their influence to shield himself from the repercussions of his follies and belligerent personality. Just as important, he used their connections to forward his plans.

There is also one very large and obvious question that, although not the focus of this dissertation, should be briefly addressed: Was there a connection

between Mendeleev's thinking on the oil industry and later communist policy? On one major point, the answer is a very qualified yes. Mendeleev did believe in the role of science in developing industry, but this is to be expected from a scientist. It should be noted that while Mendeleev believed in the role of private ownership and markets, he also feared that they would result in monopolies. As it turned out, Mendeleev's fears proved correct and for a few years in the early 1880s, the Russian oil industry was a near monopoly in the hands of foreigners. In this regard, one might legitimately say that Mendeleev's thinking was partially linked with later communist thinking. The chief cause of this problem was the lack of large quantities of investment capital, and its absence in Russia hindered the oil industry's development. What sets Mendeleev apart from the Bolsheviks is his solution: allow foreign capital into Russia. The Bolsheviks would not have been impressed.

It can be stated unequivocally that Mendeleev would never have endorsed the Bolsheviks, their political and economic goals or the means they employed to achieve them. However, their co-mingling of science and industry in order to make Russia a wealthier state would have been Mendeleev's dream. Throughout his battles in the Russian oil industry, he continually faced men who lacked his scientific genius and were able to carry out policies that were wholly incorrect - according to him. The Soviet period gave a real place for scientists in the development of industry and beyond a doubt, Mendeleev would have completely agreed with this.

There has also been the argument made by Soviet scholars that Mendeleev courageously fought the monopoly that arose in the oil industry led by the foreign company of the Nobels and later by the Rothschilds.[9] This is only

partially correct. As happens all too often with any ideologically driven history, details which make evil deeds appear less ignomious, or even understandable are left out; important nuances are disregarded and minor events distorted into matters of great import. The fact is that Mendeleev's work on the Russian oil industry covered over forty years of intensive, detailed work; furthermore, he would quite willingly change his mind on issues, contradict himself, forget events – not always unwillingly - and distort facts. The result is that Mendeleev's work on oil provides ideologically driven historians the chance to portray him as either a friend of Adam Smith or Karl Marx.

Yes, Mendeleev did fight against the oil monopolies, but they appeared only briefly in the Russian oil industry during the early 1880s and fell apart just as quickly. However, he believed that the solution for this problem was the government ensuring that that there was competition in all things pertaining to the Russian oil industry. Yet he also believed that the state should intervene where market forces failed. In all justice to Soviet scholars, the Rothschilds and Nobels could not have cared less about Russia's development: their personal fortune was their only concern. In the largest and most importance sense, Mendeleev's greatest concern was the growth of the Russian oil industry. It also must be said that the capitalists working in the Russian oil business - Russian and non-Russian - frequently engaged in practices that might be charitably termed dubious, and that Soviet scholars are correct to harshly criticize their actions.

Finally, Mendeleev's work on oil has a whiff of impropriety to it, as his published suggestions – which the Russian government and public took very seriously - occasionally coincided with the interests of oilmen for whom he was

working at the time. However, it must be stated unequivocally that Mendeleev held these ideas *before* he was hired as an advisor; thus, his writings reflect both his own long-held views and those of the oilman who employed him. Nevertheless, Mendeleev at times skated on very thin ice morally: acting as an advisor to the government on the one hand and taking money from oil industrialists with the other. He was clearly no saint.

Perhaps the most telling lines of Mendeleev's illustrating the complexity of his thinking and the intrinsic difficulty in labeling him were made in his *K poznaniiu Rossii* (Towards an Understanding of Russia), published in 1906, one year before his death. Russia's well-being hinged on:

> two questions: where do we get the capital which is necessary for the growth of industry and how do we stave off the threat of growing European and American capitalism which is the reason for the rising pernicious (*pagubnaia*) utopia of communists and socialists.[10]

What exactly does this make Mendeleev? He clearly sees the need for further capital in order to develop the Russian economy, and especially the oil industry, but at the same time is concerned about Western capitalism. What would be its result? The "pernicious utopia of communists and socialists". Thus, for Mendeleev, the roots of communism and socialism lie in Western capitalism. Admittedly, Mendeleev is not here referring to philosophical antecedents, but instead to the results of the staggering economic growth of the previous quarter century, concomitant social tensions left unresolved by an incompetent tsar and the unflinching dedication of revolutionaries. Nevertheless, his view is certainly prescient. It is also clear that Mendeleev would never have agreed with the general plans or methods of the Bolsheviks.

Finally, there is something of great value in Mendeleev's work that has transcended time. In the twenty-first century, Russia faces a situation almost identical to that which occurred in the nineteenth century: Russia's oil industry has been hamstrung by serious problems involving taxation, strategic and political questions over where pipelines routes should be laid, instability in the Caucasus and, once again the absence of sufficient quantities of capital - Russian or Western.

Scholars wishing to study Mendeleev's life face a wealth of material in Russian and a relative paucity in English. For summaries of Mendeleev's discovery of the Table of Elements, in English, see: Loren R. Graham, *Science in Russia and the Soviet Union,* (Cambridge: Cambridge University Press, 1992), 49-53; as well, O. Benfey, "Precursors of the Mendeleev Table: The Pythagorean Spirit in Element Classification," *Bulletin for the History of Chemistry* 14 (1993): 60-66.; B. Bensaude-Vincent, "Mendeleev's periodic system of chemical elements," *British Journal for the History of Science* 19 (1986) 19: 3-17, and, "Mendeleyev: The Story of a Discovery," In *History of Scientific Thought,*. Michel Serres, ed., (Oxford : Blackwell Reference, 1995), 556-582; and J.W. van Spronsen, *The Periodic System of Chemical Elements; a History of the First Hundred Years,* (Amsterdam: Elsevier, 1969). See also: W. Brock, *The Norton History of Chemistry,* (New York: W.W. Norton, 1992), 314-326. Henry M. Leicester, "Factors Which Led Mendeleev to the Periodic Law," *Chimia,* 1 (1948): 67-74; and Don C. Rawson, "The Process of Discovery: Mendeleev and the Periodic Law," *Annals of Science,* 31 (1974): 181-204. The classic Russian text is B.M. Kedrov, *Den' odnogo veligo otkritia,* (Moskva: Nauka, 1958).

Much of Russian scholarship has focused on Mendeleev's discovery of the Table of Elements. There is practically no literature on Mendeleev outside of his scientific work. This is undoubtedly because his political and economic views, on the whole, did not correspond to Communist orthodoxy. For general biographies see: N. Figurovskii, *D.I. Mendeleev,* (Moskva: Akademia nauk, 1961), B.M. Kedrov, *Mirovaia nauka i Mendeleev,* (Moskva: Nauka, 1983), P.P. Ionidi, *Mirovozzrenie D.I. Mendeleeva,* (Moskva: Izd Akademia nauk SSSR, 1959), O. Pisarzhevskii *Dmitry Ivanovich Mendeleyev*, (Moscow : Foreign Languages Pub. House, 1954).

The works by M.N. Mladenstev and V.E. Tishchenko, *Dmitrii Ivanovich Mendeleev, ego zhizn' i deiatel'nost'*. Volume I (Moskva: Izd. Akademii nauk, SSSR, 1938) as well as their *Dmitrii Ivanovich Mendeleev, ego zhizn' i deiatel'nost': universitetskii period, 1861-1890*, (Moskva: Nauka, 1993), are invaluable. Their studies contain a very good and very sympathetic outline of Mendeleev's personal and professional endeavours. They also reprint many personal letters between Mendeleev and his friends, foes and benefactors. Their work is enriched by the fact that Tishchenko knew Mendeleev. The history of *Dmitrii Ivanovich Mendeleev, ego zhizn' i deiatel'nost': universitetskii period, 1861-1890* is very interesting. Completed just before the Great Patriotic War, it was not published during this period for obvious reasons. Afterwards, it lay tucked away at the Academy of Sciences, most likely forgotten, until recently. Also extremely useful is A. Storonkin's, *Letopis' zhizni i deiatel'nosti D. I. Mendeleeva,* (Leningrad : Nauka, 1984).

The late nineteenth century saw a great deal of interest in the Baku oil industry by Western journalists. See for example: J.D. Henry's *Baku and*

Eventful History (London: Archibald Constable and Co., 1905) as well as his *Thirty-Five Years of Transport; the Evolution of the Tank Steamer* Bradbury, 1907. As well, Charles Marvin *The Region of the Eternal Fire: An account of a Journey to the Petroleum Region of the Caspian in 1883,* (London: W.H. Allen, 1888) and his *Baku: The Petrolia of Europe,* (London: R. Anderson and Co., 1881); as well as his *Gallenga A Summer Tour in Russia,* (London: Chapman & Hill, 1883). Edward Stack, *Six Months in Persia,* (London : Sampson Low & Co., 1882) A. Beeby Thompson's, *The Oil Fields of Russia and the Russian Petroleum Industry: A Practical Handbook on the Exploration Exploitation and Management of Russian Oil Properties.* 2nd ed., (London: Crosby, Lockwood and Son, 1908); The "Russian Petroleum Industry," in, *Engineering: An Illustrated Weekly Journal,* 37 (1884) includes interesting material on the Baku oil industry from an engineering viewpoint. Edmond O'Donovan, *The Merv Oasis* (London: Smith, Elder and Company, 1882).

These works provide a general journalistic account of the region and the oil industry. However, it should be kept in mind that the authors are foreigners in this area and much of what they say is slanted. They are weakest when dealing with the ethnic complexity of the region, and the reader must be wary with any information they impart on this issue. Furthermore, they are too well disposed to the Western business in the region, less so towards Russians and wholly ill disposed to the people from the Caucasus. And unfortunately for the present dissertation, they ignore Mendeleev's contributions to the region. Nevertheless, those wishing to understand the origins of this region's industry must consult these works.

Post-Revolutionary works include: Paul Apostle's, *La Lutte Pour Le Pétrole et La Russie,* (Paris: Payot Cie, 1922). This provides a brief section on the Russian oil industry up to the Revolution. Robert Tolf's *The Russian Rockefellers: The Saga of the Nobel Family and the Russian Oil Industry,* (Stanford, Calif.: Hoover Institute, 1976), gives a good account of the Nobels' invaluable contribution to the Russian oil industry. Its greatest limitation is the absence of Russian sources, a major drawback. It also ignores Mendeleev's own contributions.

Soviet scholarship on Mendeleev and oil is limited to V.I. Parkhomenko's work and an Azeri, D.I. Zul'fgaly, "D.I. Mendeleev v razvitii otechestvennoi neftianoi promyshlennosti," *Izvestiia Akademii Nauk Azerbaidzhanskoi SSR,* January(1955), 11-19. As mentioned throughout this dissertation, Parkhomenko's *D.I. Mendeleev i russkoe neftianoe delo,* (Moskva: Akademia nauk, 1957) is an indispensable resource for those wishing to understand Mendeleev's technical recommendations. For the most part it is solid and stolid, worth the occasional inappropriate comment about Lenin added for no logical reason. However, it suffers from lacunae, relies exclusively on the *Sochineniia* and was hampered by the times in which he worked. As a result he completely ignores - willingly or unwillingly - Mendeleev's rather pro-business orientation, openness to the West and its capital, amongst many other aspects. See as well his articles, "Programma D.I. Mendeleeva sozdaniia bol'shoi neftianoi promyshlennosti v Rossii." *Neftianoe khoziaistvo,* 6 (1952): 60-64. Parkhomenko, "Pervye novatorskie predlozheniia D.I. Mendeleeva v neftianoi promyshlennosti" *Neftianik* February (1957): 30-31. See as well, A.V. Topichev, "Vklad D.I. Mendeleeva v nauku o nefti." *Uspekhi khimi* 22 (1953):

1169-1187. From an Azeri perspective see, D.I. Zul'fgaly , "D.I. Mendeleev v razvitii otchestvennoi neftianoi promyshlennosti," *Izvestiia Akademii Nauk Azerbaidzhanskoi SSR*, January(1955), 11-19.

There has been recent scholarship on the Russian oil industry by John P. McKay, "Entrepreneurship and the Emergence of the Russian Petroleum Industry, 1813-1883," in *Research in Economic History*, 8 (1983): 47-89, "Foreign Enterprise in Russian and Soviet Industry: A Long Term Perspective," *The Business History Review*, 37 (Autumn, 1974): 33-56, as well as, "Baku Oil and Trans Caucasian Pipelines, 1883-1891: A Study in Tsarist Economic Policy," *Slavic Review*, 21 (1985): 604-623. Francis Stackenwalt is the author of an unpublished dissertation, "The Thought and Work of Dmitrii Ivanovich Mendeleev on the Industrialization of Russia, 1867-1907" (University of Illinois, Urbana, 1976), which includes a brief section on the Russian oil industry. He has also recently published an article, "Dmitrii Ivanovich Mendeleev and the Emergence of the Modern Russian Petroleum Industry, 1863-1877," *Ambix*, 45 (1998): 73-94. Both works examine Mendeleev's economic thinking and rely on non-archival material.

Western scholars are beginning the monumental task of examining Mendeleev's work outside of the Table of Elements. Using almost exclusively material from his Collected Works, the interpretation of Mendeleev's work as a whole has just begun. See: B. Almgren, "D.I. Mendeleev and Siberia," *Ambix,* 45 (1998): 53-69, R. E. Rice, "Mendeleev's Public Opposition to Spiritualism," *Ambix*, 45 (1998): 85-95, M.D. Gordin, "Making Newtons: Mendeleev, Meteorology and the Chemical Ether," *Ambix,* 45 (1998): 96-115.

The history of the Mendeleev Archive used in this dissertation is complicated. The documents were removed from the archive for a period during Soviet times and eventually reassembled. More than one person has assembled its catalogue so a variety of styles are in use. Fortunately, the present head archivist, Nina Karpilo has an excellent understanding of the documents. There is an excellent card catalogue that was heroically put together by a scholar, as his life's work. The Archive contains almost all the correspondence that Mendeleev is known to have received and many of the draft copies of his work. Furthermore, there are countless photographs and personal letters in the Archive. It is a treasure trove for scholars.

[1]Loren R. Graham, *Science in Russia and the Soviet Union: A Short History* (Cambridge: Cambridge University Press, 1993), 45.

[2]See: Bibliographic Essay.

[3]His great discovery was publicly announced by his assistant in 1869, while Mendeleev was away at a cheese exhibition.

[4]Graham, 45.

[5]*Ibid.*, 300.

[6]Until recently, scholars have not had full access to this material.

[7]V.I. Parkhomenko, *D.I. Mendeleev i russkoe neftianoe delo,* (Moskva: Akademiia nauk, 1957), 7.

[8]His 1876 trip to America, however, did provide some room for scathing commentary on multi-party democracies.

[9]Parkhomenko, 9.

[10]D.I. Mendeleev. *K poznaniiu Rossii* (Saint Petersburg: Izd. A.S. Suvorina, 1906), 97.

Chapter One:

Mendeleev's Youth

MENDELEEV'S CHILDHOOD

Dmitrii Ivanovich Mendeleev was the last of seventeen children born in Tobol'sk Siberia January 27, 1834, to Ivan Pavlovich Mendeleev and Maria Dmitrievna Kornil'eva.[1] Mendeleev's father was the fourth son of a priest, P.M. Sokolov. As was the custom at the time, children of priests did not necessarily take their fathers' name. I. P. Mendeleev was given the family name of a neighbouring landowner. In 1804, he finished seminary school in Tver' and went to St. Petersburg to study at the *Glavnyi Pedagogicheskii Institut* (Main Pedagogy Institute). After finishing at the top of his class, he received work in Tobol'sk, teaching philosophy and political economy. He married Maria Dmitrievna Kornil'eva in 1809. They lived in Saratov from 1823 until 1827 where he worked as the director of an institute. Returning to Tobol'sk in 1827 he began his job as director of the gymnasium.

Mendeleev was from a well-established family of Russian manufacturers with deep roots in Siberia. William Brock writes, "Mothers usually get short shrift in the history of science, but Mendeleev's Mother, Maria Kornil'eva, as he recognized, was an extraordinary woman."[2] It was believed that one of her ancestors was Tatar "and her children were proud of their semi-Asiatic and Siberian background".[3] Kornil'eva's family had done relatively well in paper and glass factories in the region and had established a printing office in 1787, the same year as Benjamin Franklin. The family's social status improved to the point that it was permitted to purchase three hundred serfs. Maria Dmitrevna's family experienced financial hardships in large part due to the death of her mother during childbirth – she would subsequently be raised by a serf nanny - and the later illness of her father. After years of improving their social position,

their misfortunes resulted in a decline in their social status from merchants (*kuptsy*) to townspeople (*meschchane*).

Although extremely intelligent, as a woman she was not able to attend school; furthermore, the lack of money made it impossible for her to receive home tutoring. Her brother, V.D. Kornil'ev, however, having the good fortune of being both clever and male, studied at Moscow University. In letters to her sister she indicated her desire that her three sons be educated outside of Siberia. As Beverly Almgren correctly points out, "it seems most likely that it was her driving ambition, not his, that got him out of Siberia".[4] Mendeleev writes of his mother:

> She instructed us by example, corrected with love and in order to devote him [Mendeleev], left Siberia with him, spending her last resources and strength.[5]

Her inheritance of one of Siberia's largest collections of books and marriage in 1809 to a teacher undoubtedly broadened her fertile mind. Family letters present her as very strong-willed and highly dedicated to education. Mendeleev's later contributions to women's university education – which were made in conjunction with his friend, Alexander Borodin - plausibly had some roots in his mother's particular circumstances.

The Mendeleevs also received houseguests, some of whom were members of the exiled Decembrists; his sister, Olga, would marry one of its members, N. V. Basargin. Dmitrii Mendeleev also appears to have developed a youthful friendship with him. "While Dmitrii lived in Tobol'sk, they often met and later often wrote to each other."[6] Mendeleev would later recount fond memories stating, "They [the Decembrists] were much respected by all . . . The tradition of them lives to this time in Tobol'sk."[7]

Mendeleev's education began at home under the tutelage of his mother. Between the ages of seven and fifteen, he studied at the local gymnasium where his work was mediocre at best. His best results were in physics, mathematics, history and geography. His school records also indicate that that Dmitrii was frequently ill behaved. One of the teachers at gymnasium was the well-known poet Petr Pavlovich Ershov, who authored *Konek-Gorbunok* (The Humpback Horse) in 1834. Ershov counted among his friends A.S. Pushkin, P.A. Pletnyov and V.A. Zhukovskii. Ershov would also befriend the Mendeleevs.[8] Dmitrii Mendeleev thus grew up in a culturally rich environment.

Mendeleev's father, however, suffered from cataracts and was forced to retire from the gymnasium. In 1837, Ivan Pavlovich Mendeleev and his daughter, Elizabeth, traveled to Moscow for an operation in an attempt to improve his fading eyesight. They stayed with Ivan Pavlovich Mendeleev's brother-in-law, V.D. Koril'ev, who was a member of the Moscow intellectual circle. As a result, his house frequently saw famous guests such as N.V. Gogol (whom D.I. Mendeleev would meet in the Winter of 1850), F.N. Glinka, as well as A.S. Pushkin's father, S.L. Pushkin. Koril'ev was also well acquainted with the powerful Prince N.S. Trubetskoi. Dmitrii Mendeleev seems to have adopted his uncle's ability to make connections with the famous and powerful.

During his trip to Moscow, Ivan Pavlovich Mendeleev and his daughter Elizabeth met S.L. Pushkin. In her journal she recounts the meeting:

> There I saw the father of Pushkin . . . The first time, while Pushkin was still alive, I asked him if he was waiting for his son from Petersburg. He responded, "I don't think he is going to arrive soon". Soon there was the horrible news about his death[9]

Because of the family's serious financial problems, Maria Dmitrievna decided to reopen one of her family's glass factories that had lain dormant for several years. With her increasingly blind husband and large brood of children, she moved to the factory, which was located seventeen kilometres from Tobol'sk. It was as the child of a factory owner that "the foundation of Mendeleev's lifelong commitment to helping foster industrial development in Russia"[10] was laid. Mendeleev would write, "It was at the glass factory which was directed by my mother that I received my impressions of ... industry."[11] Graham also writes that the destruction of the glass factory "may be one of the reasons that, throughout his life, Mendeleev was interested in the relationship of technology to economic development."[12]

In 1899, Mendeleev favourably commented on another "true Siberian woman with great business ability, since she, when her husband became ill, herself ran the trading (iron) business, just as my mother after her sickness and then death of my father ran the factory, supported the children and brought up the children." Mendeleev also stated, "Without the cursed 'woman question' the true Russian woman keeping all her femininity, has since long ago past known how to manage practical affairs."[13] This dissertation addresses Mendeleev's relationship with women only as it relates to his financial and emotional state when working on the Russian oil industry. That it was extremely complex is partially revealed in the above statements.

A final note on Mendeleev's Siberian roots: His place of birth was not unimportant as he considered his hometown to be an outpost of Western civilization in this Asiatic part of Russia. Russia acted as a 'civilizing' force in

the region. Mendeleev commented on the Asiatic quality of Russia in *K poznaniiu Rossii* (Towards an Understanding of Russia). He states:

> I myself am Siberian by birth, that is, I come from Asiatic Russia. I even think that in the future Asiatic Russia is destined to play no small role in the world. Thus, I do not at all, in any way, feel inclined to assert superiority over Asia, knowing that all European culture – especially state structure - has come from its cradle. But nonetheless in the present epoch Russia is completely and in all respects a country primarily European and only to a subsidiary degree Asiatic.[14]

It is interesting to note that he clearly states that Russia was "primarily European", but does not belittle the importance of the Asian influence.

ADMISSION TO UNIVERSITY

The final titanic act of Mendeleev's mother came after the glass factory was destroyed by fire in 1849, the same year that he graduated from the gymnasium. Determined to get her son admitted to Moscow University, she sold all her assets and travelled across Siberia with Dmitrii and Elizabeth. Upon arriving in Moscow she moved into her brother's house and immediately began trying to gain admission to the prestigious university for Dmitrii. They faced a serious problem: because they were from Siberia he should have attended Kazan University.

Throughout the winter of 1849-50 her brother used all of his contacts, but Dmitrii was refused admission to Moscow University. Instead, her brother suggested that Mendeleev work as a clerk in the Moscow Governor's office. She absolutely refused. Dmitrii was going to receive a higher education. With no

other avenues open to them, Maria Dmitrievna decided her family was going to leave Moscow to try their luck in St. Petersburg in the spring of 1850.

Mendeleev took the entrance exam at the *Glavnyi Pedagogicheskii Institut* (The Main Pedagogy Institute). With the help of his father's friends, he gained admission to the physics and mathematics department. His mother's goal of his receiving a higher education was now fulfilled after great effort. Tragically, she died shortly after in the fall of 1850, when Mendeleev was only sixteen. Within the next two years, his sister Elizabeth and his uncle V.D. Kornil'ev would also pass away. Furthermore, Mendeleev's own health became weak during the fall of 1852 and winter of 1853.

The institute - founded in 1804 and part of St. Petersburg University since 1816 - was considered an excellent place of higher learning, and included amongst its graduates, N.A. Dobrolyubov, who studied at almost the same time as Mendeleev. Upon entrance, Mendeleev was given the choice of either a three or five year course of study; he chose the latter. In spite of the personal tragedies that befell him, as well as his own ill health, he quickly became one of its best students. For the 1854/1855 academic year, his grade point average was 4.86 out of a possible five.

In the physics and math faculty, Mendeleev also studied a wide range of humanities courses including: Russian literature, French and German languages logic and psychology. However, he focussed on mathematics. One of his teachers was the famous Russian mathematician, M.V. Ostrogradskii. In later years he would study with A.A. Voskresenskii, the mineralogist, S.S. Kutorga, the botanist, I.O. Shikhovskii and the zoologist, F.F. Brandt. In the final two years of Mendeleev's study he had to choose between the fields of mathematics

and natural sciences; he chose the latter. During this period he studied chemistry, mineralogy, botany, zoology and government institutions.

Mendeleev's dissertation *Izomorfizm v sviazi s drugimi otnosheniiami kristallicheskoi formy k sostavu* (Isomorphism in connection to the relationships of the crystal form towards the compound) was well accepted and portended his later work on the Table of Elements. Mendeleev also did very well with his exit exam and the chemist, Yu. F. Fritsshe, suggested that he continue with his research. Fritsshe also suggested to the director of the institute that Mendeleev should receive a university post in the future.

Although Mendeleev had the opportunity to stay at the institute, it was believed that his poor health was threatened by St. Petersburg's climate. As a result, it was decided that he should work in the Crimea. The original plan was to go to Odessa, but because of a bureaucratic mistake at the Ministry of Education, he was sent to Simferopol'. Although Mendeleev vociferously protested, the mistaken decision would not be changed.

Upon his arrival in Simferopol' at the beginning of October 1855, Mendeleev discovered that its gymnasium had been closed due to its proximity to the Crimean War battlefields. This encouraged Mendeleev to begin plans to return to St. Petersburg to continue his research. While in Simferopol' the chemist learned from a friend that a post existed in Odessa, his original destination, and he received permission to work there. At the end of October, he left Simferopol' for Odessa.

At Odessa he began teaching mathematics, physics and other natural sciences in the gymnasium. He also continued with his research and began writing his master's dissertation. In January 1856, his undergraduate dissertation

was published in St. Petersburg, and in February a continuation of this work was published in *Gornyi Zhurnal'* (Mineral Journal). Mendeleev first showed his predilection for travel when he wrote to the director of the Main Pedagogy Institute, M.A. Papkov, in April asking that he be included amongst a group of scholars who were to travel abroad for research purposes. The director agreed to Mendeleev's request, but it appears that the trip did not actually take place.

Mendeleev might have remained in Odessa for health reasons if his doctor from St. Petersburg, N.F. Zdekauera, had not contacted the famous Russian surgeon, N.I. Pirogov, who was working in Simferopol', to request that he examine the young chemist. Pirogov did so and told Mendeleev that his health was not in danger and that he could safely return to St. Petersburg. At the end of April 1856, Mendeleev left Odessa. For three weeks throughout the month of May, Mendeleev took a series of gruelling exams at St. Petersburg University in the fields of physics, mathematics, mineralogy and land surveying. In September, he successfully defended his Master's dissertation *Udel'nye obëmy* (Specific Volumes). The "grandfather of Russian chemistry," A.A. Voskresenskii, was on his defence committee, and he was very impressed by Mendeleev. Throughout September and October his dissertation was published in *Gornyi Zhurnal'* (Mineral Journal) and in November, Mendeleev began lecturing at St. Petersburg University. It was during this time that Mendeleev developed a romantic interest in Sof'ya Kash, the daughter of a friend from Tobol'sk. Throughout 1857 very little happened to Mendeleev professionally. During much of the month of June, he spent a great deal of time with the young Sof'ya; in August she announced to Mendeleev that she would not marry him.

On April 12 1858 Mendeleev received a letter from N.A. Dobrolyubov inviting the Russian chemist to a social gathering.[15] It is incorrect to assume that this is proof that Mendeleev was a proto-revolutionary. This was not the case. As will be discussed, Mendeleev was absolutely opposed to the idea of revolution, but he nevertheless was an acquaintance of one.

In late 1858 the physics and mathematics department forwarded Mendeleev's name to the university for further research abroad. In 1859, his university agreed and on April 14, 1859, Mendeleev left Saint Petersburg for Germany, arriving in Heidelberg, his place of study, on May 22, 1859.

Although his nearly two year study abroad, from May 1859 until February 1861, was crucial for his professional development, doing research in laboratories and making professional contacts, it was also marked by constant trips around Europe. It might be said that Mendeleev developed wanderlust; unquestionably, he was very curious about Western cultures. Immediately after arriving in Heidelberg, he quickly departed from Germany for a brief vacation in Paris and returned to begin his research in late June.

While he was studying in Heidelberg, he was part of the Russian émigré group. R.B. Dobrotin states:

> It was very important in the formation of Mendeleev's worldview during these years, his relationship with the group of young Russian progressive students who were working during this period abroad. Several of Mendeleev's close friends (for example the chemist V. Olevinskii) had close connections with Russian revolutionary émigrés, such as A.I. Herzen. Mendeleev was constantly part of a circle of young Russians who met in the home of the cousin of A.I. Herzen, Tat'yana Petrovna Passek, who was living at that time in Heidelberg.[16]

In fact, Mendeleev was like Herzen: Both men were simultaneously proudly Russian and also open to certain Western ideas.

During the Christmas break of 1859, Mendeleev once again travelled to Paris and Strasbourg with his friend, the Russian scientist and composer, Alexander Borodin. During this trip, Mendeleev also visited the Paris Academy of Sciences, where he undoubtedly learnt of Lavoisier's many achievements. By early January 1860, he was once again in Heidelberg. In September of that year, he took part in an international chemistry congress in Karlsruhe.

Throughout 1860, he continued his research in Heidelberg and once again travelled extensively for personal reasons. In February, he took a trip to Frankfurt for a rest and in April he went to Wiesbaden. In May he took a sightseeing vacation in Italy. During September he was in Hamburg for a brief rest. For over a month's period from late October until late November, he travelled around Switzerland and Italy, where he saw the Italian revolutionary Garibaldi. Finally, in February 1861 he left for St. Petersburg. His first visit upon returning home was to his powerful mentor, A.A. Voskresenskii.[17]

Upon his return, Mendeleev found himself in rather poor financial circumstances, with a personal debt of 1000 rubles to his former schoolmate - and future Minister of Finance - I.A. Vyshnegradskii, and with no job.[18] He was officially placed on staff at the University of St. Petersburg, but it was a position without salary. As the academic year was already in full- swing, Mendeleev could find no other posts and survived until September 1861 translating German technical works into Russian.[19] For the 1861/1862 academic year, Mendeleev cobbled together several teaching positions around St. Petersburg giving twenty lectures a week.[20] Because of the extremely demanding schedule, he did little

research during this period. In April 1862, he did find time, however, to marry his first wife, Feozva Nikitichna Leshcheva, a woman eight years his senior. During the summer of 1862, the two traveled around Europe ostensibly for research purposes.[21]

At the beginning of 1863, Mendeleev received a request from the government to work on spirits. This work would later be expanded and would become his doctoral dissertation. In March of 1863, the Mendeleevs' first child, Maria, was born. After two years of academic odd jobs, Mendeleev finally received paying positions at both the University of St. Petersburg and the Technology Institute for the 1863/1864 academic year. This allowed Mendeleev to give up some of his other teaching responsibilities and focus on his dissertation.[22] It was in the summer of 1863 that Mendeleev first worked in the Russian oil industry.

[1]Some scholars say there were eleven children, while others believe that there were seventeen. All dates in this dissertation are old style, twelve days behind the Western calendar. Information for this chapter comes from R.B. Dobrotin and N.G. Karpilo, *Biblioteka D.I. Mendeleeva,* (Leningrad: Nauka, 1980), 20-45.

[2]W.Brock, *The Norton History of Chemistry,* (New York: W.W. Norton, 1992), 312.

[3]Loren R. Graham, *Science in Russia and the Soviet Union: A Short History,* (New York: Cambridge University Press, 1993), 45.

[4]B. Almgren, "D.I. Mendeleev and Siberia," *Ambix* 45 (1998): 53.

[5]Brock, 312.

[6]Dobrotin, 27

[7]Almgren, 52

[8]Dobrotin, 26-27.

[9]*Ibid.,* 28.

[10]Almgren, 54.

[11]Dobrotin, 26.

[12]Graham, 47.

[13]Almgren, 54. Her translation.

[14]D.I.Mendeleev, *K poznaniiu Rossii*, (Sankt Petersburg: Izd A.S. Suvorina, 1906), 143.

[15]A.V. Storonkii, ed., *Letopis' zhizni i deiatel'nosti D.I. Mendeleeva.* (Leningrad: Nauka, 1984), 51. N.A. Dobrolyubov (1836-1861) was a Russian revolutionary writer.

[16]*Ibid., 53.* See as well, K.M. Borisov, "A.I. Gertsen i D.I. Mendeleev," *Voprosy filosofii*, 4 (1962): 62-69. and T.S. Kudriavtseva, "O konspekte D.I. Mendeleeva 5-go i 6-go 'pismo D.I. Mendeleeva ob izuchenii prirody Gertsena," *Voprosy filosofii*, 4 (1962): 62-63.

[17]Dobrotin, 110. Mendeleev also had a portrait of Garibaldi on his desk.

[18]The reasons for the loan are not clear. There are hints in Soviet studies that Mendeleev had incurred these debts for academic expenses. In fact, the youthful and energetic Mendeleev had been a little too youthful and energetic, at least once, and had gotten a rather young German girl pregnant. Needless to say

Mendeleev, who was in his mid-twenties at the time, was in hot water for his indiscretions with a girl in her mid-teens. We do not know if the money was to pay off the girl's parents or to provide financial support for the mother and child. His (more than likely) illegitimate daughter was named Roza.

[19]Storonkii, 74-75 and 85.

[20]V.I. Tishchenko and M.N. Mladentsev ed., *Dmitrii Ivanovich Mendeleev ego zhizn' i deiatel'nost', universitetskii period.* (Moskva: Nauka, 1993), 20.

[21]Storonkii, 79.

[22]Tishchenko, 43.

Chapter Two:

Mendeleev's First Foray

"Russia cannot move forward without the help of capital, it is impossible for the growth [of industry] to occur without capital from the government or without foreign capital in private industry."

D.I. Mendeleev[1]

" . . science and industry- these are my dreams".

D.I. Mendeleev[2]

The purpose of this chapter is to examine Mendeleev's first trip to study the oil industry. From 1863 to 1866, Mendeleev worked as a consultant for the wealthy Old Believer industrialist, V.I. Kokorev.[3] During these three years Mendeleev provided advice to Kokorev on how to improve his oil plants which had been constructed in the 1850s in the Baku area. Mendeleev's association with this industrialist would not fade as, whenever he wrote on the Russian oil industry, he would inevitably mention his former benefactor.

As a young scientist, Mendeleev was several times tempted to give up his relatively low-paying academic position in order to work full-time in the oil industry for much more money.[4] In the end, he did not, but if he had chosen to do so there would have been little if any time left over for serious research, including his work on the Table of Elements.

Work on this period has been sketchy and incomplete at best. Figurovskii's biography of Mendeleev notes that "there was almost no trace," of this trip in the

archives of the great chemist.[5] On this point Figurovskii is wrong. Even V. I. Parkhomenko's study of Mendeleev's involvement in the Russian oil industry, *D.I. Mendeleev i russkoe neftianoe delo* (D.I. Mendeleev and the Russian Oil Industry) is flawed in this respect. It relies almost exclusively on a single volume of Mendeleev's collected works and employs very few of the other published sources which were available. In this eight-hundred page volume there is almost no information about Mendeleev's crucial first endeavors in the Russian oil industry during the period from 1863-1865. The missing material has proven to be important.

Most of the material used in this chapter has not been previously explored by other scholars. It ranges from his first wife's diaries, letters to his wife during his 1863 trip to Baku, letters to government officials, signed contracts, preliminary agreements, technical reports and rough drafts of his views on the Russian oil industry. There are also his account books. Throughout his life Mendeleev almost without fail noted most of his purchases and expenses whether it was for tea or property. They also reveal his income, which during these three years was substantial.

This new material also contradicts one very important theme in Parkhomenko's work. He argues that Mendeleev had forsaken the "path of the business-capitalist owner of plants and factories, of bank stocks or railways."[6] For the period studied this is incorrect. In fact, he was part of this milieu. Mendeleev's class origins were, in the broadest sense, bourgeois, and there is no indication that he

ever abandoned the values or beliefs – most particularly the idea of private ownership of property, which is what Parkhomenko is suggesting here.

On Saturday, August 17, 1863, Mendeleev was sitting at home with his wife, Feozva Nikitichna, enjoying a cup of tea, having returned home early from their dacha because of the apparent mild illness of their daughter Maria, when a servant of Kokorev arrived with an invitation to visit the industrialist.[7] That same day Mendeleev went off to meet with Kokorev. On returning he explained that he had been invited to go to the Caucasus to examine Kokorev's oil refinery near Baku which had become less profitable since the influx of cheap American kerosene.

For a few weeks of work, he was to earn a thousand rubles, much more than his monthly salary which at that time was only fifty-eight rubles. He also added that there might be the opportunity to direct a refinery in the region for Kokorev. Writing in her diary, his wife said that it "struck me as fine but [I] burst into tears". However, when Mendeleev told her of the prospect of working in the Caucasus, she quickly dug in her heels and said that she would in "no way agree".[8] It is impossible to know whether she was against her husband directing the factory, moving to the Caucasus, or both. What is more understandable is that D.I. Mendeleev would have been interested in earning extra money, especially at that point in his life, lacking independent financial means and with a new family.

Mendeleev left for Baku three days later via Moscow, Nizhnii Novgorod and onwards aboard a ship along the Volga for this twenty-eight day trip. Although Mendeleev did not keep a diary that year, he did write a series of letters to his wife during the trip which provide insight into his relations with Kokorev and the reasons

why he was interested in the oil industry. It becomes apparent from reading these letters that he was in awe of the Russian industrialist.[9]

Mendeleev was an extremely curious and rather cosmopolitan individual, at least in his reading. In his notebook, he wrote that during this trip he purchased books in Russian, German and French. The notebooks also reveal that, as he did on all his trips, Mendeleev took copious notes on the distances between towns, on technical information and production costs.[10] Traveling to the south of Russia, he also purchased a revolver.[11]

On August 23, Mendeleev wrote to his wife from Nizhnii Novgorod and recounted his trip to date. In Moscow he had stayed at Kokorev's mansion and was truly impressed that it was "huge, costing two-million, and not yet complete. There are (it is across the Moscow River from the Kremlin) four hundred rooms for guests and many warehouses for goods." The entire building was "constructed absolutely superbly".[12]

A few days later, on board a ship along the Volga, he was also impressed with the luxurious accommodations provided by Kokorev. "I am traveling in first class, a large divan, nice room, everything is comfortable. For the first-class passengers there is a huge hall upstairs". Mendeleev, however, was not only concerned with his own luxury but also about money for his family. Perhaps a bit disingenuously, he implored his wife "I repeat again - don't spare money on your comforts, don't spare money for your comfort, remember that I am travelling so that things will be better for you". Concerned that she did not have enough money on hand at the time he suggested that she "cash in some coupons ... that should give you

about forty-five rubles."[13] In reading his wife's diaries from this period, it is apparent that she was not interested in luxuries and had been more than content with their lifestyle before his trip. Instead, the concern for these items lay much more with Mendeleev himself.[14]

While his statements that he was traveling for his family's sake might be lacking in candor he was definitely concerned for his family. Towards the end of August he writes "God give you only peace and health to you, my love, and my little angel Masha ... Take care of her, take care of her". Mendeleev also appears to have been trying to change her mind about directing an oil factory near Baku. "[W]ith you and Masha we could have lived here. Although Baku has a lot of Tatars, it is orderly, and the view of and from the sea, is a wonder."[15]

Mendeleev's extra-curricular activities for the oil industry even during this brief trip had started to interfere with his teaching commitments. He wrote to the university that he would not arrive on time for his teaching duties.[16] It is unknown how the Rector reacted to the late arrival of the newly appointed professor. It is reasonable to assume that if this brief foray into Russian oil had encroached on his professorial duties, that a full time commitment would have precluded substantial research.

In his last letter to his wife during this trip, dated September 20, he complained that it was taking a long time to receive her missives, stating that the last one he received was dated August 26. He again implored her to ensure that his "little Masha" would "bloom and be in comfort".[17] Mendeleev's daughter had died September 1. [18]

The work proved to be very lucrative. On August 20, 1863, he received six hundred rubles from Kokorev, and on October 19 he received an additional 725 rubles "from Kokorev ending the work on the trip to Baku."[19] There is also an additional note in his account ledgers about money received from another acquaintance of Kokorev, a man named Beckman, on September 23, for a sum of two hundred rubles, also for work in the oil industry. Finally, there is a curious entry on October 10, 1863. Mendeleev writes that he received "from Schnauer for the testing of a weapon/apparatus (*snariad*) 5,000 rubles".[20]

From the examination of the letters, diary entries and account books from this one trip, it is evident that Mendeleev was very interested in the oil industry, or at least the money which could be obtained from it, and may have hoped that his wife might change her mind. Although there is no other information concerning the Mendeleev's emotional state after the tragic loss of their daughter, it is not unreasonable to suggest that, at least temporarily, it might have kept him in St. Petersburg. As for his views on the oil refinery, Mendeleev apparently gave an oral report to Kokorev. He would publish a very brief summary seventeen years later. [21]

Mendeleev made four suggestions to Kokorev: First, the chemist suggested that a pipeline be built from the oil well to the factory and from there to the sea; second, that ships be constructed to carry the oil and kerosene along the Caspian to the Volga; third, that the refining plant operate twenty-four hours a day; and, finally that Kokorev's refinery be moved to Nizhnii Novgorod.[22] These technical suggestions, it will be shown, although important, reveal only part of his work for Kokorev during this period.

Mendeleev would later write that prior to his arrival, Kokorev had "lost a lot of money from this business," and, in fact, that the plant was to be closed if it did not quickly turn a profit. According to Mendeleev, it was because of his technical recommendations that it "began to make money, in spite of the fact that the price of kerosene began to fall."[23]

Kokorev was so impressed with Mendeleev's work that he immediately took up one of his suggestions. Kokorev suggested that Mendeleev become technical director of a new oil refinery to be built near Nizhnii Novgorod. The agreement, dated November 25, 1863, sets out the terms for his employment as technical director of a refinery to be built with Kokorev's own money.[24]

Most importantly, Mendeleev would have been able to continue his university work. The contract clearly specified that Mendeleev was to have worked at the plant in the summer of 1864, and then as time permitted during the winter months.[25] Although it would have taken up some of Mendeleev's time, it is possible that he still might have discovered the Table of Elements. It also might have proven to be more attractive from a personal standpoint, as he would not have had to move his family.

The contract would have proven to be a windfall for the chemist. It called for Mendeleev to receive two hundred and fifty rubles a month from October 1863 until April 1864; from May 1864 until the oil refinery was profitable, no later than May 1867, he was to receive five hundred rubles a month.[26] He could have become a very wealthy man. However, once the refinery was profitable, and under certain conditions, Mendeleev stood to receive 30,000 rubles.[27] This document also points

to something of importance for the near future: the oil was to have come from either Astrakhan or Cheleken. Something must have happened during this period, as after Mendeleev took a trip to Nizhnii Novgorod (April 8 to 13, 1864), he reneged on the agreement.[28]

Almost a year later, Mendeleev again seriously considered working in the oil industry. The location was to be the same, but the conditions were very different. The refinery again was to have been built near Nizhnii Novgorod, except that this time he was not merely the plant's technical director, but one of its owners.[29] The project - from either late 1864 or early 1865 - was between Kokorev, Mendeleev and a man named Kovan'ko.[30] This very detailed, but unsigned document, specifically states that "Kovan'ko and Mendeleev are obligated to build near Nizhnii Novgorod a plant to refine oil into *fotonaftil'* ".[31] Kokorev was to have provided the capital which was to have been upwards of 500,000 rubles.[32] In return, Mendeleev and Kovan'ko were to pay the money back to Kokorev over a span of two years, from 1871 until 1873. As well, they were to provide Kokorev with a set amount of *fotonaftil'* for a fixed price until 1876. The contract also permitted them to produce other non-*fotonaftil* products at the plant.[33] Once again, after rather extensive preliminary work, Mendeleev changed his mind and decided not to take up the offer.[34]

Mendeleev had again considered working in the oil industry. More precisely, in this particular instance, he considered becoming the owner of an oil refinery. The deal could have made Mendeleev very rich, if he and his partner had been able to produce the required product below the price at which they had agreed

to sell it; he could have also gone bankrupt, if they failed to do so. It was a win-win proposition for Kokorev. He would have received the oil product he wished at a fixed price, plus interest on his loan. If Mendeleev and his partner failed to live up to the terms of the contract, they could have been forced into bankruptcy by Kokorev according to the Russian laws of the time. As Russia still had debtor's prison, bankruptcy was a serious concern. It is reasonable to suggest that with the stakes so high, Mendeleev would most likely have given up scientific research. It is also interesting to note that Mendeleev was rather elliptical about these opportunities in later writings. He would later write that Kokorev "could not transfer his business [refinery] to Nizhnii Novgorod, although he agreed with the usefulness of the suggestions."[35] This type of statement, rather lacking in candor, is not atypical for Mendeleev.

The final instance when Mendeleev was tempted to leave the serious study of science during this period may be found in a letter co-authored by Mendeleev and Kokorev. The letter, dated March 15, 1865, is a proposal to the Adjunct-Governor General of the Ornburg region, Nikolai Andreevich Krizhanovskii, for the very ambitious development of the oil industry along the east coast of the Caspian Sea and for oil exploration on Cheleken island in what is now Turkmenistan.[36] In this document, Mendeleev and Kokorev appear as men for whom the term ruthless might be fairly applied.[37] Information about this proposal is very superficial in any Soviet work.[38]

Writing of the importance of exploiting a more natural trade route in the region from Central Asia along the Caspian Sea and the Volga, they created a grand

vision of a quasi-empire in the region. Furthermore, and interesting for the later views of Mendeleev, they argued that this would be an important source of oil for export to Europe, in the belief that "Russian" oil could supplant American oil in the European market. They also argued that this oil could also be used in the internal Russian market. All of this was to be possible because they believed that this area possessed a considerably richer oil supply than Pennsylvania or Canada.[39]

There was the problem of what to do with the problematic Turkmen who lived there. Mendeleev and Kokorev provided some helpful suggestions to the Russian government. For the work of "trade and civilising" to be successful in this area, it was first useful to "spread money among them." This was necessary because they had to "weaken the propensity towards greediness of the Turkmen. (Only in this way is it possible) to attract such capital and people to such a wild and barren country."[40] They further reasoned that as "all of this requires a large amount of capital and cannot be undertaken in a country which is often subjected to raids from wild tribesmen, [therefore] it demands before everything military protection from the sea with the help of a warship and on the seashore with the help of a military detachment".[41]

The proposal contains an even more deft piece of *Realpolitik.* When considering the tremendous size of the undertaking it was necessary "without fail to use the aid of English capital. The attraction of English capital to this oil business ... would also be useful not only for the money, but would also guarantee the friendly attitude of the European press and English government to our intended undertakings."[42] For obvious reasons, the American government would not be too

pleased at the prospect of quasi-Russian oil supplanting their own in the lucrative European market, but in the nineteenth century American views were of less importance in world affairs than British ones were. As well, the British would be able to help the Russians sell the oil in the European market.[43]

What would Mendeleev and Kokorev receive? There is no indication that Kokorev wished to be responsible for the bulk of the investment in this project - a massive and risky undertaking, which could have bankrupted him had things gone wrong. However, he did wish to have the right to transport the oil along the Caspian Sea in his own ships to where it would be distilled in his plants near Baku.[44] If Kokorev were to have been granted a monopoly on the transport of oil across the Caspian, even more profit would be gained. Who would be the technical director for the discovery and distillation of this massive undertaking? Mendeleev.[45]

Mendeleev wrote an intriguing article, intended for publication, which appears to be an attempt to rally public support for the project.. The article almost perfectly mirrors the private letter written to the Governor, except that Kokorev's name does not appear as an author; nor were Mendeleev's financial interests mentioned.[46]

Mendeleev argues that Cheleken would be very profitable for Russia. Furthermore, that the Turkmen's would quickly submit to the "illustrious" Russian government with the help of the "mighty" Russian military. There was the question of who would be responsible for the development of the oil industry on Cheleken. The answer, for Mendeleev, was that naturally it should be "V.A. Kokorev who until now has been almost the singular businessman with an oil refinery plant in Baku.

For this he already has an extensive plant in Surakhahakh near Baku."[47] It is uncertain, however, if Mendeleev read the paper in public or published it as an article.[48]

The project does not appear to have gone ahead and Mendeleev definitely played no further role. Furthermore, this type of undertaking would have required the co-ordination of the military and the foreign ministries, at least, and it is quite possible that it could have been scuttled for any one of a number of reasons.

Mendeleev did not give further consideration to working in the oil industry, at least until after his discovery of the Table of Elements. Soviet historians have incorrectly argued that Mendeleev broke off his relationship with Kokorev because of the latter's failure to pay for earlier work. In fact, Mendeleev's time was taken up with teaching duties and research, as well as a trip to the 1867 Paris World Exhibition for the Russian government, where part of his time was concerned with questions about the oil industry. There was also at least some concern about the technical feasibility of the project voiced by the governor.[49]

This chapter has provided an indication of the complexities of Mendeleev's character. Perhaps most importantly from a purely factual standpoint, it has shown that, on a number of occasions, Mendeleev was tempted to work full-time in the Russian oil industry. Yet, he did not. Instead, he continued to perform his professorial duties and continued with his research.

The question arises as to why Mendeleev did not take up any of these potentially very lucrative offers. He was young, newly married, with a child (or two), living on a professor's modest salary. He did not know that he would one day

be credited with making an important scientific discovery. There were no messianic pretensions of future greatness in his youth: he did not know or believe at that time that the choice would lie between wealth in business or fame in science.

The most likely explanation for his decision is a combination of factors: family, personal and intellectual inclination. One possibility is his first wife's explicit reluctance for him to direct an oil refinery in Baku. However, he also had opportunities in Nizhnii Novgorod, which in one case would have permitted him to continue living in St. Petersburg, and yet did not take it up. It is quite possible that Feozva Nikitichna dissuaded him from pursuing this type of employment. Mendeleev was more tempted by luxuries than she was and did not find business, in general, a vulgar activity; she was more than content with his modest professorial income.

The other possible explanation involves the rather delicate task of assessing Mendeleev's character. Mendeleev had a very excitable personality. Although he rarely held a grudge, he could definitely be unpleasant to deal with at times. He may have simply decided that this type of work required a calmer personality. There is also the chance that he probably would have become bored with the task of managing an oil plant. This type of work would not have been on the same intellectually demanding level as scientific research.

Idealism also probably played a very large role. He may have simply felt that it was more important to be a professor of chemistry than the director of an oil refinery. He was probably already aware that the government would wish to use his services on a number of technical issues, whether it was oil or spirits, if he

maintained his academic standing. On this point, Soviet historians are absolutely correct in presenting Mendeleev as, overall, an idealistic scientist dedicated more or less selflessly to the improvement of Russia. The next chapter will discuss how Mendeleev was perhaps the most important advisor to the Russian government on the oil industry. Many of his suggestions and predictions were both prescient and at least partially responsible for the tremendous growth of the Russian oil industry in the latter half of the nineteenth century. Although he never failed to mention his former benefactor, Kokorev - sometimes critically - Mendeleev acted as an objective and highly talented advisor.

A final irony should be noted. Mendeleev approached the end of his life in debt. In a letter to the Minister of Finance, S.I.Witte, dated August 1903, Mendeleev woefully stated that he was "leaving his children a debt" as legacy.[50] He asked Witte that the government "buy 650 *desiatin* of land ... for 90,000 rubles" in light of his "48 years of work and service to the motherland".[51] Had he taken up work in the Russian oil industry, he probably would not have needed to make this request; had he taken up work in the Russian oil industry, he probably would not have discovered the Table of Elements.

[1]See: D.I.Mendeleev, *K poznaniiu Rossii,* (Sankt Petersburg: Izd. A.S. Suvorina, 1906), 97.

[2]*Dnevnik D.I.Mendeleeva Zapis'* from 10 July 1905.

[3]The role of business in Russia has been woefully understudied. The Bolsheviks, the unquestioned victors of the Great October Revolution, became the focal point for Western and Soviet scholars; Russian businessmen, one of the unquestioned losers were either left in a historical black hole by Western scholars, or vilified, very occasionally justifiably so, by their Soviet counterparts. Fortunately this has started to change and one is now able to find information on people such as Kokorev in Russian: see M.N. Bar'shnikov *Delovoi mir Rossii: Istoriko-Biograficheskii spravochnik.* (St. Petersburg: Iskusstvo 1998),pp. 194-195; in English see Thomas C. Owen *Capital and Politics in Russia: A Social History of the Moscow Merchants, 1855-1905* Cambridge: Cambridge University Press, 1981. Kokorev was much like Mendeleev - a paradox. A strong Slavophile who supported the emancipation of the serfs, in spite of almost no formal education, he learned to write and was a talented orator.

[4]This was not the first time that Mendeleev considered leaving science in order to undertake some type of employment in industry, although it appears to be his most sustained and serious dalliance.

[5]N.A. Figurovskii, *D.I. Mendeleev* (Izd. Akademii nauk: Moskva, 1961), 123.

[6]V.I. Parkhomenko, *D.I. Mendeleev i russkoe neftianoe delo* (Izd. Akademii nauk: Moskva, 1957), 5. It is interesting to note that Mendeleev actually purchased railway stocks from the money earned for his work in the oil industry.

[7]*Zapisniaia knizhka 5 Feozvy Nikitichiny Mendeleevoi* August 17, 1863, 9 Located in the D.I. Mendeleev Archive, St.Petersburg State University, Russia. All translations my own, unless noted.

There has been no definitive explanation as to how Mendeleev became known to Kokorev. It is possibly because of Mendeleev's earlier connections with German chemists. Kokorev's plant in Baku had been built using imported equipment, under the guidance of the famous German chemist, Justus Liebig and his assistant Molden Hauer in 1859. In 1860, another German chemist, V.E. Eichler, also visited the plant to make suggestions. See: V.R. Simonovich, *Neft' i neftianaia promyshlennost' v Rossii* (Saint Petersburg, 1909), 36-38. It is not unreasonable to suggest that in between Mendeleev's two years of study in Heidelberg and his translation of German technical works, that he would have become known to either Liebig or Eichler. Furthermore, Mendeleev was young and broke, all the more

reason for Kokorev's decision to employ him. See as well the explanation offered by A.V. Topchiev, "Vklad D. I. Mendeleeva v nauku o nefti," *Uspekhi khimii* 17: (1953): 1172.

[8]*Zapisniaia Knizhka 5 Feozvy Nikitichny Mendeleevoi* August 17, 1863, 10.

[9]The collection of letters may be found in *Al'bom 1*. Although not part of the archival material, it is interesting to note that Mendeleev actually hoped that people like Kokorev would be part of the Russian Duma. See D.I. Mendeleev, *Zavetnye mysli, polnoe izdanie (Vpervye Posle 1905 g.)*, (Moskva: Mysl', 1995), 389. It is also noteworthy that it was difficult to obtain access to this work during Soviet times.

[10]See *Zapisnaia knizhka D.I. Mendeleeva* 1863 No.4, 6 I have not been able to discover the *Uhlnhuth Handbuch Photogen und Paraffin Fabrication* (1858) anywhere, including Mendeleev's library. It would be interesting to note the similarities between this work, published in 1858, and Mendeleev's later technical recommendations to Kokorev.

[11]Mendeleev seemed to have had a small fetish for revolvers. Although only his temper was violent, he appears to have purchased a new one whenever he travelled. As for this trip to the Caucasus, many might suggest that carrying a gun was not an unwise thing to do. *Zapisnaia knizhka D.I. Mendeleeva* 1863 No.4, 9.

[12]*Al'bom* 1, August 23, 1863.

[13]For the comment about hotels and staying at Kokorev's mansion see *Al'bom* 1 document August 23, 1863; for concerns about money, see *Al'bom* document 24, 1863. During Mendeleev's trips to America and France he travelled first class. Although, he lived beyond the means of most Russian professors in his day, it is wrong to believe that money was the his main concern in life.

[14]*Zapisnaiia knizhka 5 Feozvy Nikitichny Mendeleevoi*, 1863. She had been classically educated.

[15]*Al'bom* 1, No. 31 August 27, 1863.

[16]*Al'bom* 1 No. 33 September 12 , 1863.

[17]*Al'bom* 1 No. 37 September 20, 1863.

[18]There was no indication that when Mendeleev left for Baku, that either he or his wife were aware that the illness of their daughter was serious. In reading Feozva Mendeleeva's diary for the period Mendeleev was away, there is no indication that

Maria was seriously ill. The day of the child's death and for a few weeks after, there are no diary entries and it is unknown whether she tried to contact her husband.

[19]From *Zapisnaia knizhka D.I. Mendeleeva* 1861-1867 za 1861-1871 gg.1863 r. In *Zapisnye knizhki D.I.Mendeleeva, 1861-1867 Prikhod* No. 3, 34.

[20]*Zapisnaia knizhka D.I. Mendeleeva ,1863* No.4, 3 From *Zapisnaia knizhka D.I. Mendeleeva 1861-1867 za 1861-1871 gg. Prikhod* No. 3, 34.

[21]See D.I. Mendeleev, *Gde stroit' nefianye zavody* (Sankt Petersburg: Izd. V. Demkova, 1881).

[22]For the unpublished article see: II-A-55-11; for the later published information see *Gde stroit' neftianye zavody,* 253-254 as well D.I.Mendeleev, "Neft'". *Sochineniia* Vol. 10 . (Leningrad-Moskva: Izdatel'stvo Akademii nauk SSSR, 1949), 803. These references were written in 1881 and 1897 respectively.

[23]Mendeleev, "Neft'", 803.

[24]I-A-51-1-1 (October 1863). I-A-51-1-2 (November 23, 1863) As for the reference to Kokorev's money see I-A-51-1-2, 1.

[25]I-A-51-1-2, 2.

[26]I-A-51-1-2, 3.

[27]I-A-51-1-2, 3. The terms of the contract were very complex.

[28]I-A-51-1-1, 1. For other documents pertaining to Kokorev, Mendeleev and Nizhnii Novgord see: I-B-51-1-61, 62, 71, 75, 80, 86.

[29]Located in the archive may be found the very rough calculations of Mendeleev dated 1863-64 for an oil refinery near Nizhnii Novgorod. It is most likely that these are in reference to the 1864-65 agreement. See II-A-4-1-1. Although not part of the archival material, it is interesting to note that near the end of his life Mendeleev wrote that Kokorev had invited him, in 1864, to direct the plant near Baku for 10,000 rubles a year. There is no material in the archive to verify this, although at that time Mendeleev was engaged in the Nizhnii Novgorod project(s). However, it is more than likely that Mendeleev, reflecting on events 40 years after the fact, was a bit confused. It is not uncommon in his accounts of events which had occurred years earlier for Mendeleev to be a bit muddled, unintentionally or otherwise, with the facts.

[30]1-55-I-7, 8 There is no specific date on the actual document. However, 1864-1865 is written on the envelope.

[31]1-55-I-7, 8, 2.

[32]1-55-I-7, 8, 2.

[33]1-55-I-7, 8, 5.

[34]Parkhomenko is unfortunately not very accurate on this. He clumps the two plans together without distinguishing that in the first Mendeleev was to have been the technical director and in the latter, the co-owner/technical direct. When referring to the latter he states that the "Technical Director of the plant during construction and its operation was to be D.I. Mendeleev," with no mention at all that Mendeleev was to become a part owner. This is not an unimportant detail. Parkhomenko, 23. Parkhomenko may have been using information from Topichiev, 1183.

[35]Mendeleev, *Gde stroit'*, 254.

[36]I-A-55-1-10.

[37]I-A-55-1-10. Parkhomenko vaguely mentions this proposal, but only in the most innocuous way. V.I. Parkhomenko, 33, as well as 247. Mendeleev's original musings about this project may be found in a draft analysis, I-A-55-1-6, written sometime in 1864-65. It outlines the very considerable sums of money necessary for this project. There is also a rough draft concerning the development of both the Caucasus and Cheleken oil industry by Mendeleev. Its date is unknown, but is most likely from the 1864 period. See II-A-4-1-3.

[38]See: Parkhomenko as well as Topchiev, 1169-1187. Both are missing very important information that show Mendeleev in a less than flattering light during this project. Considering the Soviet political environment, they can hardly be blamed.

[39]I-A-55-1-10, 3-4. Mendeleev's earlier musings on the American oil industry included studies of the Canadian oil industry. In 1876, he travelled to the United States to examine the oil industry.

[40]I-A-55-1-10, 2. The comments about the "wildness" of the region are also echoed today even in *Encyclopaedia Britannica.* It states that Turkmenistan in the nineteenth century was an area known for nomadic tribes and rampant robberies. *Encyclopaedia Britannica* Compact Disc ed., s.v. "Turkmenistan".

[41]I-A-55-1-10, 4.

[42]I-A-55-1-10, 4-5.

[43]I-A-55-1-10, 4-5.

[44]I-A-55-1-10, 10.

[45]I-A-55-1-10, 10.

[46]I-A-55-1-11.

[47]I-A-55-1-11, 4-5.

[48]There is a reference to a published lecture read in 1866 in St. Petersburg, which partially fits the contents of the essay by Mendeleev in *Dnevnik D.I.Mendeleeva Zapis'* from 10 July 1905, 6, and the time frame. The reference, however, does not include mention of Cheleken. I have found no other document in the archive that comes close to fitting this description.

[49]A.V. Storonkii, ed., *Letopis' zhizni i deiatel'nosti D.I. Mendeleeva.* (Leningrad: Nauka, 1984), 85. Storonkii argues that Kokorev failed to pay Mendeleev for earlier work and as a result Mendeleev refused to work for him. However, in Mendeleev 's *Zapisnaia knizhka 1864-65,* he lists an income of 250 rubles from Kokorev in the month of April, 1865, 4. As for the technical feasibility question, see the letter dated June 7, 1865 from Illarion Vasil'evich Pilenko. I-B-67-1-15. As well, Mendeleev wrote a letter to Kokorev on November 7, 1865 proposing a type of sewage progamme for Moscow, in which he would be paid 1500 rubles for 3 months' work. See *Al'bom.* 1 document 265. Finally, as mentioned earlier, Mendeleev wanted men like Kokorev in the government. The potential profitability of Cheleken would also be mentioned later in *Material po voprosu ob ustroistve na Kavkaze,* 1867, Author and publisher unknown, 44.

[50]August 1903 *Al'bom* 1 Letter 486, 230.

[51]August 1903 *Al'bom* 1 Letter 486, 231. Ironically, he lost much of his money because of his bad land deals. A *desiatin* is equivalent to 2.7 acres. There is an edited version of the letter in *Arkhiv D.I. Mendeleeva Tom 1,* 31-32. The edited letter does not, however, contain the request that the government buy the land, nor does it indicate that Mendeleev was a substantial landowner.

Chapter Three:

Mendeleev Visits France

"That is to say you (Mendeleev) are a gradualist and I also became one, although before I was different."

I.S. Turgenev[1]

This chapter will deal with Mendeleev's trip to Paris in 1867, his views on the West and his suggestions for improving the Russian oil industry. It will also briefly examine some of the changes that occurred in the Russian oil industry after Mendeleev's trip abroad. According to Mendeleev it was because of this work that the Russian government "began to listen to me on this [oil] question from this point" onward.[2]

Princes I. K. Romanovskii, and F. Leiktenbergskii invited Mendeleev to take part in the Russian delegation for the Paris World Fair of 1867 as an expert on chemistry. However, the focus of Mendeleev's report was on the oil industry. His published report, *O sovremennom razvitii nekotorykh khimicheskikh proizvodstv v primenenii v Rossii i po povodu vsemirnoi vystavki 1867 goda,* (About the Modern Development of Some Chemical Manufacturing Adopted in Russia and Apropos the World Exhibition of 1867) is the first public document in which Mendeleev lays out his beliefs, discussed in previous chapters, on the necessity of private ownership of oil-bearing lands, his distrust of businessmen, and his fear of monopolies.

This trip to France provides information not only on his views on the oil industry, but also on some of his philosophical ideas. Unlike his trip to Baku, scholars are fortunate to have his personal diaries from this voyage.[3] His letters

home reveal not only his intensely mercurial nature but also his previously discussed openness to Western ideas, especially those that would develop Russian science and industry. Furthermore, they also demonstrate that he was not a revolutionary in any sense of the word.

Some of his convictions may seem contradictory, but they are more comprehensible if one remembers that Alexander Herzen was one of Mendeleev's favorite Russian writers. Soviet scholarship, in an attempt to justify their own economic policies, depicts Mendeleev as "one of their own," ignoring crucial views expressed after his visit to Paris.

Mendeleev was absent from Russia for two months, leaving St. Petersburg on March 3, 1867, and returning on May 13 of the same year. For his work he was well paid, receiving 2,000 rubles - almost twice his yearly salary at the University - and the chance to live well during the trip itself.

He arrived in Paris on March 12 and soon after settling in, set-off to examine the Paris exhibition.[4] Commenting on the Russian exhibit, Mendeleev made a paradoxical observation, "We (Russia) have many useful things, but everything is weak, everything is useful."[5] This is the extent of Mendeleev's comments in his personal diary about the exhibition. Mendeleev, however, wrote a letter to his wife about the fair. While Mendeleev was not wholly enthused about the Russian exhibit, he did make several interesting observations about the presentations of other countries:

> A week has passed since the opening of the exhibition and still many have not unpacked. Only us Russians are ready. The French have the best machines, the Belgians, English, and

> Germans have the best mining equipment, the Germans and English have the best chemistry, the French have the best dresses, us mosaics, statues Italians ... We have the best tavern, positively the best of all, everything is fresh, although expensive, just chock-o-block.[6]

This type of rather balanced and broad view of the exhibit is very typical of Mendeleev. He was willing and capable of judging the strengths of each country's exhibits. He engaged in neither mindless nationalistic chest thumping - his earlier comments regarding Turkmenistan being an exception - nor in undue criticism of Russia.

While Mendeleev frequently wiled away his time playing chess he was not averse to enjoying an occasional drink. On one particular evening Mendeleev found himself in a Russian bar in Paris with some of his Russian compatriots. Mendeleev recounts in his diary how "three drunk Frenchmen began to curse the Russians. One said, 'tous les russes sont stupides.'" The ever hot-tempered Mendeleev testily replied, "repeat what you said. I am a Russian". The Frenchmen responded, "that they were just talking to themselves." Mendeleev as usual quickly calmed down and was content to let things pass. The three Frenchmen decided to leave. One of Mendeleev's compatriots not content to leave well enough alone, decided to follow them outside. There was soon a commotion at the entrance and the Frenchmen were soon screaming, "calling him an idiot," amongst other things.[7]

Mendeleev also spent time on more mundane matters, such as purchasing a microscope and gun for himself, gifts for his family, earrings for his wife, and toys for his son.[8] Some of the personal details contained in these letters provide insights into Mendeleev that contradict existing scholarship – especially Soviet scholarship –

in important ways. For example, suitably enough seeing that he came from a long line of priests, Mendeleev was also, at least in form, religious. As was his Sunday custom he notes that he "got up early and went to the Russian church ... everybody was there".[9]

Mendeleev's quick temper has already been discussed. He was also very emotional and under certain circumstances extremely sensitive. During his trip to Paris he suffered from a typically strong Russian case of *toska po rodine* (homesickness). Not atypical of Mendeleev is the following entry in his diary: "I was so happy to receive a letter from Feozva that I began crying. Why did I decide to travel?" His diary reveals that he waited anxiously for news from Russia and his family. He was happiest when he received letters from his homeland.[10]

Mendeleev had not lost his taste for the finer things in life, which he had demonstrated in his trip to Baku. His diary frequently reveals such trivialities as "ate well at home. In the evening, I ate in the *Café de la Régence,* like every day." The next day he ate at another restaurant and commented "expensive, but good".[11]

Eating habits aside, the *Café de la Régence* provided the setting for a very telling moment. One evening Mendeleev talked at great length "with the already then famous I.S. Turgeneev". After a long Russian discussion about the meaning of everything "my famous neighbour (Turgeneev) said 'That is to say you (Mendeleev) are a gradualist *(postepenovets)* and I also became one, although before I was different.' I remember very clearly that word 'gradualist'". At the end of this account of his meeting with the Russian writer, Mendeleev writes that one of his personal favorite sayings was "the quieter your move – the farther you will go".[12]

On the surface it is ironic that Turgenev would believe that Mendeleev was a gradualist and that the chemist would agree with him. However, it is evident throughout his work on oil that he was not keen on a smash-it-up, thrashing leaps and bounds approach. The idea of gradualism was a pejorative term in the Soviet lexicon, favouring the titanic, testosterone-laden lingo of the gigantism of the Stalin era, crash-courses and *piatiletkas* (five year plans) in four. Yet, Mendeleev was a gradualist. This may explain why Soviet hagiographies of Mendeleev ignore this crucial statement. Not only would the elitist Mendeleev have been against the building of socialism by the Bolsheviks, but there is simply no way he would have approved of their means.

In examining his published report on the Paris Fair, *O sovremennom razvitii*, some of Mendeleev's ideas on the oil industry are revealed. The work proved to be extremely popular for its genre and was soon sold out.[13] Many of his ideas about oil would be expanded upon in his later writings, but it is in *O sovremennom razvitii* that they first received an audience. As well, it reveals a major strength of Mendeleev's: an intense curiosity about Western scientific techniques, and a willingness to import and use any and all ideas possible in the interests of Russian development. This is in contrast to his strong Slavophile views on Russia's political system, which he would later reveal in his writings about the American oil system in 1876.

Mendeleev, however, was clearly impressed with the success of the American oil industry as early as 1867. His trip to Paris was in part an attempt to understand its accomplishments. He states in the introduction that the "Importance of the oil

and paraffin industry is evident in that North America sends to Europe 10 million puds of oil and kerosene," resulting in an expenditure/income which, "reached the huge number of 80 million rubles."[14] (A pud equals 16.4 kilograms.) If America could profit from its oil reserves, why not Russia?

Even from this relatively brief Western visit, Mendeleev shows that he was more than willing to import non-Russian ideas to improve the Russian oil industry. He was impressed with the efficient method of transporting oil and its by-products that was on display at the American exhibit. Unperturbed by its completely foreign origin, Mendeleev argues that "many cities in South Russia might also be able to use such a highly profitable method..."[15] Mendeleev also notes that some of the other means of transporting oil and its by-products - specifically pipelines - on display at the Fair would also be useful. For this, he looks much closer to home, specifically to the pipelines employed in France and England.[16]

However, the most important and influential position that Mendeleev advocated in this document was his belief that in order for the Russian oil industry to grow it was necessary that oil fields be privately owned. During this period, the practice was for government to lease the oil fields to businessmen for a period of four years under an arrangement known as *otkup*. Mendeleev argues forcefully that it was necessary to "abolish the *otkup* system and transfer the oil lands to private hands"[17] so as to attract the capital needed to develop the resource properly.

Mendeleev, however, added two caveats. He notes that "of course one measure such as the abolishment of the *otkup* system for personal enterprise will not do all; it is necessary that there are also knowledgeable businessmen" who would

"risk much of one's strength and happiness," and of course money.[18] Thus, for Mendeleev mere private ownership was insufficient to ensure the growth of the Russian oil industry. It was also necessary to have competent and adventurous entrepreneurs who would develop the area. Private ownership might result in incompetent, but rich businessmen getting hold of this natural resource and doing nothing with it except enriching themselves.

Mendeleev harboured no illusions about businessmen and capitalism. He feared that private ownership might result in a monopoly and excessive concentration of the oil fields. He argued that it was "necessary to sell it [the oil fields] in small pieces," because "monopolies for this new affair are much more damaging than [what] already exists."[19] This did Mendeleev no harm in the eyes of Soviet scholars - for example, Parkhomenko notes that Mendeleev was a foe of monopolies[20] - for Karl Marx would have been proud of his stance. But then again, so would Adam Smith.

Mendeleev also returns to a theme that he had earlier written while acting as a steward for Kokorev: Cheleken. According to Mendeleev "Cheleken at this time should be a part of Russia (it was then part of Turkmenistan)" and that all that was necessary for Russian industry to set up shop in the area was that the "government provide protection from robbery." The result would be that "Oil exploration should be highly profitable on Cheleken..."[21] When Mendeleev raised the issue of Cheleken in 1867, he was apparently not being paid by Kokorev, reinforcing previous arguments that his published views, when acting as an advisor to oilmen, were fundamentally his own and not simply a form of intellectual prostitution.

While the potential of greater wealth for the nation, as well as the concomitant increase in oil production was clearly very important, Mendeleev had another reason for concern about the growth of oil - kerosene lamps.

He viewed the emancipation of the serfs as a source of great potential for Russia. Noting the rather long winter evenings in Russia - he had after all been living in St. Petersburg - he believed that lamps would give the opportunity for industrious peasants to work late into the evening. While he might have been overestimating the desire of the Russian peasant to work, he viewed kerosene lamps as another important key in the growth and enrichment of Russia. This is evident in Mendeleev's observation of the prevalence of lamps throughout France.[22]

Mendeleev realized the incredible potential of the Russian oil industry. "The Russian oil and paraffin industry holds a great future when our industry receives some help because Russia has the greatest raw materials of all the European powers ... I am talking not about some hypothesis, but about that which is proven fact. And confirmed in the last five or six years."[23] Mendeleev's thesis did prove correct: The Russian oil industry (and the Russian economy) did experience explosive growth during the last quarter of the nineteenth century.

There were others also interested in the reform of Russia's oil system. In 1868, two other government commissions were formed - one in Tbilisi and one in St. Petersburg. The St. Petersburg commission, headed by I.A. Shteinman, an engineer, reached similar conclusions to Mendeleev's – namely, the need to end the leasing system on oil lands. By 1872 the system had been abolished and the land had been purchased not only by Russians, but also by many foreigners.[24]

The 1868 Tiblisi commission noted that the United States, which was not encumbered by the *otkup* system, experienced quick and tremendous growth. Drilling started in 1860. In the succeeding year, Ohio pumped out just over a million gallons of oil; in 1862, just under 11 million gallons; by 1865, over 87 million gallons were produced annually. As well, the American treasury in the span of two years - from 1865 to 1866 - almost doubled its income, from 8.75 million dollars to 16 million dollars, from this revenue source. Oil proved to be an important source of income to the Federal government, which from 1861-1865 was involved in the American Civil War.[25]

Russia, however, had seen rather violent swings in its Baku oil production. In 1863, it produced 112,000 puds; in 1864, just over 795, 000; in 1865, just over 281,000 puds; in 1866, just under 592, 000 puds. There was no apparent rhyme or reason for the violent swings in production levels. The major problem was that there had been no sustained increase in either oil production or any real increase in the money coming into the treasury, unlike America.[26] Something was amiss.

The commission's ultimate conclusion was that those to whom they were leasing the oil lands were holding the Russian oil industry and the Russian treasury hostage. It notes that the "*Otkup* system was profitable" for the treasury and held an extremely important "position during the war [Crimean]." However the "*Otkup* system created an oil industry of an exclusive circle," in which in exchange for providing income to the treasury, the oilmen did not have to subject themselves "to free trade and not even to open up new wells."[27] And, as a result it was "of course impossible to wait either for technological modernization, neither for the

improvement of production and cheapening of oil, nor even particular attention for sales."[28]

When the *otkup* system was removed, to recoup anticipated losses from leasing, the Russian government placed a tax on the process of distilling kerosene. In addition, the Russian government used a sealed bidding system to sell off the land in an effort to ensure that they received the maximum price possible. The system was highly successful and, according to Soviet accounts, oil lands that had been valued at just less than 550,000 rubles fetched 3,000,000 rubles. According to one dubious Soviet account, the process proved to be so successful, from the standpoint of the government, that the industrialists had no capital left over to actually drill.[29]

Most businessmen overpaid, in some cases grossly so, for their oil lands. Kokorev was the one exception. While his colleagues paid, in one case, almost 73,000 rubles for land assessed nearly at 12, 000 rubles and 13,000 rubles for land valued at 28 rubles, Kokorev paid a mere 926, 331 rubles for land purportedly worth 2, 354, 072.

The results were astounding. In 1872, the year that the system was abolished, production of crude oil stood at just over 1,300,000 puds; the succeeding year, production more than doubled; by 1874, it had reached 5 million puds per year. There was also a tremendous drop in the price of crude oil and kerosene. The price of crude, standing at 42 kopeks before the reforms, plummeted to a mere 2 kopeks immediately after. The price of kerosene, which stood at 3 rubles just before the reform, dropped almost in half to 1 ruble 80 kopeks afterwards. The results were

tremendous and by 1875 oil from Baku had almost completely replaced American oil in the Russian market.[30]

As Parkhomenko notes using a common Russian expression, the result was that "kerosene factories around Baku began sprouting like mushrooms after rain."[31] Another sign of the incredible success of the abolition of the *otkup* system was that in 1869 kerosene exports from the Baku port stood at 150,000 puds; in 1872, 450,000 puds; and in 1875, 3,235,000 puds.[32] Furthermore, there was an increase in the number of wells. In 1872 and 1873, the number remained static at 17; in 1874, 50 were in operation; in 1875, 65; in 1876 the number stood at 101.[33] Three years after the abolition of the *otkup* system, the number of wells had increased more than five-fold.

Surprisingly, Mendeleev was not satisfied with the great strides made in the development of the oil industry in Russia. As he would note, the growth of the Russian oil industry would have been even greater "if there had been no tax imposed on the production of kerosene".[34]

By 1875, the Russian oil industry was facing serious problems. Parkhomenko, whose work is usually solid and lacking ideological cant, writes that the problems were because "in the oil industry anarchy and bitter competition reigned ... It was the first and the brightest moment marked by a typical capitalist crisis ...."[35] Mendeleev disagrees. According to the Russian chemist "it would be better if there had been several large plants," instead of dozens of small, inefficient operators. The final result would be better and the end products would be cheaper.[36]

According to Mendeleev, the problem was not Russian capitalism, but American oil: "Business changed when around 1875, America made some huge oil field discoveries and in the absence of any taxes, the price of American oil markedly fell."[37] Thus, Mendeleev argued, the source of the Russian oil industry's distress was Russia's internal taxes on kerosene and the discovery of other oil sources abroad - not a capitalist crisis. As he would note again in 1881, the threat of the influx of cheap American kerosene in 1875 was taken very seriously and a commission was created, headed by Nikolai Maksimilivich Leitenbergskii whose purpose was to examine the question of taxes on oil. The abolition of the tax was not a simple matter as the Russian treasury received 300,000 rubles from it annually. The Russian government decided to send Mendeleev to examine the American system. It is interesting to note that although this trip was to examine the American oil industry, Mendeleev notes that "already in 1873, when at the Vienna World Fair it became known that in 1876 there would be a World Fair in America, I decided to go there."[38]

There were high expectations for Mendeleev's trip, not only from the government, but also the public. As the *Bakinskiie Izvestiia* noted, it was Mendeleev who "was the first to warn in print about the harmful nature of the *otkup* system and of the necessity of its earliest abolition," and therefore Russia was right to wait to hear from him about the "best ways of work and practices [used] there [in America]."[39]

This chapter has examined some of Mendeleev's views on the development of the Russian oil industry as revealed from his trip to Paris. It has also reinforced

discussions in previous chapters on aspects of Mendeleev's attitudes and character: his sometimes mercurial temperament, his interest in Western ideas without being a Westernizer, and the tensions between his belief in private property and his distrust of businessmen and monopolies.

Mendeleev, however, did not work in a vacuum. Concerns about the health of the Russian oil industry - and the Russian treasury – were very strong at this time, and there were other people and commissions who were involved in this question. However, Mendeleev was the first to advocate in print that the old *otkup* system had to be abolished. Ultimately, after a long laborious bureaucratic process the oil fields were sold-off and this industry at first experienced tremendous growth.

[1]D.I.Mendeleev, *Zavetnye mysli, polnoe izdanie (Vpervye posle 1905 g.)*, (Moskva: Mysl', 1995), 310 .

[2]See: V.I. Parkhomenko, *D.I. Mendeleev i russkoe neftianoe delo*, (Moskva: Akademiia Nauk, 1957), 39.

[3]These diaries have not been previously been used.

[4]On the way to Paris, Mendeleev stopped off in Hamburg where he had studied chemistry, amongst other things. The reason for this lateness was to see his daughter Roze. Mendeleev recounts a very poignant, and overwhelming moment, when he visited his "glorious little daughter, Roze," whom he more than likely had fathered during his studies in Germany four years earlier. The next day he asked a friend, "not to forget Roze". Mendeleev's *Zapisnaiia knizhka* 1867, 1. This stood in contrast to what Mendeleev would much later tell his daughter from his first marriage. According to Mendeleev's daughter he said that, "I was not persuaded that she was my daughter (Roze), but I paid to her parents 2,000 gul'denov as if I recognised that she was mine. But even after that until 1902 she continually came to me, although I already considered myself free." It is uncertain if Roze or her mother continued visiting Mendeleev. However, writing well after his 1867 trip to Paris, his mind regarding the patrimony of Roze might have changed; or he might have been attempting to spare the feelings of his daughter. M.N. Mladentsev and Tishchenko, V.E. *Dmitrii Ivanovich Mendeleev, ego zhizn' i deiatel'nost'*, Vol.I. (Moskva: Izdatel'stvo Akademii Nauk, SSSR, 1938), 409.

One wonders what Mendeleev had said to his first wife regarding Roze. In 1871, during another trip abroad, not related to the oil industry, he once again stopped off to see Roza. Writing to Feozva, "Roze is healthy and has grown, but her father (the mother had married) does not teach her anything. He appears to be a good person, but barely teaches the child anything. Right now Roze is standing right in front of me and asks me to say hello to you from her and to kiss Volodia and Lelia (his son and daughter with Feozva). She is already ten, but she reads quite well." May 16, 1871. Letter from Mendeleev to Feozva Mendeleeva. Considering the very emotional account of his meeting with Rosa in 1867 the child was most likely his. As for his later accounts to wife and daughter, Mendeleev was not incapable of deception.

[5]*Zapisnaia knizhka D.I. Mendeleeva*, No. 9 March 9/ 21, 1867.

[6]*Perepiska D.I. Mendeleeva* March 29/ April 10, 1867. Letter to his wife.

[7]See *Zapisnaia knizhka D.I. Mendeleeva* 9 1867-68. April 16 1868. Mendeleev's language skills were mixed. In recounting the episode, he writes everything in

Russian except for, "tous les russes sont stupide (sic)," which he writes in French. His German was good, after living in Germany for a long period of time. Living in St. Petersburg, he was obviously also acquainted with French. He also had more than a passing knowledge of English. His library is filled with books in all three languages and, of course Russian.

[8]*Zapisnaia knizhka* D.I. Mendeleev No. 9 1867-68 April 12. Mendeleev also visited other places of interest. On March 11th Mendeleev noted that he had spent some time looking at weapons, some of which he believed would be useful at war. On April 1, perhaps predating his later extensive work in agriculture, one finds Mendeleev noting that he "saw many interesting things at the English Agricultural exhibit." He also visited a glass factory, perhaps recalling his youth and his mother. *Zapisnaia knizhka* D.I. Mendeleev No. 9 1867-68 April 10. Mendeleev looked at the refining plant of J. Cann and Maeshall near Paris while in Paris. Parkhomenko, 34.

[9]For information about Mendeleev's religious heritage see *Semeinaia khronika v pis'makh materi, ottsa, brata, sestry, diadi D.I. Mendeleeva.* 1908: St. Petersburg, p. 1. This work has been, to the best of my knowledge, completely ignored by Soviet scholars. As the opening words of the work reveal this very important fact, it is perhaps understandable that incompetent and or craven, as well as highly competent but politically pragmatic Soviet historians avoided this work.

As for his visits to a church, see *Zapisnaia knizhka* D.I. Mendeleev No. 9 1867-68 April 4, 1867. The fact that he was, at least in form, religious, is interesting as it provides a contrast to the anti-religious Bolsheviks who claimed to be scientific in their approach to everything. While one may argue that Mendeleev was simply following the social codes of the times, it is indisputable that he was not anti-religious. In my opinion, he was far from it. Mendeleev would have been against Bolshevik attacks on religion, just as he would have been against many of their later social, political, cultural and economic (but not scientific) policies, ideas and acts.

[10]*Zapisnaia knizhka D.I. Mendeleeva* No. 9 1867-68 April 4 / 16.

[11]*Zapisnaia knizhka D.I. Mendeleeva* No. 9 1867-68 March 9/ 21.

[12]D.I.Mendeleev, *Zavetnye mysli,* 310-311. Mendeleev writes that the meeting occurred in the 1860s and this 1867 trip appears to be the most likely year of the meeting, especially considering that he mentioned this café in particular. There are three plausible explanations: Most likely Mendeleev, wrote about this meeting in the early 1900s and may simply have gotten the dates mixed up; secondly, Mendeleev may not have noted it in his diary; finally, he might simply have invented the meeting. The latter possibility would be completely out of character for Mendeleev, as he had no need to invent connections with famous people. Furthermore, while Mendeleev could be elliptical, deceptive, selective and a bit loose with his facts, it

would have been very unlike him to lie. Regardless of the reason, I have included this meeting with Turgeneev in his 1867 trip to Paris because it most closely fits what he says occurred.

[13]D.I. Mendeleev, *O sovremennom razvitii nekotorykh khimicheskikh proizvodstv v primenenii v Rossii i po povodu vsemirnoi vystavki 1867 goda.* (Sankt Petersburg: Izd. A.S. Suvorina, 1867). In the Mendeleev archive one may also find the technical musings and doodles of Mendeleev from this trip, see: 1-A-64-1-5.

[14]Mendeleev, *O sovremennom razviti, 7.*

[15]*Ibid.,* 89.

[16]*Ibid.,* 78-79.

[17]*Ibid.,* 108.

[18]*Ibid.,* 108.

[19]*Ibid.,* 109

[20]Parkhomenko, 123.

[21]*Ibid.,* 107.

[22]*Ibid.,* 73.

[23]*Ibid.,* 103 A distinction should be made between Mendeleev and the Bolsheviks. While they both believed in the crucial role of science in the development of Russia/ Soviet Union and the "bright shining future" which it was to have, Mendeleev would never have advocated blowing things up to start afresh. Furthermore Mendeleev, while far from an unconditional supporter of capitalism, would never have supported the wide scale nationalization of the oil industry, as his writings from Paris and later demonstrate.

[24]Parkhomenko, 123.

[25]I. Shteinman et al., *Materialy po voprosu ob ustroistve na Kavkaze* ,(St.Petersburg: 1872), 95. One gallon equals .37 vedra; one vedro is approximately 24 funts.

[26]*Materialy po voprosu ob ustroistve na Kavkaze,* 27-29.

[27]*Ibid.,* Part II, 3.

[28]*Ibid.,* Part II, 3.

[29]G. Balaev, *Neft' strany vechnogo ognia,* (Baku, 1969), 70.

[30]Parkhomenko, 37.

[31]*Ibid.*, 38.

[32]*Ibid.,* 33.

[33]*Ibid.,* 39.

[34]D.I. Mendeleev, *Gde stroit' neftianye zavody,* (Sankt Petersburg: Izd.V. Demkova, 1881), 32. Curiously, Mendeleev appears to be mistaken when he also added that one of the problems was also that another impediment to the growth of the industry was that the price of kerosene had not also fallen. He may have meant that it had not fallen as much in comparison with oil.

[35]Parkhomenko quotes Lenin to the effect that the "great growth in the discovery of oil and its processing resulted in greater use of Russian kerosene which completely replaced American kerosene." Parkhomenko, 52.

[36]Mendeleev, *Gde stroit'*, 23. As will be discussed in a later chapter, this was a key component in Mendeleev's thinking and the government appears not to have followed his advice. As A.V. Topichev notes, "Only after the Great October Socialist Revolution was the dream of D.I. Mendeleev realised with the widespread construction of refineries in the central part of the country. During the Stalin Five Year plan in our country," the construction of these plants occurred with new technology, "not only in the Volga region, but in other areas of the central part of the country." in Topichev, "Vklad D.I. Mendeleeva v nauku o nefti," *Uspekhi khimii* 22 (1953): 1175. Topichev is accurate, and this is but one example of the Soviets borrowing Mendeleev's technical ideas, or using his ideas to justify their plans.

[37]Mendeleev, *Gde stroit'*, 257.

[38]*Ibid.,*74.

[39]*Bakinskiia Izvestiia*, No. 28 July 14, 1876.

Chapter Four:

Mendeleev Visits America

America "is the country of the almighty dollar and profit and bourgeois philistines"

D.I. Mendeleev on America[1]

Mendeleev's trip to America in 1876 for the Russian government provides one of the clearest examples of the way in which Mendeleev was open to the Western world. Mendeleev did not place America amongst the ranks of civilized nations - North, South, East or West. However, in spite of America's complete lack of redeeming cultural or political virtues, he did find many ideas that he believed would be of value to the Russian oil industry. This is characteristic of Mendeleev: He was willing to use any ideas which might further the oil industry's development, even if they came from what he believed was an uncultured, uncivilized cultural backwater.

The work, *Neftianaia promyshlennost' v severo-Amerikanskom shtate Pensil'vanii i na Kavkaze* (The Oil Industry in the North American State of Pennsylvania and in the Caucasus) contains four chapters entitled in a self-explanatory fashion: 1.) Introduction; 2.) Trip to America; 3.) Statistical Information on the development of the oil industry; and 4.) On the origins of oil. This part of my dissertation will focus on the second chapter, which reveals many of Mendeleev's views on the general social, political and economic environment of America.

His ultimate conclusions about America and the state of its society and polity were uncompromisingly harsh; his conclusions on the merits and strengths of its economy were neutral. During this period, America's economy was not, on the whole, any better than that of several other European countries with which Mendeleev was familiar. This report reveals that Mendeleev was in a very large part a Westernizer who despised America: The Siberian born chemist believed that Russia was – or at least should be – part of the European world. America, Mendeleev concludes, had nothing to offer Russia outside of lessons from its oil industry.

Mendeleev's reasons for the trip are clearly set out in this report: "The goal of my trip to America was to understand the modern technology of the oil business in America and most importantly to understand the reasons for the lowering of kerosene prices which occurred in the last year... Above all, the Minister of Finance wanted extensive information about the regulations which existed in America with regards to taxes on the oil industry." It was not a trip to study gunpowder as some have suggested.[2] The trip, however, took on other features as he decided to provide Russian readers with a travelogue of America complete with his own stilted political analysis.

I have used the original *Neftianaia promyshlennost'*, published in 1877, for this dissertation because the version re-published in *Sochineniia* Volume 10 is missing crucial material. Parkhomenko unfortunately did not utilise the original version in his work. Furthermore it is not clear why Parkhomenko only devoted a disproportionate eight pages in his text to this crucial report – at over two hundred

pages, by far Mendeleev's lengthiest tract.[3] While other lapses in Parkhomenko's work, such as Mendeleev's trip to Baku in 1863, may be legitimately attributed to difficulty in tracking down original documents, or their absence in the *Sochineniia*, this is not the case for the trip to America. Even the edited version in the collected works contains a trove of information.

Unlike his earlier trips abroad there are no moments in his diary when he was overwhelmed with emotions after receiving a letter from his wife or accounts of barroom scuffles. There are two plausible reasons for this: First, Mendeleev's marriage was in trouble and he was in no mood to reveal his deepest feelings to his wife through his letters.[4] Second, after 1869 - the year in which he discovered the Table of Elements - he undoubtedly realised that his papers might eventually be open to the public. Mendeleev was sufficiently reticent to realise this and it is from this point on that very personal information starts to be left out of his papers. A slightly more prosaic interpretation is that Mendeleev, crankier and less romantic with age, simply did not feel the need, or have the time, to reveal himself in letters and diaries.

Now already famous thanks to his discovery and depressed by the disintegration of his first marriage, Mendeleev had changed. Mendeleev, who was never known for his sense of humour at the best of times, appears during this trip to be pedantic and mirthless. Furthermore, at times his writing is venomous. However, his rather acidic tone must be placed in the context of his personal problems.

THE VOYAGE

Mendeleev departed from St. Petersburg on May 30, 1876 with his English-speaking assistant, V.I. Gemilian, and did not return until September 11th of the same year. Mendeleev began writing his report during the return trip and was able to finish it so quickly that it was published in January 1877.[5]

The reasons for his pathological dislike of America were varied, but if there is one underlying reason, it is his belief that its multi-party system hindered economic growth and damaged the social fabric.[6] Ultimately, and in contrast to the Great Reforms of Russia, the American way ensured that large-scale reforms could not occur without bloodshed. The freeing of the American slaves and the preservation of the Union resulted in the Civil War; the liberation of the serfs was accomplished without such a tragedy. If Mendeleev's basic assumption is correct, he was, for good reason, proud of the Russian way. Whether his analysis was accurate or not, by the end of his trip it is evident that Mendeleev found little of value in America, except for its oil industry. However, Mendeleev believed it was doomed to fail because America did not conduct the type of research on oil that he was carrying out.

Travelling first class as usual, Mendeleev made notes in his journal of all sorts of measurements -speed, water, air temperature, etc. - as was his custom.[7] During his trip across the Atlantic Ocean, he spent much of his time conversing with both Russian and Western passengers. The Russians apparently were very favourably disposed towards America.[8] Mendeleev also talked with a large number of Westerners aboard the ship and made a complaint similar to what one might hear

today: "Many people [Westerners] had questions and were interested in Russia. [However] it turned out that the most educated people had no understanding of even the most important aspects of Russian history."[9]

The discussions soon turned towards the tensions between Turkey and Russia that would soon culminate in war. Mendeleev notes that "there was a lot of discussion about the Eastern question. From everything which was heard, there was support for the Slavs, antipathy towards the Turks and criticism of the English."[10] It is possible that Mendeleev's fellow travellers were being kind to him; it is also possible that his Western acquaintances simply disliked the Turks more than the Russians; finally, it is possible that his translator simply left out the less friendly comments.

IN AMERICA

Upon arrival in America, Mendeleev was rather shocked by the courteous behaviour displayed by the customs' officers. At first, he was rather perplexed when they came on board the ship: "They were so nice that they brought fresh newspapers from New York for us. We then knew that there would be no problems, no questions about the political situation in Europe."[11] He was even surprised that American customs officers seemed to follow the law and not demand bribes from the passengers. Mendeleev was impressed by the lack of bureaucratic officiousness that was so prevalent in Russia. One, however, suspects that Mendeleev viewed their honesty with an almost Old World disdain.

Once on land, Mendeleev's impressions of America were not as favourable and his harangue against what he perceived the infantile nature of Americans began. The first proof? The American obsession with their flag. Just off the boat, he notes that the American flag was visible everywhere and writes with great contempt that "in general, Americans love to put their flag wherever they can - its one of the ways they show their patriotism."[12] For Mendeleev, patriotism in the Old World, whether in Russia or Europe, did not require such garish and shallow symbols of love for one's country.

Travelling from the port, he discovered a dirty New York and taxi drivers who were not as honest as the customs officers. He writes: "When the two of us took a taxi we paid three dollars to travel two *versts*, to reach the hotel."[13] He then continues with comments on the American roads: "we were struck by the homeliness of the streets of this famous city. They are narrow cobbled streets and [are] absolutely horrendous. [They are] worse than the worst streets of St. Petersburg or Moscow. The buildings are unpainted, clumsy and dirty, even the streets are dirty."[14] Recent visitors to Russia may find his statement about dishonest American taxi-drivers and the apparent impeccable nature of Russian streets a bit ironic.

After settling into their hotel, Mendeleev and his assistant set out for a walk around New York City. They soon found themselves on an even uglier, dirtier unassuming street, in their quest for Broadway. His English-speaking assistant asked someone where Broadway was located. They were thunderstruck to discover that they were actually on the street and at first refused to believe it. "It was not possible to compare it with any of the famous streets of London, Paris or St. Petersburg."[15]

Mendeleev, the world traveller, placed the streets of Russia in the class of other great Western cities, far above the lowly Broadway.

The focal points of Mendeleev's analysis - and the reason that the Minister of Finance paid for his ticket overseas - was American tax policy on the oil industry.[16] An additional purpose of the trip for Mendeleev was to understand what he termed the crisis of the American oil industry. However, Mendeleev also commented at length on the general economic situation in America and what he saw as its strengths and weaknesses. His general views on economics - at least those revealed in this tract - are remarkably similar to his views on oil. There appears to be one difference: While Mendeleev supported unbridled competition in the Russian oil fields in order to ensure its prosperity, he expressed reservations about this approach here, at least in regard to the American railway industry. In later chapters, it will be shown that the Russian government's railways tariffs had a significant impact on the Russian oil industry dramatically limiting its ability to export crude oil or its by-products.

Mendeleev believed that most European economic problems could be attributed to the debts accumulated during wars. However, in the Unites States the "most immediate cause was because of the immense amount of capital used to build the railways," many of which proved to be unsuccessful and as a result "the price of practically all the railway stocks fell very, very steeply."[17] This was of particular interest to Mendeleev because at one time he owned Russian railway stocks.

One of Mendeleev's fears for the Russian oil industry, as he had noted in 1867, was the formation of monopolies. Mendeleev believed that the only way

businessmen would invest in industry and not gouge consumers was through competition. However, he believed that the railway industry should have its rates set by the government because excessive competition would ultimately create a monopoly. He saw proof of this in the American railway system and its role in transporting oil and its by-products: "If some [railway] company set a price a competing company would immediately beat it."[18] Mendeleev believed that competition contained the seeds of its own demise and the seeds of its antithesis: Eventually competition would destroy all but one company and ultimately create a monopoly. Mendeleev writes: "the price of bread should go up because some of the railway companies which were transporting it received very little [money for doing so] because of the competition and as a result one company destroyed the competition." The result of this monopoly would be dramatic increases in the cost of transportation and as a result an increased price for bread and many other products.[19]

Mendeleev made no further comments on the nature of competition. His surprise that the American government did not set rail rates suggests that he was comfortable with the idea of some form of state regulation of the market, indicating that Mendeleev was not a proponent of completely unfettered competition. He also seems to have made distinctions between the railway industry, where he thought that the state should set rates, and the oil industry, where Mendeleev simply wished to ensure that the oil bearing lands did not fall into the hands of a very few who would then abuse their monopoly.

AMERICA'S POLITICAL SYSTEM

Mendeleev's most caustic comments are reserved for the American political system. He condemned the belief that a change of political parties was the panacea for all of the country's ailments including its economy. Even worse, he suggests that the revolving door politics of Washington were responsible for its military losses and for damage to its scientific research. It is evident that Mendeleev did not believe that the multi-party system was healthy for America and did not help the development of its oil industry.

During his visit, Mendeleev had frequent discussions with the Americans that he met concerning their economy and he was surprised by their belief that changing the party in power would result in a dramatic improvement in the economy. "Democrats wait for the biggest change if their party replaces the Republican Party." To Mendeleev this was silly because "it is known that in Europe they put most of their trust in the ability of the recovery of the industry after the elimination of a large war debt; in America they do not have that expectation - there they wait for the quickest recovery from the change of the political parties."[20] Mendeleev viewed the debt as the source of economic retardation Americans viewed the source of economic retardation as originating from the political party they did not belong to.

Mendeleev also clearly attacked what he perceived to be the gravest fault of the multi-party system: its inability to effect large-scale reforms without bloodshed. In the United States "the changing of the internal order already cost the American

States a bloody war, and that today's current struggle between Democrats and Republicans, in the opinion of many, sooner or later, will lead to an open war for predominance. And, there is the possibility of victims - it occurs of course without upheaval, but not in America, where without bloody clashes there are hardly any conceivable profound, serious changes for the better."[21] It is impossible to overstate the importance of this to Mendeleev. Whatever Russia's innumerable problems in the nineteenth century, beginning with the emancipation of the serfs, they had undertaken with varied results, wholesale changes much larger than Americans without bloodshed.

Mendeleev also found fault in the American party system and its impact on scientific research. After visiting the meteorological centre in Washington – meteorology was a subject which he would later study for the Russian government - he writes that following a change in party at the White House, all of the staff at this centre were replaced with the new party faithful, including scientists, regardless of their credentials.[22] Mendeleev was clearly aghast at this approach to the study of the weather.

He was also less than enthralled with the state of American science, especially in regards to its research on oil production. "Research on oil [in the United States] has not moved at all in the last ten years ... In America they are only concerned with how to get the most now, and are not concerned about the past or future, or about doing it in a rational fashion; they are only concerned about the present and have no concern for primary research. This way of doing things is always threatened by the unexpected and might cost the country a lot... In the United

States there is no growth in the scientific study of oil. Because of this there is no certainty in the oil business."[23]

Mendeleev was clearly concerned that the American approach to oil production, lacking in rational scientific study, would eventually cave in on itself. According to Mendeleev, once the easy oil was gone, there would be no scientific knowledge to aid the Americans in oil exploration, or to improve the efficiency of the refinement or transportation of oil. It is not surprising that Mendeleev, a scientist who extensively researched the oil industry, would believe that his chosen profession was necessary for its long-term health. It is also important to note that the Russian government supported a number of scientists, in addition to Mendeleev, in the study of this issue; the American government did not. Nevertheless, Mendeleev was more than willing to admit that the American oil industry was, at least for the moment, very strong. To ensure its continued strength, however, he suggested that it should employ more scientists.

For a North American scholar at the beginning of the twenty-first century, Mendeleev's writings on George Custer and Little Big Horn are surreal, and once again reveal his antipathy towards the American multi-party system. This infamous battle occurred just before Mendeleev's arrival and was the subject of great discussion in American society. As a result, Mendeleev discussed the causes and political repercussions surrounding the massacre of George Custer and his army at Little Big Horn in his report. According to Mendeleev, the reason for the defeat was that the infamous Captain had gone out ahead of his commanding officer and put himself and his troops in harm's way. Custer apparently separated from the main

force because of "political enmity between the general and the captain: one was a Democrat, the other was a Republican, and the junior officer did not want to follow the orders of his political enemy."[24] It is quite possible that Mendeleev provided Russians with an accurate portrayal of the American debates surrounding Custer's Last Stand. It is not implausible, however, that there were other interpretations of this event which Mendeleev either did not hear or did not believe. What is important is that Mendeleev himself believed and presented to Russians the belief that political tensions created by the American multi-party system were the source of this military failure.

While Mendeleev's views of Custer's Last Stand might have been lopsided, they were at least plausible. However, some of his interpretations were much worse. For example, at a party hosted by the new American Minister of the Navy – at which diplomats, politicians, and other famous personages such as Mendeleev were present - wine was served. The hostess turned to her European guests and said, "You can drink this wine without fear; it was bought before my husband became minister." Not recognising the joke, Mendeleev continues, "This was said with absolute seriousness."[25]

Mendeleev also took it upon himself to explain American race relations – at which he was aghast - to Russians: "In New York, there are few Negroes, but in Washington, there are many. They must be given their due: They distinguish themselves not only as servants but also in simple encounters. One day I was looking for the house of our ambassador and it was necessary for me to ask a Negro where it was located. It wasn't very far and the Negro offered to take me there."[26]

Mendeleev's statements are patronising by modern standards, but for the nineteenth century they were not outrageous. Mendeleev also notes "they [Americans] detest the Negroes, the Indians, and even the Germans."[27] At the time of Mendeleev's writing there can be little doubt that the plight of African Americans was horrendous and the employment of the American military against American Indians was brutal. However, Mendeleev might have considered Russia's seemingly eternal military engagement in Southern Russia.

He also commented on the state of the bureaucracy and the employment of women within it: "The Ministry of Finance was notable because of the many woman bureaucrats [employed therein] ... their advantage according to the words of a bureaucrat, is not of little importance, particularly as a consequence of their accuracy in accounting."[28] While Mendeleev had marital problems, he was very progressive in his attitudes towards women's education and employment. Later he would be the driving force in the creation of a chemistry programme for women at St. Petersburg along with Alexander Borodin, the professor of medicine and part-time composer, and his friend from Heidelberg.

While travelling around the American Northeast he stopped off at the Philadelphia World Fair. He was unimpressed. According to the Russian chemist, Americans who had seen European fairs admitted that their fair was, by comparison, of inferior quality.[29] Mendeleev, a veteran of European and Russian fairs, and not at all well disposed towards the United States, whole-heartedly agreed. For Mendeleev, the most important exhibit in Philadelphia was, of course, the oil display.

However, Mendeleev was willing to recognise America's strengths. In particular, Mendeleev was intrigued, if not awed by the fact that America used three times as much kerosene per capita as Europe.[30] At the time, Russia was using considerably less than Europe, which left a lot of newly emancipated serfs literally in the dark during Russia's long winters. From Mendeleev's point of view, this was a tragic waste of human resources, as these same peasants, with proper lighting, could have been productive in the evenings.

Mendeleev wanted to know why Americans were using so much more kerosene. He was also perplexed by America's lead in oil production, especially when, in other respects, it was such a "backward country". Mendeleev, however, found some plausible reasons for their success. As market economies were a given for Mendeleev, whether in Russia or abroad, the American oil industry was successful because of "the excellent quality of the raw product ... as well as thanks to the statutes of several states."[31] He did not believe that the American industry's strength was due to its business practices or some moral virtue.

Mendeleev's comments on America's social and political system were not, on the whole, balanced. His attacks on the American political system had some basis if one remembers that the Civil War had only ended a few years earlier, whereas Russia had up to that time avoided this type of ugly conflict. Mendeleev saw a clear connection between this war and the jockeying of the Democrats and Republicans for power. Russia had problems, but this was not one of them. It is interesting to note that Mendeleev did not view the American Civil War as the result of the South's separation or of the emancipation of the slaves. Mendeleev might

therefore have looked upon the bloodless liberation of Russian serfs with some pride in comparison to the United States.

Before returning to Russia, Mendeleev took a small trip to Niagara Falls where he was so entranced that he stayed for three days. It was "absolutely staggering," and if "you put together all of the waterfalls of Europe they would only make up a part of Niagara Falls not only in the mass of water and its height, but also by the impression it leaves."[32] North America's natural riches, whether oil fields or tourist destinations, impressed Mendeleev.

THE TRIP HOME

During the return trip to Russia Mendeleev began writing the first draft of his report and further discussed America with the returning passengers. "The return trip across the ocean was a lot quieter than to America ... Everybody who was returning with whom I spoke was more or less disillusioned with America."[33] Furthermore, the travellers found America to be a "wild country," and that it would "be a mistake to return. No one would have been happy if they had stayed in America."[34] One of his compatriots, Doctor Petrovskii, who was disillusioned with America, was also a messianic Slavophile, and thus prone to anti-American rants.[35] While other Russians apparently supported the doctor's overall views, in a much milder form, Mendeleev says nothing about his own ideas in this regard. Throughout this report, Mendeleev never failed to provide devastating, if sometimes foolish, commentary on events and people, so it is interesting that he did not write a word either in support or condemnation of the doctor. Did he support this doctor's views? Was he a

Slavophile? Did he truly believe that Russia provided an alternative path, a synthesis, the best of both worlds? It is arguable that his silence was due to the fact that he was both a Westernizer and a Slavophile, and oscillated between these positions, depending on his mood, the subject and the year.

After their own disillusionment with America, it appears that the returning Westerners with whom Mendeleev spoke viewed Russia more favourably "hoping for something new from the Slavs" and from Russia. Mendeleev's fellow travellers admired the "peaceful, truthful and desirable resolution of the deepest social problems through gradual and firm internal reforms - this is what they are expecting from the Slavic peoples and especially from Russia."[36] His fellow Western travellers apparently agreed: "They see that in Russia there is neither the evil of organised aristocracy nor the disastrous enemies of political parties."[37] Scholars should warily note the rather uncanny similarities between Mendeleev's own views on societies and polities and those of his fellow travellers.

Unlike his diatribes against America, which provided both factual accounts of political events and caustic analysis, Mendeleev reports the views of his fellow-passengers without comment. After all, Mendeleev could have scored political points at home by wrapping himself in the Russian flag and arguing that his fellow travellers were absolutely correct.

During his trip Mendeleev discovered a change of opinion regarding Russia by many in the West:

> Fifteen-years ago, when I travelled and lived a great deal in Western Europe, I didn't hear once anything good about Russia. Many were frightened by Russia and because of that

> many did not love her; no one was interested in her and when they talked of her they talked of her like India and Australia. Now, there has doubtlessly been a change ... they [believe] that it will sooner or later influence the fate of civilization.[38]

While this statement might be somewhat excessive, it is interesting that these flattering comments were coming from Europeans - although Mendeleev does not specify if they were German, French, British, or some other nationality. As he noted, Russia was apparently not held in high regard in the 1860s. While this situation could well have changed, it is also possible that his fellow passengers were flattering Mendeleev so that they could bask in the reflected glory of this eminent scientist.

Regardless of whether he was a Slavophile or a Westernizer, his repeated statements condemning bloodshed in America and his emphasis on gradualism only serves to underscore one crucial fact: Mendeleev would never have supported the Bolsheviks. Both wished, at least ostensibly, to ameliorate the economic and social conditions of Russia through, in part, science; where they differed was on the issue of violence. Mendeleev's unwavering condemnation of bloodshed as a solution for America's problems and of its social and political system, which created the violence, may be realistically applied to Bolsheviks ideology and practice. Soviet scholars have ham-fistedly attempted to claim Mendeleev as one of their own - a proto-Bolshevik. On the crucial question of using force to resolve disputes they are absolutely wrong. Mendeleev's unflinching condemnation of political violence, and the polities which create it, in *Neftianaia promyshlennost'* may partially explain why Parkhomenko perhaps wisely glossed over this crucial trip to America.

Mendeleev's ultimate conclusion is that "to everyone it is clear that the growth of the United States is not better, but average and worse than European." [39] Thus, there are no general economic lessons to be learnt from America. Yet, one can only conclude that Mendeleev's hatred for America appears to have clouded his views somewhat. When reading any of his work, it becomes very evident that if something was quantifiable, Mendeleev quantified it. Yet he provides no statistics at all on America's economy as a whole. This point is reinforced by his selective use of statistics in this report: In the section analysing America's oil industry, massive documentation is provided in support of his argument that while oil industry was very strong, in itself it was nothing special. Rather, its lead in oil was due to the quality of the raw product and intelligent legislation.

One of his most succinct statements about America is to be found at the end of this work. He demands: "why do they not have proportionate growth of science, poetry; why so many lies, so much nonsense. One may say that America produced an expensive experience for the working out of political and social ideas." [40] It was not a good idea for Russia to follow the American model.

Perhaps Mendeleev's most vitriolic attack on the United States, and the ugliest comment that he ever published, may be found at the very end of this work. "I don't advise anyone to live there who expects something from humanity, something besides that which has already been attained" in Russia. "It would be very difficult for them [to live] there." However, America did have some uses: "Many Jews from Russia go there and stay, they predominate among Russian immigrants. In the emigration of Jews, the States are useful for Russia..." [41]

This comment, at the end of *Neftianaia promyshlennost'*, was removed from *Sochineniia* Volume 10. This is unfortunate as it does reveal important information about Mendeleev. While Mendeleev's attitudes towards other ethnic groups were benevolent, if paternally racist, this did not extend to Russian Jews. The comment also reveals something of the times. While Russia did not have a monopoly on anti-Semitism, it is interesting to note that it was acceptable to publish such comments in 1876, while in 1949 - the year in which *Sochineniia* Volume 10 was published - it was not.

The purpose of this chapter has been not to examine Mendeleev's views on the oil industry, but rather to assess his general views of America. Simply put, he was not at all impressed with this New World country. Mendeleev travelled to America apparently well disposed towards it, yet returned with almost no kind comments about the social and political situation of the country. What changed his mind?

Primarily, it was America's belief – or what Mendeleev thought was their belief - that the solution to their economic and other problems might be found in their electoral system and its practice of alternating between the two main political parties. In his acidic tone, he makes it perfectly clear that he thought that this was nonsense. Europeans resolved their economic problems by retiring cumbersome war debts. Mendeleev though that Russia should strive to become a European country, and would do well not to follow the American model.

Above all, Mendeleev believed that the acrimony created by the American multi-party system resulted in bloodshed and that whole-scale reforms were

impossible without violence erupting. It is quite understandable that after viewing the Great Reforms of Russia and its freeing of the Serfs, Mendeleev would be proud of his homeland's accomplishments. The agony of America's Civil War was not something that Russia should emulate: The system and values that brought about this catastrophe must be avoided. While Mendeleev's interpretations may be incorrect, they are plausible. Thrown into a culture completely foreign to him and lacking English language skills, post-Civil War America must have seemed surreal. By comparison, and in spite of its own many problems, Russia must have appeared to be a calmer place.

Mendeleev also believed that America was lacking a "soul". It was a place devoid of art, poetry and any sense of collective ideals. For Mendeleev it was quite literally a country of the all-mighty buck and of individualism run amuck. It was also a place where science was practically non-existent. Considering Mendeleev's profession he was understandably aghast at this apparent deficiency. However, his argument that America's oil industry would decline after the 'easy' oil had been discovered and used up was subsequently shown to be incorrect. His belief that scientific research was necessary to make more 'difficult' oil profitable was wrong. Both America's and Russia's oil industries would experience incredible growth during Mendeleev's lifetime without receiving the level of scientific research which Mendeleev thought proper to them.

His commentaries also reveal that, while Mendeleev was clearly unimpressed with the United States, he was not a rabid Slavophile attacking any and all things Western. Instead, when criticizing America, Mendeleev would always contrast its

apparent weaknesses with the strengths of European countries and Russia: the streets, the culture, science, the politics etc. Russia was a part of Europe. Even though more Slavophil statements would have stood him in good stead with the powerful or even with the general Russian public – as they perhaps would have here with Russia on the verge of war with Turkey – Mendeleev did not use them. The reason, I believe, is simple. While he was pro-Russian and components of his thinking were Slavophile, he was not an extremist in thought and many of his ideas were counter-balanced by his equally strong Western leanings.

RECOMMENDATIONS OF 1876

In October 1876, upon his return to St. Petersburg, Mendeleev wrote a memorandum to the Minister of Finance, M. Kh. Reitern, entitled "*Zapiski o neobkhodimosti otmeny aktsiznogo sbora s osvetitel'nogo neftianogo masla*" (Memorandum regarding the abolition of lighting oil taxes.) The memorandum mentions a variety of issues that Mendeleev would later study: for example, kerosene safety, the refinement of oil by-products, and oil pipelines.

However, the focus of the memorandum – and the reason the Russian government paid for his trip to America - was a discussion on how to attract capital to the Russian oil industry and how to encourage its growth.

He writes in the introduction:

> Whether owing to those reasons, which by me were submitted, or because of other reasons, M.Kh. Reitern soon supported my views on the necessity of completely cancelling the petroleum excise tax, despite the beginning difficulties in Turkey [wars are expensive]. In spite of the fact that war was obviously so close, its abolition has been

> carried out both in the State Council and in the legislature. As a result there was a complete cancellation of the petroleum excise tax.[42]

This statement is interesting for two reasons. First, it mentions that he supported the abolition of petroleum taxes – a continual theme of Mendeleev's[43]. Furthermore it reveals something of Mendeleev's character: While he was not lacking in self-assurance, he did admit that there might have been "other reasons" for the abolition of the tax. And while this sense of modesty might have been merely formal, it is also very representative of the way he wrote until 1880.

This memorandum was quickly followed up by the publication of a short essay intended for a scientific audience in the *Imperatorskoe Russkoe Tekhnicheskoe Obshchestvo* entitled "*O neftianom promysle v Amerike i ob otnoshenii ego k Russkomu neftianomu promyslu na Kavkaze*" (The American Oil Industry and its Relations to the Russian Oil Industry in the Caucasus.) which focused on the lowering of kerosene prices. In this essay, Mendeleev noted that only half of America's kerosene was consumed at home while the rest was exported. However, he drew a subtle distinction when he noted that kerosene was widely consumed in the cities – this was not the case in Russia - while kerosene was the fuel of choice for towns and rural areas.

He also noted that America's use of kerosene was much ahead of Europe; the unsophisticated New World consumed three times more kerosene than its more sophisticated rival. While Mendeleev was willing to admit America's economic strengths, he did not believe that this particular success was the result of any great genius on the part of American industry. Instead, it was due to the quality of

American oil, which produced much greater quantities of kerosene than Russia's; Baku oil produced much more *ostatki* (remainders). How to employ these remainders would later become a subject of some interest to Mendeleev.

Mendeleev lauded the United States for introducing legislation that forbade the sale of dangerously flammable kerosene: "This would be highly useful for us." Undoubtedly safer kerosene would lessen the number of fires caused by peasants kicking over lanterns. This was another issue that Mendeleev would later examine.

He also observed the arrival of the first gas piston engine in America: "In them the pressure under the piston is made by explosions from a mixture of compressed air with petroleum". However, to allay any suspicions that Mendeleev was overly impressed with America's inventiveness, he adds that "however it is not news: as at the Vienna fair there already was an exhibition of the same sort of explosive petroleum engine."

Finally, in early 1877, he published *Netftianaia promyshlennost' v severo Amerikanskom shtate Pensil'vanii i na Kavkaze* which set out for the general public his views on America's oil industry. The technical suggestions of the work will now be addressed.

Mendeleev believed that American oil started to decline in price when all taxes on crude oil and its refinement were abolished in the 1870s. The result was both an increase in use and a decrease in the price of kerosene in America. Mendeleev believed that the Baku oil fields could compete with the American product if the Russian government similarly abolished the taxes it assessed the industry.

Mendeleev revealed in this text an even greater plan for the developing Russian oil industry. Once Russian kerosene was plentiful and reached a low price - something that he was certain would happen after the Russian government enacted his plans - then Russia, "should export to Europe" by using "pipelines, special barges and wagons". If this were done, "we can profitably compete with America".[44] As will be seen in future chapters, the issue of transportation and oil exports would play a crucial role in Mendeleev's thinking on the industry. This type of farsighted, broad view was typical of Mendeleev.

Mendeleev reiterated to the Russian public his position that the Russian oil industry's problems could be easily solved: "the abolition of the existing excise tax would ... excite interest in the oil industry" and that "it appears that the appropriate time for the state measures has come".[45] This statement in many ways sums up Mendeleev's views on the role of the state and the development of the oil industry: the state has a role in promoting the general interest and in formulating policies necessary for its success, and private industry was responsible for its ownership and growth.

There were other roles for the government in developing the oil industry: for example, in the realm of safety legislation and research. It was crucial for the government to re-examine all laws concerning the fire hazards of kerosene, as well as to inquire into the dangers of transportation and storage. Furthermore, because there was insufficient technical information on Russian oil, it was necessary that an extensive scientific study of all aspects of the industry be undertaken in the Caucasus with the help of the Russian government, and with the results published in

Russian. As Mendeleev notes, "Private individuals, if they do it [research], rarely publish it."[46] He also noted that with sufficient research, the by-products of Russian oil refining could be used to power steamships. The issue of by-products would soon play a substantial role in the Russian oil debate.[47] Of course, Mendeleev felt that he should conduct the research.

Mendeleev argued that the government should gather detailed statistics on the industry in order for the state to have an exact knowledge of its trends and current situation.[48] Mendeleev, who shared the attributes of an accountant and a scientist, had a passion for statistics. His critics would at times accuse him of sloppiness or abuse of statistics, but that is another issue.

Mendeleev also recounted his visit to the oil fields in Pennsylvania and his visits to the refineries, Atlantic and Tveddly. Much impressed with the fields, his technical analysis revealed an unnerving but nevertheless important conclusion: American oil yielded more kerosene than Russian. American oil gave 75% kerosene and 15% *ostatki* ; Russian oil produced 33% kerosene and 60% *ostatki.*

Nevertheless, Mendeleev believed that Russian oil "deposits were not worse, but even better than in America." Yet, there was one hindrance to Russia's industry: the excise tax. According to Mendeleev, when America removed this tax there was an immediate increase in production facilities and a decrease in the price of kerosene - just what light starved Russian peasants needed.

However, Mendeleev was not inflexible and doctrinaire in his thinking, and although the abolition of the excise tax was extremely important for the welfare of Russia, Russians and its oil industry, he notes that:

> neither the removal of the excise duty, nor the rising price of [America] kerosene, nor the existence of an import duty on kerosene by itself will make our kerosene cheaper nor develop our oil industry. For this it is necessary to increase extraction, contribute a lot of strength, and introduce such means and techniques, which are friendly to big business, which is eager to cheapen an important product for the people ... In order to attain this it is necessary for us to construct the necessary industrial, technical and trade side of our oil production.[49]

This statement is crucial to understanding Mendeleev's views on oil. While much has been made of Mendeleev's battle to remove the excise tax, his belief that the oil industry had to be made attractive so that businesses would invest in its development and, ultimately, produce cheap kerosene has been ignored.[50] Mendeleev never viewed any action, piece of legislation or even technical innovation as singularly crucial for the industry's development: His mind was far too busy, crowded, too catholic and supple to demand that rigid logic be applied to his work. (Of course, this did not stop him from demanding rigid logic from his opponents.) Instead, throughout his work on oil, and acting as a good propagandist, he would continually aggressively promote one aspect of his thinking while keeping other important facets in the background. Yes, in 1876 Mendeleev did actively promote the abolition of the excise tax, but this was only one part of a complex puzzle.

Mendeleev also argued that what the industry needed most was a pipeline. As he writes, "The technical advantages of transporting oil by pipeline were already apparent in Baku in 1863 when I recommended its construction. It is time now to begin construction." In fact, after his visit to America in 1876, Mendeleev wrote that it was crucial for drilling to be concentrated in one area, namely Baku: "a lot of

force [should] be concentrated in one place. Between Baku, Kuban and Cheleken, it would be better to focus all of the efforts on Baku..."[51]

While Mendeleev encouraged the state to involve itself in creating a suitable environment for investors – foreigners included - he also believed that "only [with] the participation of many industrialists is it possible to ensure the production of large quantities of oil and make our oil industry independent, lively and important for Russia." Mendeleev never changed his belief in the importance of many refiners and not just a few. He wrote about this in 1863 when he first became interested in the industry and would do so for the rest of his life. This was undoubtedly the source of his fear of monopolies.

Mendeleev also argued that it was impossible for one industrialist to do everything in the oil industry. He believed in specialization. The proprietors of the oil fields:

> are not able to alone do everything, especially in such a large industry. In order for the drilling to be successful, it is necessary for other entrepreneurs to do the work ... [It is necessary that different people] do the construction, sales, give technical advice, drilling, construct reservoirs and other apparatus. All of which is necessary for a successful industry.

Furthermore:

> it is important that the sale of oil products should not be conducted by the refiners, drillers, or the owners of petroleum sites . . . the business of trade requires a special knack.

As noted above, Mendeleev thought that no single industrialist could do everything, but in 1880, Ludwig Nobel would prove him wrong. However, Mendeleev's reasons for thinking so were simple: Russia must "have cheap lighting oil in our

long winters." This was Mendeleev's obsession: cheap plentiful kerosene for the peasants. This document is also interesting for the larger plan of Mendeleev's that it lays out: the exportation of Russian oil. But first, Russia had to develop its industry to the level where there was sufficient kerosene for Russians; the rest of the world could wait.

In this document's summation, Mendeleev returns once again to the most pressing need, removing the excise tax on oil, stating that in America this resulted in the price of kerosene being lowered. Russia could not "close its eyes". There was no doubt that the "oil business in the Caucasus promises much, but requires solid capital and deep knowledge and enterprise." He concludes by saying that:

> I wish that the excise tax on kerosene be removed in order to . . . attract the attention of capitalists and technically qualified people [This is in order] that the Russian people will finally receive cheap lighting oil and new goods for the export market.

Mendeleev also returned once again to the oil pipeline question. He believed that pipelines which travelled from the drilling rigs to the refineries and the Black Sea would "greatly increase the speed and cheapen its transport," but only if there was a large amount of oil being produced by a large number of drilling rigs. Building pipelines before there were sufficient quantities of oil was putting the horse before the cart.

Mendeleev recognised that Russian oil produced less kerosene and more *ostatki* - of which a large component was heavy oil - than its American counterparts, and he set out to turn this weakness into a strength. While kerosene production was still crucial for the Russian chemist, he decided that it was also important that

research be undertaken into "heavy oil and do research for its uses," as well as "to find a market for it." This type of flexible approach to issues was very typical Mendeleev.

Mendeleev also clearly sets out his plans for a decentralized Russian refinery system. Although he would spend more time and energy on this issue ten years later, at this juncture he already had some ideas on the subject. Mendeleev argues that the refineries should not only be in Baku:

> but primarily along the Volga and generally in the centre of trade and use, close to those places where barrels[52] are cheaper and where it is possible to return them. This important question is connection to cost. To the factories oil can travel by pipes, water and train and packed in large reservoirs, and not in expensive barrels.

As will be examined in detail in the next chapter the issue of transportation was becoming extremely important to the industry. The Nobels' ability to create a massive and very expensive network of ships and railways was crucial to their tremendous success - much to Mendeleev's chagrin.

Nevertheless, it is important to note that as early as 1876, Mendeleev publicly advocated the building of refineries along the Volga. In the early 1880s Mendeleev would work for a Russian industrialist at his oil refinery on the Volga; simultaneously he would advocate the need for policies that would promote refineries on the Volga. If one did not know that several years earlier Mendeleev had advocated this policy, it would certainly appear that he was corrupt. This is not the case.

The argument to refine oil away from its origins in Baku dovetails neatly with Mendeleev's belief that the Russian oil industry should be specialized; different

businessmen should carry out different processes. Drilling and refining oil in Baku would lend itself to a quasi-vertical monopoly.

Mendeleev was willing to use parts of the American oil industry as a role model for Russia's own; the excise tax is the clearest example. Mendeleev used America's abolition of these taxes as one of the keys for the future growth of the Russian oil industry. This is clear proof of his willingness to use Western ideas not only to improve the Russian industry, but also to justify his policies to the Russian public. The connection between the American oil industry and other policies he was advocating for the oil industry is weaker. He did argue that American pipelines were very effective and should be employed in Russia, but he apparently had done so with Kokorev in 1863. Nevertheless, he was more than willing to use America as an example of how things should be done in the oil industry when these suited his purpose.

It was in the realm of scientific research that Mendeleev most clearly broke with America on issues directly pertaining to the oil industry. America carried out almost no serious scientific research at all; Mendeleev thought this was shortsighted and believed that the state must sponsor extensive study. Of course, this might have less to do with the question of his openness to the West than of his profession. As a scientist, it was natural that he believed in the value of scientific research to promote industry.

[1]D.I. Mendeleev, *Neftianaia promyshlennost' v severo-amerikanskom shtate Pensil'vanii i na Kavkaze*. (Sankt Petersburg: Obschestvenaia pol'za, 1877), 150.

[2]I.S. Dmitriev,"Osobaia missiia Mendeleeva: Fakty i argumenty. *Voprosy istorii estestvoznaniia i tekhniki,"3* (1996): 126-141.

[3]V.I. Parkhomenko, *D.I. Mendeleev i russkoe neftianoe delo.* (Akademiia Nauk: Moskva, 1957), 53-61.

[4]Soviet sources delicately state the Mendeleev's first marriage had not been a "real marriage" for several years as a result of complications from childbirth.

[5]Valerii Aleksandrovich Gemilian would later become a professor of chemistry at Warsaw University.

[6]It is odd that Soviet scholars did not use Mendeleev's rants against the American multi-party system to buttress their own system. Parkhomenko quite correctly noted that Mendeleev was very concerned about the development of monopolies in the oil industry; yet, he completely ignored the clear connection between the Soviet system and the one Mendeleev criticized.

[7]Mendeleev, *Neftianaia promyshlennost'*, 77.

[8]*Ibid.*, 75.

[9]*Ibid.*, 81.

[10]*Ibid.*, 81.

[11]*Ibid.*, 86.

[12]*Ibid.*, 87.

[13]A *verst* equals 1.06 kilometers.

[14]*Ibid.*, 87.

[15]*Ibid.*, 87.

[16]*Ibid.*, 87.

[17]*Ibid.*, 89.

[18]*Ibid.*, 90.

[19]*Ibid.*, 91.

[20]*Ibid.*, 91.

[21]*Ibid.*, 301.

[22]*Ibid.*, 95.

[23]*Ibid.*, 94.

[24]*Ibid.*, 94-95.

[25]*Ibid.*, 94.

[26]*Ibid.*, 92. Mendeleev uses the word *negr*. This word has no racist connotations in Russian; however, the Russian word for black (*chernyi*) in the sense of dark-skinned or person of colour has racist connotations.

[27]*Ibid.*, 154.

[28]*Ibid.*, 93.

[29]*Ibid.*, 94.

[30]*Ibid.*, 306.

[31]*Ibid.*, 306.

[32]*Ibid.*, 149.

[33]*Ibid.*, 150.

[34]*Ibid.*, 301.

[35]*Ibid.*, 152.

[36]*Ibid.*, 152.

[37]*Ibid.*, 152-153.

[38]*Ibid.*, 152-153.

[39]*Ibid.*, 301.

[40]*Ibid.*, 154.

[41]*Ibid.*, 303.

[42]D.I. Mendeleev, *Gde stroit' neftianye zavody,* (Sankt Petersburg: Izd.V. Demkova, 1881), 7-8.

[43]Mendeleev's tax policies have been discussed in Francis Stackenwalt, "The Thought and Work of Dmitrii Ivanovich Mendeleev on the Industrialization of Russia, 1867-1907," Ph.D. diss. University of Illinois, Urbana, 1976.

[44]Mladentsev, M.N. and Tishchenko, V.E. *Dmitrii Ivanovich Mendeleev, ego zhizn' i deiatel'nost': universitetskii period, 1861-1890.* (Moskva: Nauka, 1993), 304.

[45]*Ibid.*, 304.

[46]*Ibid.*, 304.

[47]*Ibid.*, 304.

[48]*Ibid.*, 304.

[49]*Ibid.*, 304

[50]Stackenwalt, 89.

[51]Apparently, someone had decided to follow Mendeleev's advice by creating an oil industry on Cheleken.

[52]There is little wood near Baku.

Chapter Five:

The Earth and the Moon: Mendeleev Against the Nobels

"In other words, you are demanding from a professor of chemistry further technical proof . . . Please! First enter first-year university in the sciences, where I give lectures on chemistry, study first theoretical chemistry, then analytical laboratory, then organic laboratory."

D.I. Mendeleev's response to Ludwig Nobel's questioning of the great chemist's statistics. [1]

Mendeleev's report on his 1880 trip to Baku demonstrates that even the most brilliant mind is subject to the human condition. His prescient views on the oil industry from 1863 through until 1876 came, partially, to a grinding halt. Through this earlier decade-and-a-half, some of Mendeleev's ideas, such as the private ownership of oil fields and the elimination of the excise tax, became the cornerstone of the Russian government's policy on the oil industry, policies that were so successful that the industry boomed. Interestingly, although the Russian government chose not to follow Mendeleev's advice in 1880, the industry continued to grow, clearly demonstrating that Mendeleev was not omniscient in regards to the proper direction for the Russian oil industry. The following table illustrates the incredible growth rate experienced by this industry between 1875 and 1885.

OIL PRODUCTION

YEAR	BARRELS	GALLONS
1875	850,000	34,000,000
1876	1,400,00	56,000,000
1877	2,000,000	80,000,000
1878	2,500,000	100,000,000
1879	3,000,000	120,000,000
1881	4,000,000	160,000,000
1882	5,000,000	200,000,000

2

However, this success soon resulted in schisms in the oil industry. The industry split into two factions: One group, led by the Nobel family and consisting of assorted small-scale Russian, Tatar and Armenian oil men believed that the raw oil product should be distilled on sight in Baku prior to being shipped off to the various parts of Russia.[3] The other grouping, led by V.I. Ragozin, believed that the oil should be transported in raw form to various regional centres in Russia -- where he had built refineries -- to be distilled into kerosene closer to consumers.[4] Mendeleev, who at that time was working for Ragozin, forcefully opposed the

Nobels in a public forum employing a wide range of economic and technical arguments in doing so.[5]

This section will also discuss the unexciting but important role of oil by-products and the differences between American and Russian crude oil.[6] Until the late 1870s, the only petroleum product of any commercial value was kerosene. However, after this time other oil-based products became valuable, which changed the economic equation somewhat. "These leftovers (*ostatki*) until recently were simply burned," Mendeleev writes, "Now they are burning in the boilers of steamships." This would prove to be very important for whereas American oil produced ¾ kerosene and ¼ leftovers , Baku oil produced ⅓ kerosene and ⅔ remainders.[7] The leftovers were now being widely used in the steamships and warships now plying the Caspian Sea.[8]

Mendeleev also differed from Nobel when it came to policy on oil exports. In addition to the proximity to users argument, Mendeleev wanted raw oil distilled in central Russia for two reasons. First, it would foster the development of Russian industry. Second, if crude oil were directly exported, Russian refineries would have to compete for its supply. This would drive up its domestic price and, ultimately, drive up the price for kerosene that Russian peasants would have to pay. Furthermore, the Nobels maintained a very circuitous route to the Baltic Sea, exporting small amounts of kerosene in what Mendeleev believed was an inefficient manner.

While oil is now widely recognized as perhaps the most important natural resource for economic growth – not a few wars have been fought over it -- this has

only been the case since the early 1880s. At this point the Rockefellers and Rothschilds became involved, recognizing its great value, exploiting it to amass great riches in the European and American markets. In Russia, the driving industrialist force – for good or ill –was the Swedish Nobel family: They were, aptly described at the time as the Russian Oil Kings. (Later Alfred Nobel would be known for his invention of dynamite and his funding of a peace prize). In the early to mid 1880s, the family's combination of organizational skills, court connections, access to huge pools of capital, daring and sheer luck was perhaps the greatest reason for the massive growth of the Russian oil industry. Mendeleev fought their efforts every step of the way.

A study of the battle between Mendeleev and Ludwig Nobel reveals very different ideas on how to develop the oil industry. These struggles also reveal much about Mendeleev's personality, both good and bad. Until this point the Russian government listened to and followed the advice of the great Russian Chemist, however there were few alternative sources of such broad vision as Mendeleev's in Russia at the time. One now emerged -- Ludwig Nobel -- and the Russian government and people were presented with a different vision for the industry's future. Mendeleev was not amused. While he was unquestionably a genius in the realm of chemistry, Mendeleev did not necessarily have the same ability in other fields, as this episode will show. It was the Nobels' talent for business that served them well during this conflict, allowing them to influence government policy into directions that ran counter to Mendeleev's views.

Mendeleev's response to the challenge posed by the Nobel family is fascinating: At times hectoring, bullying, duplicitous, sneaky, elliptical and viciously sarcastic, he unrelentingly attacked the Nobels' plans as being unsound and doomed to failure. However, they were the ones that were put into action, and the outcome demonstrated that Mendeleev's dire predictions were completely wrong. The Russian oil industry continued to experience fantastic growth.

It must be noted that in spite of his invectives and his rather dubious approach towards his opponent, Mendeleev apparently remained on good terms with the Nobels. While ferociously hot-tempered, Mendeleev quickly forgot his furies and rarely burnt his bridges, although he scorched more than a few along the way. It appears that those who dealt with Mendeleev regularly became accustomed to his outbursts, recognizing that it was just part of his character. It is also important to note that nowhere did Mendeleev attack the Nobels because they were foreign. Soviet academics have argued that Mendeleev was an ardent Russian nationalist who did not want foreign investors in the oil industry. In fact, Mendeleev was willing to accept anyone's money as long the oil fields were developed, cheap kerosene became available to the Russian peasants and money flowed into the state's coffers.

Undoubtedly the Nobels were much more concerned with amassing great wealth than in developing Russia's riches; Mendeleev was much more concerned with the development of this industry than in fattening his wallet - although he did receive remuneration from those interests he championed.

The basic technical argument was over where oil refineries should be built: Nobel wanted them in Baku, where he had already built refineries at great cost; Mendeleev wanted them closer to the end-user. An interesting point concerning Mendeleev's personality that this period helps illustrate is that he was not a hidebound ideologist. In 1880 he wanted oil refineries throughout Russia, predicting dire consequences if he was not listened to. He was not, and the sky did not fall. A few short years later, in 1886, Mendeleev actively promoted the construction of refineries on the Black Sea, far away from the centre of Russia. Circumstances had changed, the oil supply was now plentiful, and it was time, in Mendeleev' view for Russia to enter the lucrative foreign market for oil. For the present, what is important to note is that Mendeleev normally demonstrated a flexible, pragmatic approach to the problems of the oil industry. He collected reams of statistics on it and used them empirically to arrive at his conclusions (although it should be acknowledged here that, at times, he was accused of using statistics inaccurately). One question, therefore, arises: how could Mendeleev have been so wrong in his judgements in 1880? One possible reason is the cacophony that resonated throughout Mendeleev's personal life.

FAUST AND MARGARET: MENDELEEV'S PERSONAL LIFE

His battle with Nobel took place during a tremendous crisis in Mendeleev's life -- the dissolution of his marriage and his increasingly passionate involvement with a much younger woman. With all the turmoil that was going on in his personal

life, it is indeed a wonder that he continued on with his work, achieving as much as he did along the way. It is likely that the pressures and distractions of this situation were partially responsible for Mendeleev's apparent errors in calculation and the occasionally nasty tone of his writings. By 1880, Mendeleev's first marriage had effectively been over for several years, with husband and wife living apart most of the time. His love affair with the young woman who would become his second wife was the stuff of romantic legends. He paid dearly, in all meanings of the word, for his marriage to the beautiful Anna Popova.

Apparently as early as the summer of 1877 Mendeleev lived with Anna Popova, the daughter of a Cossack soldier, and a mother who was half-Russian and half-Swedish. Her friends referred to Anna as the little Cossack. Anna Popova was born in the Caucasus in 1860 (twenty-six years after Mendeleev's birth in Siberia) where her father was serving. Her father decided that it was better to have Anna and her sister, Maria, educated in Russian in an environment other than the Caucasus. Maria was sent to Moscow and Anna, with her talents in music and drawing, was sent, in 1875, to study in a conservatory in St. Petersburg at the age of fifteen.

Soon after her arrival, Anna Popova began studying drawing at a museum of sculpture where she met Mendeleev's niece, who was also studying there (they were the same age), and through her, Mendeleev's sister, Ekaterina. Because of her friendship with Mendeleev's niece, Anna Popova began living at Ekaterina Mendeleeva's apartment in the fall of 1876. In spite of this living arrangement, she did not meet the great chemist until she attended an event at St. Petersburg University.

Her account in *Mendeleev v zhizni* (Mendeleev in life), of first meeting Mendeleev would have made Lermentov proud and been fodder for Pushkin's pen. Waiting in a packed university auditorium, which included the rector, Beketov, Butlerov, Menshutkin and others, she read the fairytale *Kot Murylka.* She recounts:

> All of a sudden there was whispering and a low rumble. Faces lit up. What was the matter, who was coming? "Mendeleev, Mendeleev", they began whispering louder and louder in a chorus. Through the passageway, between students came a person with a unique face. Tall, elevated shoulders, flowing mane of light brown hair, bright shining eyes, straight nose, beautiful lips, expressive face and quick of movement ... He had an inspiring and majestic look. Everyone was smiling.[9]

In April 1877, Ekaterina Mendeleeva decided to move to another apartment along with her daughter and Anna Popova, who was still living with them. Unfortunately, the new apartment would not be ready until September. Because of this, Mendeleev invited the three to share his apartment along with his son, Vladimir (Mendeleev and his first wife no longer lived together). They agreed and soon the five were living together.

Soon Mendeleev's apartment was full of activity. Anna Popova writes: "Sometimes, Dmitrii Ivanovich would read aloud, that was how he read Byron. During the evenings he played chess with me and I even began to have some success and became less shy."[10] They also went on sailing trips to Kronstadt and other such events. While the relationship appears to have been platonic, everyone recognized what was going on.

There is a natural tendency to disapprove of Mendeleev's interest in this young woman. However, one should at least consider the final evening that Anna

Popova stayed at Mendeleev's apartment before moving in September 1877. Alone, they played chess and once over, she returned to her room, but "I wanted to ask something and saw Dmitrii Ivanovich and froze." She had good reason; apparently unaware that his future wife was surreptitiously watching him, "He was sitting there with his eyes covered, crying. Crying real tears. Then he said with an unforgettable voice 'I am so alone, I am so alone.' I felt so sorry for him. 'I have always been alone my entire life, but have never felt so pained as now.'" Once he saw her, he fled.[11] This very emotional reaction of Mendeleev was not atypical; while in Paris in 1867, he also broke down in tears upon receiving a letter from his first wife.

This was, however, just the beginning. Soon a very passionate love affair developed between the two. Mendeleev sent her letters everyday and was soon seen waiting for his beloved after her classes at the Academy of Artists. Her friends named them Faust and Margaret.[12] Their relations became so intense that Popova's father came to St. Petersburg to put an end to it. The battle-hardened Cossack and the Siberian Chemist discussed the situation and Mendeleev promised to break off the relationship. One reason for Popov's displeasure was the large age difference: Anna Popova was seventeen and too young for betrothal. But there was also a legal impediment: Mendeleev's first wife refused to divorce him, so he was in no position to marry Anna.

From May 1878 until the end of the year, Mendeleev was abroad ostensibly because of illness. (Mendeleev was very fortunate that the rector of the university was his friend.) Upon his return, however, Mendeleev and Anna discovered that their feelings for each other had not diminished.[13] Anna Popova continued to write

to her father about her relations with Mendeleev. Her father "found a heroic exit, he suggested that I travel abroad by myself."[14]

With Anna gone, Mendeleev sunk into a great depression and briefly considered suicide. He would later tell Anna that while on a ship, "I wanted to throw myself from the deck of the ship into the sea."[15] While Mendeleev was emotional, the depths of these dark feelings were atypical for him. Although he told only Anna Popova about these feelings, his friends sensed the darkness which was overwhelming Mendeleev and they decided to approach his first wife to convince her to permit the divorce. They implored her that his health was at risk because of his tortured soul. Finally, she agreed.

In March 1880, shortly after these events took place, Mendeleev left St. Petersburg and appeared unexpectedly in Rome where Anna Popova was then living. Arriving at her doorstep, Mendeleev:

> was in such condition that it was necessary to save him ... It had been such a long difficult struggle for four years with no personal happiness – I agreed to be his wife and we left Rome together. I didn't even have the chance to say goodbye to anyone. I wrote to my father about my decision and asked him to very carefully prepare my mother for the unexpected news ... [16]

Their troubles were far from over.

Still unmarried, they traveled around Europe visiting Paris and Spain, before Mendeleev had to return to Russia to set up a laboratory at Ragozin's plant on the Volga. Mendeleev now really needed the money because "according to the divorce agreement all of his university salary went to Feozva Nikitichna."[17]

Upon their final return to St. Petersburg in the fall of 1881, Mendeleev received bad news. While the church would grant him a divorce he was forbidden from ever marrying again under its auspices. What did Mendeleev do? According to his good friend, O. Ozarovskaia, Mendeleev bribed a priest with 10,000 rubles to perform the marriage ceremony. On April 22, 1882, the twenty-two year old Anna Popova married Dmitrii Mendeleev, who was then forty-eight. The rector of St. Petersburg University acted as best man. The following day the priest was defrocked.[18] The reason for their haste was apparently simple: "Soon after the marriage my oldest daughter Lyuba was born (L.D. Blok)."[19]

Actually, it was more complex than this. In fact, Lyuba was born in Mendeleev's apartment on December 29, 1881, some months before their marriage took place.[20] It is understandable why they lied about their daughter's birth date, for at that time out-of-wedlock children had no rights to the patronymic name, their father's family name, or to inherit as legitimate children did.[21] We also do not know who gave Mendeleev the money to bribe the priest nor why.

This, then, was the tumultuous personal context in which Mendeleev was working at the time, and it provides one explanation for the errors that he made and for the frequently bitter tone he used when confronting Nobel.[22]

Tragically, the letters from Mendeleev to his second wife have all disappeared. The collection was extensive, comprising "the first letter he wrote when he [Mendeleev] saw me at lunch one Sunday at Ekaterina Ivanovna, to the last letter, which was to be read after his death." For safekeeping, they had been stored in a bank's vault. When Anna went to retrieve them in 1921, she was told that they had

all been sent to Moscow. She travelled to Moscow to retrieve them and was told that they had all disappeared. Later on she was told that the safe that contained the letters had burned.[23]

THE NOBELS' BEGINNINGS IN RUSSIA

Immanuel Nobel, the father of Ludwig, Robert and Alfred, traveled to Russia from Sweden in 1838 with models of land and sea mines and plans for their manufacture.[24] The government funded his factory for the manufacture of sea mines. Immanuel Nobel, however, spoke no Russian and was provided with a Finnish engineer, General Baron Standertskold, who spoke Finnish, Swedish and Russian. As will be discussed, the General would prove very important later for his sons. The Russian government was so impressed with Immanuel Nobel's military designs that they gave him a grant to set up a factory in St. Petersburg. Immanuel Nobel soon brought his family to Russia. The children were educated in St. Petersburg and were soon put to work in the prospering factory. Perhaps even more importantly, Ludwig and Robert began their immersion in Russian culture, language, and politics.[25] Their deep knowledge of all things Russian greatly aided them in their struggles against, first, Mendeleev, and later against the Rockefellers and Rothschilds when they became interested in the Russian oil business.

Business was prosperous during the 1840s and rapidly expanded during the Crimean War. However, with the war's end, the government cancelled its contracts and Nobel's firm found itself over-committed to military production. It tried to re-

direct its energies towards the civilian market but ultimately failed. Immanuel Nobel was bankrupt and left Russia in 1859, returning to Sweden as penniless as when he arrived. His sons, however, chose to remain in Russia.[26]

Ludwig Nobel picked up where his father had left off by opening up a small engineering shop. While Ludwig Nobel was widely recognized for his business and engineering talents, he also had very important contacts in government circles. General Baron Standertskold was not only multi-lingual, but he was also the chief inspector of the state armouries. Another important life-long friend was Peter Bildering, who would become commanding officer of a state armoury. Thanks in large part to these connections, Nobel received government contracts for rifles and small arms. For example, Bildering recommended to the government the creation of a joint venture between the state, on the one hand, and Nobel and his partners, on the other. With Nobel and his partners providing much of the capital, the government agreed and the plant went ahead with great success and profitability. Who were Nobel's partners? Bildering and Standertskold.[27] Western journalists of the time were more than naive when they pompously announced that Nobel was beyond the apparently dishonest – by their standards – use of government connections. (Mendeleev as has been noted and will be further demonstrated was also willing to play the same game). According to these journalists, Nobel's success was due to his superior ability and morality. While the former is beyond doubt, the latter is open to question. His most important product was artillery ammunition, which was produced in large quantities for the Russian military.[28]

While Alfred began focussing on explosives and was soon inadvertently blowing up buildings and barges in the city, Robert and Ludwig continued their own successful engineering firms. Their involvement in Baku was pure happenstance. Robert secured a contract from the Russian government to manufacture rifles and traveled to the Caucasus in 1874 looking for walnut for rifle stocks. [29] While in the region, he was so enthralled by the prospects of oil production that, without consulting his brother, he spent the money earmarked for the rifle butts on an oil field. Another version of the story is that the family had some previous exposure to the oil industry, and had already made plans for involvement in the Baku oil fields. This is quite plausible, as Robert Nobel had lived in Helsinki from 1860 until 1870 where he had imported kerosene from Baku.[30] Regardless of which story is correct, the decision was risky at this point because the oil fields were completely unknown outside of the Russian Empire and little known within it.[31] Robert Nobel's decision proved to be a wise act of insubordination.

Neither was Ludwig Nobel a complete stranger to the industry. In 1877, his "Views on the Baku Oil Industry and Its Future" appeared alongside Mendeleev's writings on his trip to America, and shows that their respective interest in the oil industry went deep with both men.[32]. In this paper, Nobel outlined an overall plan in which his family would be engaged in every aspect of the oil industry: drilling, refining, transportation and marketing.[33] This plan undoubtedly infuriated Mendeleev, no doubt because it was published along side his own work but also because of the chemist's strong belief in specialization.[34]

It appears that the Nobel's original investment in the Baku oil fields, as well as some of the later capital investments in pipelines and ships, was from the profits earned manufacturing military equipment for the state. The evidence seems to suggest that Robert and Ludwig did not receive money from their brother, Alfred. This is not an insignificant fact, as the issue of foreign money and influence in the oil fields became a critical one during the 1880s.[35]

According to a report published by the Russian Minister of Finance during the First World War, the Nobel brothers deserved credit for being "the first pioneers in the oil industry".[36] While this is debatable as there were large numbers of small-scale oil outfits in Baku – just as Mendeleev wanted – the Nobel Brothers were undoubtedly the first large oil company in the area. While journalists of the era argued that their unquestioned success lay in their superior morality and work ethic, there was a factor which was probably much more important for their success: capital. In the year of their incorporation, they had thirty million rubles in capital; the next largest oil company had six million rubles capital; the third largest company had 2,340,000 rubles and Ragozin's company, which was the fourth largest, had 1,300,000 rubles. Altogether, the Nobels had twice the capital of all their competitors *combined.*[37]

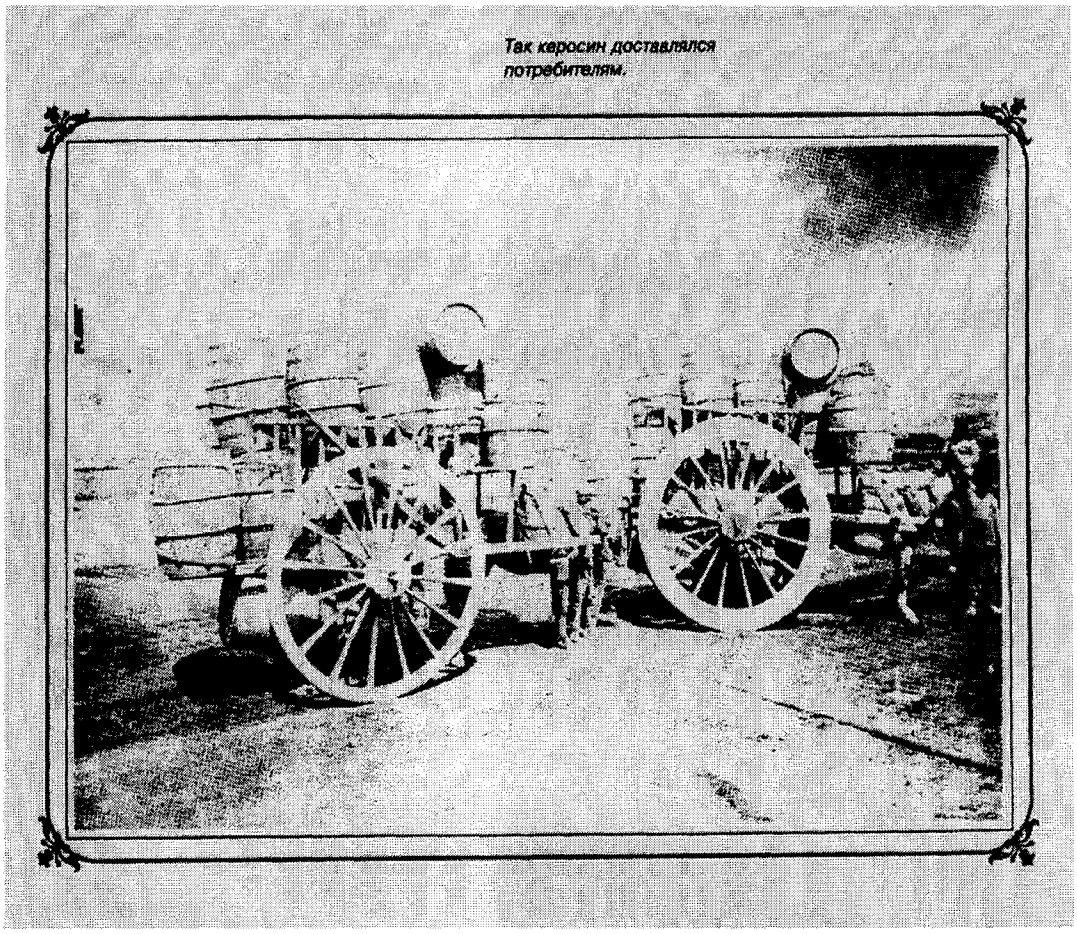
It did not take Robert Nobel long to get his Baku petroleum refinery up and running. By 1875, it was one of 120 or so already at work in the region. A British journalist recounted the success of their operations as the product of Christian manhood. The Victorian reader could be assured that:

> The Swede did not concern himself, however, with concessions, subsidies, and other similar crutches dear to the

> heart of the company promoter. He simply settled down in an ordinary way at Baku, as any quiet plodding capitalist might from England tomorrow; and commenced the campaign, conscious that success lay in replacing the desultory, primitive and wasteful operations of the native firms with their sources of engineering, chemistry, and commercial organization.[38]

While one is nowadays tempted to question the underlying prejudice in the above statement, the question remains: why were the Nobels so successful in Baku, while other native firms were less so? Was it because of the Nobels' supposedly higher level of morality? Their work ethic? Were they more ambitious? Better businessmen? Did they have more and better government contacts? Or did they simply have access to the large amounts of capital necessary to do more than simply drill a hole in the ground? One of the reasons for the Nobels' success was their court connections. This partially undercuts the claim that their success had nothing to do with talents other than those that solid white Protestant men might or should employ.

Perhaps the greatest genius of the Nobels' was their revolution in transportation. In 1878, shortly after Robert Nobel began refining crude oil in Baku, he decided to lay down pipelines, breaking the old method of transportation by barrel and cart.[39] During this time, the 120 or so refineries around Baku moved their oil from the oil wells to Baku in barrels on carts known as *arbas*. This method had proven to be very inefficient. According to Ludwig Nobel, the pipeline was inspired by one of Mendeleev's earlier ideas – the construction of a pipeline from the oil fields to Baku -- from his work in 1863 for Kokorev.



OIL TRANSPORTATION BEFORE THE NOBELS[40]

The Nobels, however, ran into difficulties with the other local refiners when they first suggested the pipeline idea.[41] The various Russian, Armenian and Jewish oil producers in the area were more than content to leave the current system in place. According to one reporter of the period, the Nobels made the pipeline suggestion to the refinery owners but failed to win them over because "jealousy and want of industry have always been the characteristics of the Russian and native firms of Baku. They refused."[42] Furthermore, the local government in Baku originally denied the Nobels permission to build the pipeline, perhaps fearing the social unrest

that would be caused by lay-offs in the cart hauling business[43]. The Nobels took their case to St. Petersburg and won. They then spent £10,000 to lay a pipe eight miles long, from the oil fields to Baku.[44]

The Nobels' actions proved to be so successful, with the pipe paying for itself in the first season, that the other owners constructed their own pipelines. The fears of local government proved correct and there was social unrest. Unemployed Tatars who had transported the oil began blowing up the pipelines in protest against their loss of livelihood. To counteract this, guard towers were placed along the length of the pipeline a few hundred meters apart, with trigger happy Cossacks stationed within. Several years later, in 1882, the attacks on the pipelines effectively came to an end after a Cossack company guard shot and killed the leader of a gang which had blown up an oil reservoir and was in the process of trying to burn a pumping station. The leader had been a major cart maker, who had gone bankrupt.[45]

It should be noted that these problems were not unique to Russia. In the United States similar problems occurred with local teamsters who were put out of work by expanding pipeline systems: Pipelines were sabotaged and reservoirs blown up. Lacking Cossacks nearby, American oilmen used Pinkerton guards to protect their investments.[46]

Once the Nobels got their pipelines in working order, they also decided to modernize the drilling process. Until that point, oil was literally scooped from the ground with buckets and poured into barrels. The Nobels brought over drillers from America and they soon began drilling in a fashion recognisable to us today.[47] Mendeleev himself had made notes on the cost efficiency of American drilling

methods during his trip to Pennsylvania.[48] The Nobels were at first unsuccessful drilling on Cheleken – one of Mendeleev's earlier recommendations - but they preserved and were finally successful.[49] The improved drilling system of boring was a great boon to the Baku oil industry and one with which Mendeleev had nothing to do.[50]

At this point, the Nobels turned towards the crucial question of transportation. It is perhaps because of their genius – and access to capital - in setting up a highly efficient and capital-intensive transportation system for kerosene that the Nobels were as successful as they were. As a Soviet historian has noted "the role of oil transportation in the fate of Baku oil" was absolutely crucial for the creation of the monopoly. While it was "doubtless that the Nobel Brothers firm was contributing to the progress in the sphere of oil transport. [It was also true] that at the same time the policy of the Nobels' firm was for the protection and strengthening of their monopoly position..."[51] Just as Mendeleev was an unquestioned genius in the sphere of chemistry, the Nobels had a certain genius in the field of transportation.

Russians of the last century were more than willing to acknowledge the great contributions that the Nobel's made to their society. They would write that "the idea of transportation by steamer was completely new, as such nowhere, not even in America until then was anything attempted like that."[52] The result of the revolutionary approach to transportation apparently refuted all of Mendeleev's arguments regarding Nobels' plans. A contemporary of Mendeleev's writes: "The introduction of water transport greatly decreased the cost of transport and gave the

opportunity to widely distribute kerosene and increase its use owing to the decrease in price."[53]

Before the Nobels, oil was placed in wooden barrels and shipped by boat up the Volga. Manufacturing barrels on site was made worse by the lack of wood in the region. Because of this, many of the barrels were imported from America, meaning that often times the barrel was of more value than the oil that it carried. Furthermore, the barrels were prone to leaking due to the dryness of the region. In order to improve efficiency, local refiners asked the local shipping monopoly, Caucasus and Mercury Shipping Company –owned by Mendeleev's friend, Kokorev - to install cisterns so that oil could be shipped along the Volga in bulk. This company, which was receiving a state subsidy and had been granted monopoly status, and which was making huge profits just the way things were, not surprisingly, refused the request. [54]

The Nobels decided to build their own ships. Their ownership of an engineering firm in St. Petersburg gave them an immense advantage over the other local oil firms in this regard, as they could effectively design and manufacture their own. The combined forces of Robert Nobel as an engineer in Baku, Ludwig Nobel as the financier in St. Petersburg, and Alfred Nobel as the family chemistry expert, meant that they presented a formidable team. (The Nobels were not afraid to employ other talented people.) Ironically, Mendeleev who had written about the need for specialization in the oil industry found it in the Nobel family, his enemy.

The Nobel plan was an immediate success and the tanker paid for itself in its first year of operation, 1879.[55] The Nobels decided to push forward as quickly as

possible with the construction of several other tankers in Sweden where they could be built less expensively. Soon the Caspian Sea saw their ships everywhere. Their fleet, at its height, had twelve tankers with such interesting names as Darwin, Mahomet, Talmud, Spinoza and Zoroaster. The approximate cost of their plan was £400,000, which also included a dockyard at Astrakhan.[56] It was a massive and expensive undertaking, well beyond the means of their competitors in the Russian oil business.

The round trip from Baku to Astrakhan where the oil was off-loaded for further transportation took six days. The savings were simply astounding. In 1878 there was a single ship operating on the waterways; in 1879, two; by 1883, eighteen; and by the turn of the century, 134. During the same period the total shipping capacity of the area had increased from 15,610 tons to almost five-million tons[57] Mendeleev's diatribes against Nobel's transportation plans and the prohibitive costs of shipping refined kerosene in this manner were proved wrong.

Unfortunately, Soviet scholarship has effectively ignored the positive contributions that the Nobel family made to Russian society, choosing instead to emphasize only the negative while simultaneously not mentioning Mendeleev's errors in judgement. Sergei Goulichambarov, a Russian contemporary of both Mendeleev and the Nobels, places all of the credit for what he believes was the world's first oil tanker with the Swedes. [58]

Once just south of Astrakhan the oil was transferred into barges for transhipment along the Volga. During the return trip from Astrakhan to Baku, the holds were filled with water, which was very scarce in the southern city. The oil was

then transported north four hundred miles to Tsaritzin, where it was transferred to railways for its final trip throughout Russia.[59]

While Mendeleev did not explicitly attack the Nobels' transportation system, it undoubtedly irritated him. According to Ragozin, who employed the Russian chemist at the time, one of the partners in the Caucasus and Mercury Shipping Company was none other than Kokorev.[60] Until the Nobels began their operations, this shipping company had maintained a monopoly on the transportation of oil in the region. Therefore, in addition to his technical disagreements with the Nobels, two people Mendeleev respected (at least at that moment), and from whom he periodically received remuneration, were facing business difficulties as a result of the Nobel's work.

Along with their pipelines, improved drilling methods and fleet of ships, the Nobels also decided to improve the way in which oil was shipped by rail. Previously, once in Tsaritzin, the oil was transferred into barrels before it was loaded on to the trains. These barrels, however, were prone to leaking.[61] As a result, the Nobels tried to persuade the railway company to adopt the use of tanker cars. The company refused and the Nobels decided to build their own -- approximately 1,500 – at a cost of £275,000. Each tanker car held 250 tons of kerosene and could be filled in a mere three-and-a-half minutes. The Nobels' next step was to create massive fuel depots along the railway lines at a cost of £200,000. These depots were crucial to their overall plan because during the winter when kerosene was at its peak demand, the Volga was frozen solid.[62] As a result, it had to be stockpiled in massive quantities well in advance.

The main depot, with an impressive eighteen million gallon capacity, was located in Orel. Four other large depots were located in Moscow, St. Petersburg, Warsaw and Saratoff, and an additional twenty-four smaller depots were located throughout Russia.[63] The results were truly impressive. The Nobels soon controlled a massive conglomerate of kerosene depots and tanker cars, covering an area twenty times larger than Great Britain.[64] All of this was done by 1879, the year before Mendeleev's trip to Baku. By the time Mendeleev arrived for his 1880 trip to Baku, the Swedes already dominated the transportation of oil.

Robert Nobel, who had the unenviable task of living in Baku during these years, became ill and left the company in 1879. The company went public and was named Nobel Brothers' Petroleum Production Company. Its chairman was Ludwig Nobel, and its directors included the ever-present General Bilderling as well as Alfred Nobel who was now residing in Paris.[65]

The end result of the Nobels' massive and risky endeavour was something approaching a transportation monopoly. This was a fear of Mendeleev's dating back at least as far as his 1876 trip to America, when he expressed concerns over the impact of a railway transportation monopoly on the oil industry. Now, he faced it literally in his own backyard. Soviet historians are absolutely correct when they argue that Mendeleev was very concerned about this issue, just as they are accurate in stating that a transportation monopoly existed in the Russian oil industry at this time.[66] Even Henry, whose romantic view of the Nobels' appears at times to be naïve in the extreme, admitted that they had exactly what all businesses dream of having and despise in their competitors, a monopoly:

> Thanks to their petroleum network, Nobel Brothers have practically secured a monopoly of the Russian kerosene trade. Refined petroleum conveyed by railway in barrel from the Volga has no chance whatever against them. Possessing vast resources, they can raise or depress prices in that quarter, and not only drive the American oil completely out of the market, but undersell all Russian competitors likewise. It is but fair to say, however, that up to now they have never abused their position, and have always displayed generosity towards rivals, seeking of their own accord to enter into friendly arrangements with them rather than ruthlessly expel them from the field.[67]

According to this author, the Nobels were one of those rare breeds who did not abuse their newfound power, in spite of the considerable risks involved in accruing it.[68] John McKay, argues, rather graciously, that the "Nobel Brothers Petroleum Company was experiencing serious financial problems, which were probably as important a factor as monopolistic aspirations" as anything else in limiting what they did and did not do.[69] Whether the Nobels were great humanitarians is an open question. More importantly these Western writers support a crucial thesis of Soviet academics: the rise of a transportation monopoly - at least for a while - in the Russian oil industry.

J.D. Henry writes uncritically:

> Yet these two Swedes, Robert and Ludwig Nobel, have as completely revolutionized the Russian petroleum industry, and the Russian industrial and political position in the Caspian, as Alfred Nobel has transformed mining operations and the art of war, and given incalculable power to democracy, by his discovery of dynamite.[70]

While one might hesitate to accept the argument that Alfred Nobel added much to democracy, his contention that the Nobels revolutionized the Baku oil business is accurate.

It is impossible to determine whether Mendeleev's plans would have been any more successful than those of the Nobels in either the quantity of kerosene produced or its cost. However, it is difficult to imagine his plan producing better results in terms of distribution of kerosene than the Nobels. Ultimately, it would not be unjust to suggest that Mendeleev's undisputed genius in the field of chemistry met its match in the combined abilities of the Nobels', at least in terms of the second stage of development of the Russian oil industry.

MENDELEEV'S TRIP TO BAKU AND HIS POLEMICAL BATTLE WITH NOBEL

By the early 1880s, Baku had become of increasing interest to Westerners. However, Western journalists who visited the area were completely unaware of Mendeleev's contributions to the industry. From some of their writings, it becomes quite clear that they believed Baku oil should be primarily, if not exclusively, for Western consumption.[71] This was not what Mendeleev had in mind, at least not at this point. Instead, in 1880, Mendeleev believed that Baku oil was to be more or less exclusively reserved for Russian consumption. Another important issue during this period, as we shall see, was the absence of large-scale venture capital for the development of the Russian oil industry.

Mendeleev once again went to work for a Russian oil industrialist. He travelled to Ragozin's refineries during the Christmas holidays of 1879/1880 and possibly the summer of 1880, for which the industrialist paid him 750 rubles.[72] He

met Ragozin once again in Paris in the spring of 1881 with Anna Popova,[73] and in the summer of 1881 Mendeleev once again visited Ragozin's plant on the Volga apparently to set up a laboratory.[74]

From May to July of 1880, Mendeleev travelled to Baku to do further research on the oil industry, the trip being financed once again by the Russian Minister of Finance. Mendeleev was to provide information on the Baku oil industry and make suggestions on its improvement.[75] Unfortunately, Mendeleev's personal documents from this period reveal relatively little of interest or value.[76] The exception is his notebook, which reveals that Mendeleev conscientiously examined all aspects of the Baku oil industry: it is full of detailed statistics and notes on oil production, shipping costs and other such statistical information.[77] Mendeleev also took time out to give some advice to his old friend Kokorev, see Ragozin and comment on the absence of a middle-class in Russia.[78] . Accompanying Mendeleev on the latter part of this trip were Anna Popova and his son Vladimir. One wonders on Mendeleev's political wisdom in bringing along his much younger mistress on a government funded expedition, but from his letters, there is no doubt that Mendeleev was very smitten with her.[79] Along the way Mendeleev stopped off to see what might have been his own personal oil well.[80]

The polemical battle between Nobel and Mendeleev over the future of the Russian oil industry was bitter. While presenting a public image of wanting to encourage a free and fair discussion on the subject, the chemist made a conscious decision to limit the Swede's ability to make his views public. Throughout their exchange in the Russian newspaper, *Golos*, Mendeleev tried to prevent the

publication of his opponent's views. Mendeleev was even more underhanded when he published their newspaper exchanges in a book, *Gde stroit' neftianye zavody* (Where to Build Oil Refineries), ostensibly to ensure that the public had the chance to see all sides of the debate. In this eighty-four-page anthology, Nobel is given a total of eight pages to make his case, while Mendeleev has the remainder to make his. In addition to this gross disparity, Mendeleev added new material in the form of commentaries that serve to reinforce Mendeleev's views and attack Nobel's. While the work does show how devious Mendeleev could be (without resorting to character assassination, it is important to note), as well as hard-nosed and at times downright nasty, it also reveals some of his key ideas for the development of the Russian oil industry.

Parkhomenko characterizes Mendeleev's writing quite accurately as involving "impassioned arguments, anger and sarcasm." Less accurately, he writes, that Mendeleev through "facts and numbers" was able to "completely prove" his thesis. In fact, Mendeleev's "facts and numbers" were spotty at times.

Parkhomenko states that Mendeleev wanted "the independence [of the Russian oil industry] from foreign capital."[81] This was not the case. Mendeleev did not care whose money developed the Russian oil industry as long as it was developed - preferably according to his plans. This point cannot be stressed too much, for the extant historiography makes this essential. However, Parkhomenko was partially right: Mendeleev feared monopolies and even British accounts from the time admit that the Nobels had created one, even if for a very brief time.[82]

In his application to the Minister of Finance for funding, Mendeleev provided reasons for the need for further research, pointing out the importance of his article "L'origine du pétrole," in the *Revue Scientifique* in 1877.[83] The apparent interest of the scholarly community in his work was sufficient for the Minister to fund these further investigations in the Baku area.[84] Mendeleev also provided another reason for the grant: his further study of the problem "might cheapen the price of illuminating material, such as kerosene."[85] This was, of course, the major reason for Mendeleev's obsession with oil.

In this application, Mendeleev also observed that "foreign and Russian capital are already strongly interested in our Caucasian oil, but have not decided to invest because of the absence of authentic and contemporary information about the conditions of our oil industry."[86] Thus this trip would serve the joint aims of providing additional scientific research to further the technological development of the Russian oil industry, and providing the information necessary to encourage investment - Russian or foreign - into the region.

In his writings on this trip, a theme that Mendeleev revisited was taxation.[87] From his point of view, the issue of where to build oil refineries could only take place after the tax system had been fixed. "When the *otkup* was still in place, it was useless to explain about the need for moving refineries around Russia. The struggle with taxes was the greatest concern."[88]

By 1880, the Baku oil fields had attracted the attention of the world. Foreign investors began scouting the region looking for investment opportunities. They faced many linguistic, cultural and political problems in dealing with Russia and

Russians. According to one British account, these were less exotic and much more manageable than dealing with the Tatar transportation mafia, lazy thieving Armenian oil field owners, hot-tempered and violent Chechens and the necessary Cossack guards.

There is little doubt that Mendeleev's research on the oil industry and subsequent advice to the Russian government had been excellent to this point. From his first foray into the oil fields in 1863, through his trip to America, his suggestions were indispensable for the initial development of the Baku oil fields. His fame, connections with Russian ministers, technical expertise, forceful statistical arguments - even if they were not wholly accurate or complete - ebullient temperament and true romantic commitment to the industry's development made him a formidable force steering government policy. The resulting growth of oil production was impressive and Russia owed much to him. However, by 1880 this had changed: from their subsequent actions, it appears that the Russian government did not listen to Mendeleev's advice this time around. The result? Russia's oil production grew at a rate greater than previously seen, so much so that by the turn of the century Russia was the world's largest oil producer. And to add insult to injury, the policy followed by the Russian government was that suggested by his rivals, Ludwig and Robert Nobel, the Oil Kings of Baku.

At the most basic level, their argument was not about the potential growth of an oil monopoly in Russia, but rather on where Russian oil was to be processed - in one centralized location, Baku, or throughout Russia in a more decentralized fashion. More profoundly, it raised questions about the role of foreign investment in

Russia, the development of Russian industry via tariffs and the proper use of Russia's natural resources. Questions of specialization in the economy were also raised. Mendeleev strongly believed that each part of the industry should do only one thing, and that non-specialized businesses would fail.[89] And while Mendeleev remained firmly committed to both foreign investment and market economies, there are a few caveats which need mentioning. For example, Mendeleev made appeals to Russian industrialists to develop the industry on their own. As well, Mendeleev argued passionately that export tariffs be imposed on crude oil so as to ensure that it would be refined in Russia in order to encourage the growth of native industry. Their argument also involves very powerful personalities: Ludwig Nobel would not be overawed by the polemics of the great Russian chemist. And finally it should be acknowledged that both sides had strong personal financial interests in the outcome of the debate. Ludwig Nobel's is obvious enough, but the continued financial success of Mendeleev's friends and sometime employers needs to be kept in mind as well.

There is no doubt that one reason for the argument between Mendeleev and Nobel was personal. Mendeleev, responding to Nobel's suggestion that his numbers were inaccurate, vehemently states: "There is nothing wrong with my numbers ... And by the way I heard that you allegedly said that I was lying!"

In *Gde stroit'*, Mendeleev writes that the reason for building refineries in the centre of Russia was to accommodate the growing demand for kerosene, which was partially caused by the Russian government's decision to follow his earlier advice to repeal the excise tax.[90] There were two clear camps:

> One group in Baku thinks that the where the oil is drilled, it should remain [and be processed] ... Others, and I am with them, believe that with the removal of the oil tax and the growth of local and international consumption of lubricating oil, oil, gas, vaseline and other oil products it is necessary to construct factories in central Russia. Oil from Baku and Caucus oil will be sent there in raw form by water.[91]

It is interesting that he mentions that it was to be transported by water, as for some reason Mendeleev refused to accept or promote its transport by rail. Was it because he recognized that rail's use to transport oil in and about Central Russia would eventually lead to the Baku-Batum Line and result in the easier export of oil outside of Russia?

According to his later account, it was as early as either 1866 or 1867 that Mendeleev read a lecture at the agriculture museum on the two subjects which were the centrepieces of his thinking: the necessity of building refineries in the centre of Russia and the need for the abolition of taxes on oil products.[92] One eminent Western scholar argues that the reason why the United States abolished excise taxes in 1876 was because of the changing views on the role of government in the development of industry. According to Mendeleev, the government's initial reluctance to abolish the tax in 1880, and later decision to do so, was not because of some underlying change in philosophy regarding state involvement in the economy. More prosaically, it was because of the fear of losing "three hundred thousand rubles from the taxes" and the great uncertainty that the initial losses would "be recouped by the growth of the oil industry."[93]

He also notes that if correctly done it would result in a

> large profitable oil industry with important results for the entire country. For that, it is necessary to rearrange the main parts of the Baku oil industry. First of all the whole process must be removed from the hands of those who discovered the oil. That is to say, one person should search for oil and another should refine it. Second, the refinement should take place not in Baku, but in the centre of Russia, where our manufacturing skill are located. This will ensure our ability to market without interruption our manufactured goods to Russia and Europe.[94]

In this later account, Mendeleev also mentions his contribution to Kokorev's refineries in the 1860s. He claims to have recommended to the industrialist at the time that he construct pipelines from the oil wells to the refinery and from there to the waterway. Historians should regard this claim sceptically, as the period documents do not contain information showing Mendeleev's interest in pipelines. It is unclear why Mendeleev would, therefore, make such a statement, but jealousy over the great success and importance of the Nobels' own pipeline system and its emulation by other industrialists in the region might be responsible.

Mendeleev also recounts in this work how he recommended the use of ships equipped with "special reservoirs" to transport oil along the Caspian.[95] The Nobels used "special reservoirs" to transport their oil products up the Caspian. At first glance, therefore, it might be wise to maintain one's scepticism of Mendeleev's claims. However, this time there is an unpublished document in the archive that clearly states that Mendeleev tried to have one of these containers built.

Finally, Mendeleev recounts how he recommended that Kokorev's refinery be constructed near Nizhnii Novgorod. Furthermore, he recommended its

construction here. However, he fails to recount how under various guises he almost became the manager or owner of this endeavour. Even worse, he is misleading when he states that the reason for its construction was "for the refining of raw oil into different products".[96] There are two problems with this statement. First, in 1863 when Mendeleev made these suggestions to Kokorev, there was a demand only for kerosene in any real quantity; the demand for other products, such as fuel oil and lubricants, only developed in the 1880s. Second, the contracts between Mendeleev and Kokorev mention nothing but the production of kerosene. Therefore, in these statements Mendeleev completely misrepresented the Nizhnii Novgorod plant.

In this text, Mendeleev also discussed the main reason for his obsession with the oil industry: kerosene, and its potential for solving the economic problems of the recently emancipated peasantry. With great pride, knowing that the tremendous growth of the Russian oil industry was due in large part to his advice, Mendeleev writes "Only three or four years ago no more than three million puds of kerosene were used, but nowadays not less than nine million puds – that is how quickly the peasants began using kerosene."[97]

Mendeleev was confident that his plan would provide the maximum cheapest yield for the peasants. If properly implemented, it would also maximize the benefits that Russians themselves garnered from their natural resources by ensuring that Russian oil was used to further the development of her industrial base. However, large amounts of capital - preferably Russian, but if not Western – would have to be invested in the oil industry so as to build it up to the required level. Mendeleev, as far as can be determined, did not see the contradiction between his wanting large

sums of money invested in the industry and yet wanting to maintain ownership on the basis of small-scale producers. The danger that he did see, and which he argued forcefully against, was that posed by oil exports. If prematurely entered into, they would simply mean that Russian peasants would have to compete with the world for the use of their own products, resulting in higher domestic prices.

These factors combined shaped Mendeleev's views on the respective roles that the state and private enterprise should play in this industry. The argument reveals that Mendeleev was afraid of excessive competition in the oil industry: He believed that it would eventually result in one company left standing and thus creating what competition was supposed to counteract monopolies. Mendeleev had demonstrated this fear earlier in 1876 in America when he was concerned that competition would destroy all of the rail companies except for one that would create a monopoly and thus, invariably raise prices. Given the dangers that monopolies could pose, Mendeleev believed that the state simply *had* to become involved at some point, in some way. However, it is also interesting to note Mendeleev's later comment that "we (Russians) need very strong capitalists."[98]

Mendeleev's struggle with Ludwig Nobel became a great highly polemical battle over the future of the Russian oil industry. Until 1879, Mendeleev had been the person that the Russian government primarily went to for advice, and, to this point, his advice had been excellent. However, in 1880 a sea change occurred, and the Russian government turned to others, such as the Nobels, for ideas on how to formulate policy towards the oil industry.

As is appropriate for a work entitled "Where to Build Oil Refineries" Mendeleev discussed where they should be built in Russia. Simply stated, he did not believe that Baku was the place. His concern over the proper location for Russia's refineries was not new.[99] As previously discussed, Mendeleev recommended to Kokorev that one be built in Nizhnii Novgorod. Mendeleev informs his audience "in my 1863 trip to Baku I recommended quite strongly that a plant be built for refining in central Russia. This was when the only product refined from Baku oil was kerosene, and there was no need to construct a refinery in central Russia."[100] Now that the oil was to be refined into many different products, it only made sense - at least according to Mendeleev - to transport the crude oil to the centre of Russia in bulk in order to be distilled into a variety of products closer to consumers. [101] In essence, Mendeleev was arguing that not only was he right when he suggested this idea to Kokorev twenty years earlier, but, thanks to the advent of new uses for oil, he was even more accurate now.

In his opening letter to Nobel, Mendeleev clearly sets out the reason why oil should only be processed in Central Russia. He also apparently believed, at least at first, that Nobel was a man of honour: "[I] was naive in that I believed that in Nobel I had an opponent who really wanted to know the truth."[102] This view quickly changed when Mendeleev found that he could not intimidate Nobel. No doubt it was also influenced by the chemist's realization that the latter's truth (and facts) were far different to his own.

Admitting that he had not yet done the calculations, Mendeleev writes, "but I predict that the refining of oil into its by-products will result ... [in] not a single oil refinery [surviving] in Central Russia."[103] Quickly forgetting that he had not done the calculations Mendeleev writes, "Thus, with our convictions we now wait for your more exact evidence". [104] Mendeleev does not mention who "our" is and it is quite possible that he was referring to himself in the third person.

The refinement of oil in Central Russia would also play a role in the further development of Russian industry, which, Mendeleev argued, was apparently hindered by Nobel's insistence on oil production in Baku. Mendeleev was also increasingly sarcastic and personal in his attacks on Nobel. "This May when I was in Baku Mr. Nobel burnt on the ground outside of the city every day a mass of light oil products, which made every day a very beautiful spectacle." If Nobel had been smarter, "If there had been a refinery in the centre of Russia, Mr. Nobel would have found a market to sell his benzene." And even if this had not been the case, he could have refined it further into a type of fuel. Furthermore, "In the centre of Russia [industrial] production demands a lot of fuel but there is little [and] as a result the price for it is good." Apparently Nobel's Baku-centric approach was not only harming nascent Russian industry but also costing him money.[105]

Mendeleev mentions once again his friend and occasional employer Ragozin. In this portrayal, Ragozin was apparently one of those fine people who, along with Mendeleev, aided in the abolition of the *otkup* system as well as the pernicious excise taxes that had been placed on the oil. Ragozin, who had been on the side of

economic righteousness with Mendeleev, now was once again "helping with [the] creation of a complete refinery system along the Volga." [106]

Mendeleev also notes that one of the great problems facing industrialists in the Russian oil industry was the lack of capital. His plan was open to everyone, even if the offer was somewhat sarcastically made. "I would like to say to Mr. Nobel that my project is open to everyone for fulfilment..." The work demanded "huge amounts of capital, which only Nobel has."[107] Nobel had money, but apparently not, in Mendeleev's view, the expertise for the task. The Nobels had apparently amassed a fortune from their work in Russia and were now willing to bet it on the oil industry.[108]

Mendeleev does not provide statistical evidence for the fuel demands from the factories of Central Russia – while there was undoubtedly some demand it would be useful to know exactly how great it was - and in general he appears to be using any argument which would buttress his views. When Nobel asked Mendeleev to provide *some* statistical information in support of his position, the Russian chemist's response was downright cranky:

> First of all you want to receive from me "exact scientific information about the best ways of manufacturing from Russian oil kerosene, lubricating oil and paint." In other words, you are demanding from a professor of chemistry further technical proof and wish that I report it to you. Please! First enter first-year university in the sciences, where I give lectures on chemistry, study first theoretical chemistry, then analytical laboratory, then organic laboratory. [109]

Only then would Nobel have the knowledge – or the moral right – to demand statistical proof from the great Russian chemist. What Mendeleev failed to recall was that Ludwig's brother, Alfred, was an accomplished scientist and that the Nobels had talented scientists working for them.[110]

To be charitable to Mendeleev, it is possible that he was truly concerned about the fuel demands of the nascent Russian industry and truly did not believe that he had to provide proof to the upstart Nobel. What is not in any doubt is that he was concerned about Russia's industrial development and that he viewed Russian oil and Russian industry as being two indispensable and perhaps intertwined components of the prosperity of his homeland.

Nobel and Mendeleev became involved in a nasty bout of duelling statistics over the location of the plant, with the Russian chemist accusing the Swede of making errors – intentional or otherwise – and demanding that they be publicly recanted. However, Mendeleev appears to have made a glaring error himself in arguing that it was smarter to ship crude oil than kerosene. Sarcastically he writes,

> Above all it is apparent to everyone that it was better to transport the inexpensive liquid such as raw oil to the more expensive kerosene, because oil can be loaded directly into the holds of barges and ships ... but kerosene demands a high degree of cleanliness ... [and must be transported] in expensive barrels.[111]

Yet, the Nobels proved that kerosene could be transported with much less care and in a less expensive fashion than Mendeleev claimed. As a chemist, Mendeleev should have known that kerosene could be transported nearly as cheaply as oil. Therefore, in this work Mendeleev buttresses his argument that the oil

refineries should be built in Central Russia by misleading his audience, while simultaneously suggesting that anyone who challenges his findings is a fool.

For Mendeleev, the nationality of the investors in Russia's oil industry was unimportant. What was important was that the investment happen and that it occur in a manner which would facilitate overall Russian industrial development.[112] This directly contradicts one of Parkhomenko's main arguments that Mendeleev "did not want the dominance of foreign capital, including that of the Swedish such as the Nobels."[113] As a means of ensuring his desired outcome, Mendeleev argued for protectionist tariffs on crude oil exports, believing that they would lead to creating a disincentive designed to promote the building of new refineries in Central Russia. He this would create "refineries near the users and the refineries would have a direct relation with the users [as a result]. This would be profitable on both sides. Therefore, it would be profitable for foreigners to refine our oil."[114]

Curiously, according to Ragozin, his views coincided perfectly with Mendeleev's on two important issues. First, as has been discussed, both believed in the necessity of building oil refineries away from Baku and more towards the centre of Russia. Second, both believed in the necessity of banning the export of crude oil abroad. Allowing easy export of crude oil would not only drive up the price that refiners in central Russia would have to pay, but would result in making kerosene more expensive for peasants, Mendeleev's great fear.[115] Although Ragozin does not mention it, another reason for the chemist's desire to ban the export of crude oil was to aid in the growth of Russia's domestic industries.

Not everyone agreed with Mendeleev's views on the consequences to Russia of crude oil exports. The Nobels and others were actively promoting the creation of a rail line connecting Baku to Tbilisi whose expressed purpose was the movement of Russian crude to foreign markets. Mendeleev was not impressed. He attacked the question with what was by 1880 his customary sarcasm:

> They think that the construction of the Baku-Tbilisi railway will be complete in two years. They will then immediately sell their product abroad, the price will increase and on our streets will be a party. Very unlikely![116]

Further on, Mendeleev provides tedious statistical information regarding the cost of transportation by rail as further proof that this was not a good policy.[117] And yet underlying all these publicly expressed views was his over-riding fear: oil exports would lead to higher fuel prices, which would put it beyond the financial reach of the average peasant.

Despite Mendeleev's best efforts, Ludwig Nobel was able to get two articles in print that put forth his position. In one of these he succinctly summarized the chemist's views. "Your advice is essentially that raw oil should be sent from Baku along the Volga to refineries which will refine it. You believe that the people of Baku are gravely mistaken in building refineries in Baku," and that the use of any railway system is also a grave error. Understandably cranky after Mendeleev's harsh attacks on him, Nobel writes, "You promise the earth and the moon" to those who follow his advice.[118]

Mendeleev was wrong when he argued that the overall health of Russia's oil industry depended upon the de-centralization of its refineries. Fortunately for the industry, the Russian government did not place as high a value on Mendeleev's ideas

as they once did, and, as a result, the Nobels' plans to create a massive transportation and refinery system based in Baku were left unencumbered by legal obstacles. This was completely against everything Mendeleev believed in, and as a result he repeatedly demanded -- in a manner suggesting that the sky would fall if *his* plans were not immediately enacted -- that oil refining in Baku cease. Yet, the government did not listen to Mendeleev and the result was far different than what he predicted: the Nobels went on to tremendous success and the Russian oil industry continued to grow.

Two questions arise from this: why was Mendeleev wrong and why did the Russian government refuse to listen to Mendeleev at this time? It is not implausible to suggest that the answer lies, at least partially, in Mendeleev's personal life. The crushing pressures induced by his chaotic personal life would obviously have had some affect on Mendeleev's judgement. Mendeleev was no cold fish, able to rationally separate his personal from his professional life, so it is frankly surprising that he accomplished anything at all during these years. It is also fairly certain that the vitriolic attacks Mendeleev made against Nobel were at least partly due to these personal pressures -- Mendeleev was always hot-tempered and disposed to angry rebuttals, but never so harsh as during this period. Furthermore, the scandals might have made him, at least temporarily, a social pariah, meaning that many people, including government officials, would have been less inclined to listen to his views.

One must also consider the abilities of the Nobel Brothers and in particular those of Ludwig Nobel. Although Nobel was no genius by Mendeleev's standards, he was more than bright enough for the job at hand. Ludwig Nobel was also a far

more pleasant person to deal with; Mendeleev was, to put it politely, difficult at times. Ludwig's smoother manners undoubtedly made it more likely that government officials would listen to him than the scandal-plagued Mendeleev. As well, the fact that the Nobels were already well connected to the Russian Court and were comfortable in the Russian setting and language undoubtedly made their work easier.

It is also quite possible that Ludwig Nobel's arguments and statistics simply made more sense to Russian officials. Nobel accused Mendeleev -- who loved to buttress his arguments with reams of statistics -- of making errors in his calculations, a fact that might have sewn a seed of doubt in the minds of key Russian officials. Furthermore, Nobel's arguments were more user friendly, were not packed with highly learned equations, and were generally more accessible to those lacking Ph.D.s in chemistry.

This chapter has sought to demonstrate that Mendeleev was open to the West? His desire to open up the Russian oil fields to Western money, ideas and people, including the Nobels – if they would follow his plan – is proof that he was. Yet it is important to keep in mind that his underlying goal in all this was to spur the growth of the Russian oil industry with the ultimate aim of providing cheap kerosene to Russian peasants. Therefore, plans that ran contrary to this ultimate aim – exporting Russian oil abroad, for example – were fiercely opposed by Mendeleev. If historians are to make proper sense of his actions at this time, this over-riding concern of his must be kept firmly in mind.

[1]D.I. Mendeleev, *Gde stroit' neftianye zavody.* (Sankt Petersburg: V. Demkova, 1881), 41.

[2]Charles Marvin, *Baku: The Petrolia of Europe.* (London: R. Anderson and Co., 1881), 37. E.I. Startseva, *Bakinskaia neftianaia promyshlennost'. Istoriko-statisticheskii ocherk* (Baku: Nerucheva, 1886), 29. See as well G. Engler, *Bakinskaia neft' putevyia zapiski* (Sankt Petersburg: A.I. Transhelia: 1886), 5-8. Engler's theory on the origin of oil was different to that held by Mendeleev.

[3]Although beyond the scope of this dissertation, there was an interesting ethnic mix at work in the Baku oil fields. The ethnic divisions were one cause of the massive uprisings in the area in 1905. One argument made by Western journalists was that the Tatar and Armenian oil-well owners were not interested in expanding their operations beyond Baku or in running their opponents out of business. They were only interested in becoming extremely wealthy and otherwise enjoying life. The Russian oil-well owners were mainly former generals who had received lands in the Caucasus as a reward for fighting in that area. For the most part, they also showed little interest in taking great risks or hard work. The Nobels were unquestionably different in this regard.

[4]For an interesting account of the small Russian oil industry in Northern Russia during this period, see: M.K. Sidorova, *O nefti na severe Rossii* (Sankt Petersburg, 1882) as well as *O nefti na severe Rossii* by M. K. Sidorova in *Prilozhenie k pervomu tomu trudov vysochaishe razreshennogo torgovo-promyshlennogo s''ezda sozvannogo obshchestom dlia sodeistviia Russkoi promyshlennosti i torgovle* v Moskve (Moscow: Izd. A.S. Suvorina, 1883).

[5]See, M.N. Mladenstev and V. E. Tishchenko. *Dmitrii Ivanovich Mendeleev, ego zhizn' i deiatel'nost': universitetskii period, 1861-1890,* (Moskva: Nauka), 1993, 310. For a Soviet account of the Nobels' involvement in Russia, see N.A. D'iakonova *Nobelevskaia korporatsiia v Rossii.* (Moskva: Mysl, 1980). Unfortunately it almost completely ignores the early years of the Nobels work as well as any of their positive contributions to the Russia oil industry. It is liberally interspersed with vast quotations from Lenin, and is less reliant upon archival sources as one might otherwise have wished. What little information on the Mendeleev/Nobel contest may be found in: 18-22. To see an interesting American view of the Russian oil industry which briefly examines Nobel's role – but not Mendeleev's – see William Allyne *The Petroleum Industry of Russia* (Washington: Government Printing Office, 1924), 3-4.

[6]To see an account describing the different qualities of American and Russian oil see: V.O. Kovalevskii, *O sredstvakh k uprochneniiu i rasshireniiu neftianoi promyshlennosti v Rossii.* (Sankt Petersburg, 1881), 1-6.

7Mladentsev, 312.

[8]See Marvin, 29.

[9]Mladentsev, 59.

[10]*Ibid.*, 60.

[11]*Ibid.*, 60.

[12]*Ibid.*, 61.

[13]Anna Popova writes that she did not see Mendeleev again until the fall of 1880 in St. Petersburg. In fact, she had travelled with Mendeleev and his son during part of his voyage through Baku in the summer 1880.

[14]*Ibid.*, 62.

[15]*Ibid.*, 62.

[16]*Ibid.*, 62-63.

[17]*Ibid.*, 63.

[18]*Ibid.*, 64.

[19]*Ibid.*, 63.

[20]*Ibid.*, 216.

[21]*Ibid.*, 389.

[22]In considering all of the non-oil material examined on Mendeleev – letters, diaries, personal accounts etc. – it is evident that he was very much in love. Their relationship endured for four tortuous uncertain years before they finally married; his mental and physical health was put in dangerous state; his career was threatened by his actions (at the very least he gave his enemies ammunition to use against him); his entire salary from the university –his only source of constant income- was given to his first wife for alimony. Their first daughter, Lyubov, would marry Alexander Blok.

[23]*Ibid.*, 389.

[24]A brief but good discussion of the Nobels from pre-Revolutionary sources may be found in B.F. Brandt's *Inostrannye kapitaly i ikh vlianie na ekonomicheskoe razvitie strany,* (Sankt Petersburg,1898), 420-425. See as well Robert Tolf's *The Russian*

Rockefellers: The Saga of the Nobel Family and the Russian Oil Industry. (Stanford, Calif.: Hoover Institute, 1976). See also Parkhomenko's work. Unfortunately, Parkhomenko completely dismisses or ignores any of the Nobels' contributions. This work is laudable in its use of Swedish sources, but fails to use almost any Russian sources. This is bizarre. As a result of his ignorance of Russian, Russian contributions to their own industry are left unexamined. Despite its limitations, it is useful. For a good synthesis see John P. Mckay's "Entrepreneurship and the Emergence of the Russian Petroleum Industry, 1813-1883," *Research in Economic History*, Volume 8, 1983. His approach as a historian of business is markedly different than mine. As a result, he does not give enough of a voice to Mendeleev in the development of the Russian oil industry – at least from my viewpoint. Instead he focuses on the role of the state in the development of the oil industry. His decision to use Ragozin's 1884 study of the industry is problematic due to Mendeleev's connection to the oil industrialist and their attempts to convince the government to promote a policy favorable to Ragozin's financial well being (and perhaps Mendeleev's?). He writes, "I have relied on it (Ragozin) rather heavily." McKay,"Entrepreneurship and the Emergence of the Russian Petroleum Industry, 1813-1883," 89. In my view, McKay does not give suitable consideration to Ragozin's strong financial motivation for bashing Nobel and arguing for the building of refineries in central Russia. As well, McKay uses few pre-Revolutionary Russian sources. Nevertheless an important contribution

[25]McKay, "Entrepreneurship in the Russian Petroleum Industry," 36.

[26]*Ibid.*, 62.

[27]*Ibid.*, 62-63.

[28]*Ibid.*, 62.

[29]N.V. Nardova, *Nachalo monopolizatsii neftianoi promyshlennosti Rossii.* (Akademii Nauk SSSR: Leningrad, 1974), 16. Apparently, Robert Nobel had been sent there as early as 1873.

[30]McKay, "Entrepreneurship," 63.

[31]Mladentsev, 311.

[32]Interestingly, Mendeleev had a carefully hand-written version in his possession that is dated 1876. It thus appears that Nobel might have sent Mendeleev an advanced copy. The published articles by Mendeleev and Nobel may be found in "Iz. Zapisok I.R.T.O." 1877. From Mladentsev, 310.

[33]L. Elventov, *Inostrannyi kapital v neftianoi promyshlennosti Rossii (1874-1917)* (Moskva: Planovoe khoziaistvo, 1925), 17. This is an interesting book, and is unlike

most Soviet works in that it gives at least some credit to the Nobels for their accomplishments. It is also fairly restrained in its use of Lenin's thinking on industrialization. This raises historiographical questions about Soviet accounts of the Russian oil industry. This curious work also provides two interesting appendices: One lists the substantial foreign investment in the various oil fields; the second provides an excellent chart that explains the highly convoluted story of which company owned what. It is readily apparent that foreign capital was absolutely crucial for the development of the Russian oil industry. See: 121-125, as well as the fold-out chart. One wonders what became of this scholar during the 1930s.

[34]*Ibid.*, 19.

[35]A. Beeby Thompson's *The Oil Fields of Russia and the Russian Petroleum Industry: A Practical Handbook on the Exploration, Exploitation and Management of Russian Oil Properties.* 2nd ed. (London: Crosby, Lockwood and Son, 1908), argues that the money came from inside the Nobel family. Actually, the money appears to have come exclusively from profits made from manufacturing arms for the Russian government. This is not a small detail. The source of the capital – whether it was Russian or non-Russian - is an extremely important part of the historiographic debate. Soviet scholars correctly argue, in my opinion, that Russian capital developed the Russian oil fields. See Nardova, p.15 and N.A. D'iakonova, *Nobelevskaya korporatsiya v Rossii.* (Moskva: Mysl', 1980), 89 who either ignore or dismiss the early considerable contributions of the Nobels, while emphasizing their monopolistic intentions.

[36]V.S. Zuv' *Inostrannye Kapitaly v Russkoi nefianoi promyshlennosti* (Petrograd: M-Va Fin., 1916), 4.

[37]*Ibid.*, 5.

[38]Charles Marvin's *The Region of the Eternal Fire: An account of a Journey to the Petroleum Region of the Caspian in 1883.* (London: W.H. Allen, 1888), 288. While at times full of Victorian bombast, it provides an interesting first hand account of the Baku oil industry. It barely mentions Mendeleev's contributions, but does graciously mention that, "No Russian *savant* has a higher place in the esteem of English scientific men than Mendelaieff." 189. However, even in the small mention that Marvin makes of Mendeleev's oil work, there a few important errors.

[39]Nardova, 60. Nardova's thesis is good; however, her slightly ideological scholarship, in my opinion, remains unproven. The crux of her argument, that there was a monopoly, at least for a period of time, could very well be correct. See as well Marvin, 203-205.

[40]G. Bondarskii, *Shell: 100 let s Rossiei* (Moscow: Moskovskii Press Klub,1992), 4.

[41]A courageous and perhaps foolhardy American apparently tried this first in 1877, but failed. Nardova, 62.

[42]See: The Russian Petroleum Industry in, *Engineering: An Illustrated Weekly Journal,* 37 (1884), 260.

[43]McKay, "Entrepreneurship and the Emergence of the Russian Petroleum Industry, 1813-1883," 67.

[44]See J.D. Henry *Thirty-Five Years of Transport; the Evolution of the Tank Steamer,* (Bradbury, 1907), 71.

[45]*30 let deiatel'nosti tovarishchestva neftianogo proizvodstva brat'ev Nobel, 1879-1909*, 90.

[46]See Ron Chernow's excellent biography, *Titan: The Life of John D. Rockefeller, Sr.*, (New York: Vintage Books, 1998), 110.

[47]N.A. Sokolovskii, *Burenhie na neft' v Baku i ego stoimost': istoricheskiii ocherk za period 1873-1883 gg.*, (Baku, 1886), 5. This work contains a good overview of the history of drilling during this period.

[48]D.I. Mendeleev, *Neftianaia promyshlennost' v severo-amerikanskom shtate Pensil'vanii i na Kavkaz,e.* (Sankt Petersburg: Obschestvenaia pol'za, 1877), 127. See as well Sokolovskovo, 26.

[49]*The Russian Petroleum Industry*, 329. For other information on Cheleken Island see the reprints from the Baku newspaper in S.Apresov, *O neftenosti Chelekena* (Bakum, 1915).

[50]*The Russian Petroleum Industry*, 329.

[51]Nardova, 92.

[52]Brandt, 422. An earlier shipping method used by Mendeleev's friend, Kokorev, involved simply placing the barrels on the ships. The use of this method dated back as far as 1869. As well from the Azerbaijanii view see:V.A. Samedov *Neft' i ekonomika Rossii (80-90-e gody 19 veka)* (Baku: Elm), 25-26.

[53]Brandt, 422.

[54]Henry, 282.

[55]For brief information from a Western company's point of view on the Nobels' contribution to the area, see: *Shell,* 8-10. It does not mention any of Mendeleev's contributions, although it is rather talented company propaganda.

[56]See as well Marvin, 261, McKay, 329, and J.D. Henry's *Baku and Eventful History* (London: Archibald Constable and Co., 1905), 71-73.

[57]See J.D. Henry *Thirty-Five Years of Transport; the Evolution of the Tank Steamer,* (Bradbury, 1907), vi.

[58]See the preface written by Sergei Goulichambaroff in Henry's *Thirty-Five Years of Transport*; v-vii.

[59]Henry, 283.

[60]V.I. Ragozin, *Neft' i neftianaia promyshlennost'*, (Sankt Petersburg: Obshchestvennaya pol'za, 1884), 245.

[61]Henry, 285.

[62]Ibid., 286.

[63]See :Brandt, 422.

[64]Henry, 287.

[65]Ibid., 290.

[66]Nardova, especially, 15-29, 32-41. As well, Parkhomenko, 205-211.

[67]Henry, 290

[68]To see the Soviet accounts of the Nobels' monopolization of the oil industry, see: D'iakonova, .61-65. and Nardova, .24-26 and 96-101. As well see: *L'industrie du Pétrole à Bakou et La Société Nobel Frères* (Saint-Petersbourg: Trenké et Fusnot, 1885.) This is a brief account of the Nobels' work, but it is of limited value.

[69]See John P. McKay, "Baku Oil and Tran Caucasian Pipelines, 1883-1891: A Study in Tsarist Economic Policy," *Slavic Review*, 21 (1985): 608.

[70]Henry, 123.

[71]See Charles Marvin's, *Baku: The Petrolia of Europe.* London: R. Anderson and Co., 1881; *Gallenga A Summer Tour in Russia* (London: Chapman & Hill, 1883); as well as Edmond O'Donovan, *The Merv Oasis* (London: Smith, Elder and Company,

1882); and Edward Stack, *Six Months in Persia* (London : Sampson Low & Co., 1882). Marvin was a writer for the *Morning Post*; Gallenga a journalist for the *Times*; O' Donovan a journalist for the *Daily News*; and Stack was a bureaucrat in the Indian Civil Service. Marvin also sees the clear geo-political impact of oil for the West and Russia. Marvin writes, "Politically, by the development it will provoke of Russia's power at Baku and Batoum, it will exercise a significant influence on the course of the Eastern Question, while industrially it will give Europe an opportunity of retorting [sic] upon American competition, and piling up, in her turn, colossal fortunes similar to those which have become a proverb in the Pennsylvania region from the affluence suddenly attained by individuals lucky in 'striking oil'. Marvin, 37.

[72]Mladentsev, 311. Mendeleev produced a pamphlet on Ragozin's factory, which although undated, I believe is most likely from this period. See *Soobshchenie D.I. Mendeleeva o nekotorykh rezul'tatakh poluchennykh im pri issledovanii nefti na zavode V.I. Ragozina.* This is a brief two-page document which may be found at 1013/4. As for the 750 rubles see I-25-1-17 20 Aug. 1880.

[73]Parkhomenko, 85.

[74] Parkhomenko was apparently unaware of the trip. In fact there is a chance that Mendeleev took only one trip to Ragozin's on the Volga in either 1880 or 1881. There is conflicting information, but I believe that he took two trips.

[75]This included talking with the various players in the industry, including those with which he disagreed. According to an unpublished letter Mendeleev wanted to meet Ludwig Nobel before the former left for Baku. Ludwig Nobel was leaving for Stockholm the next day and was unable to meet the Russian chemist. See I-B-15-1-53 April 9, 1880.

[76]The unpublished letters to his family are: 27 May 1880, *Al'bom I* 208/227; August 12 1880, *Al'bom I* 210/228; June 27 1880 *Al'bom I 203*; 11 July 1880, *Al'bom* I 207; June 3 *Al'bom I* June 1880. As well, see the unpublished documents 2-9-I-609-614; 55-A-P1-4; 67-A-P I-3; 2-Arkh-1; 15-A-P1-4; II-A-4-1-7; II-A-1-9. Most of these documents have proven to be irrelevant to the themes discussed in this chapter, but may prove of use to other scholars. The letters to his first wife, however, reveal that at this time their relationship was, for lack of a better term, very formal. There is also one professional note regarding the trip before his departure date. See: I-A-15-1-4, 24 March 1880. The diaries and notebooks unfortunately yielded nothing of value for this period.

[77]See *Zapisnaia knizhka Kavkaz* 1880 25, II-A-1-1-9 especially, 58-72.

[78]*Zapisnaia knizhka Kavkaz* 1880 25, II-A-1-1-9, 4,5 (his advice to Kokorev), 25 (discussion with Ragozin) and 39 (the absence of the middle-class in Russia). There

has been an interesting work done on the archival materials available on the oil industry in Baku See: Seidov Vugap Nadir Olgy's *Arkhivy Bakinskikh neftianykh firm*. Unpublished dissertation (Moscow, 1995). According to this dissertation there is a great deal of archival material in Baku from all of the oil plants in the area. The Nobels were very good, apparently, at keeping records.

[79]One can find a *very* interesting letter from Mendeleev to Anna Popova dated June 23 1880 from Tbilisi, asking her to join him and his son. I have chosen not to include the text simply because it is far too personal. There is no doubt that Mendeleev had very strong feelings for her. It should be added that from this letter, it appears that she was born in the Caucasus. Mendeleev, who rarely had anything good to say about the region, waxed eloquent on its beauties and peoples. See *Al'bom I* 383-383 June 23 1880.

[80]See R.B. Dobrotin, Dobrotin, R.G. and N.G. Karpilo, *Biblioteka D.I. Mendeleeva* (Leningrad: nauk, 1980), 207 as well as Mendeleev's letter home, he writes to his son, "Greetings to Volodya from Baku, your oil well produced an entire lake of oil." August 12 1880. *Al'bom* 210/229.

[81]Parkhomenko, 209. It also clear that the Soviets used Mendeleev's ideas to justify their own oil plans – or used his ideas to build their oil industry. Parkhomenko writes:

> The Soviet government constructed and continues to construct large oil refineries in almost every location ... Several of these refineries were constructed during the first Five Year Plan, when just about the only place for the refinement of raw oil was in the Caucasus, (Baku and Grozny). Thus, it is impossible to see better proof the correctness of Mendeleev's view of the necessity of refining oil in Central Russia".

[82]Discovered in the Mendeleev archive are several rough drafts of a request for money to do research in Baku. Mendeleev's trip to the Caucasus in 1880 began with the age old academic game of asking for money to carry out what is always invariably important research when in fact it was for another reason altogether. In this case, Mendeleev requested money from the Russian Minister of Finance Reitern to continue his research into the origin of oil. He also requested money to travel to Paris in order to attend a congress on the subject later on. See I-A-55-1-4; I-A-67-1-3; and I-A-14-1-5. All dated somewhere between 1879 and 1880. I have used the latter version because it is the most polished and appears to be the one sent to the Minister of Finance.

[83]I-A-14-1-5, 1. From the rough notes that I have seen, it appears that Mendeleev also wrote in French.

[84]To see a brief overview of the debate on the origins of oil, see the lecture of 1911-1912 *Neftiania promyshlennost' v Rossii* (Sankt-Peterburg: Izd. Smirnova, 1912), 7-10.

[85]I-A-14-1-5, 1.

[86]I-A-14-1-5, 3.

[87]There are, to the best of my knowledge, no mysterious ellipses in the version contained in the *Sochineniia* Vol. 10. One may find in the archive the rough corrections made to his replies to the Nobels. See II-A-4-1-18.

[88]Mendeleev, *Gde Stroit'*, 68.

[89]See Parkhomenko's comments on this, .67.

[90]For a brief account of their argument, focussing more on the scientific arguments see: A.V. Topichev, "Vklad D.I. Mendeleeva v Nauku o nefti" *Uspekhi khimii* 22: 1174-1175.

[91]Mendeleev, *Gde Stroit',* 1.

[92]*Ibid.*, 4.

[93]*Ibid.*, 7.

[94]*Ibid.*, 6.

[95]*Ibid.*, 2.

[96]*Ibid.*, 2.

[97]*Ibid.*, 24.

[98]*Ibid.*, 70.

[99]To see a discussion of the government's concern on the location of the factories see Ch. 2 entitled, "Sovremennoe polozhenie neftianoi promyshlennosti i mery, dolzhenstvushchiia sposobstvovat' obrabotke syroi nefti vnutri Rossii, 5-12. in Mery predlagaemyia ministerstvom gosudarstvennykh imushchestv dlia razvitiia neftianoi promyshlennosti" (Saint Petersburg: Izd. Suborina, 1884).

[100]Mendeleev, *Gde Stroit',* 8.

[101]*Ibid.*, 8.

[102]*Ibid.*, 26. See also the unpublished letter from Mendeleev to Ludwig Nobel December 9, 1880. Mendeleev also recounts how he felt betrayed by the Swede. *Al'bom* 2 Doc. No. 611, 657.

[103]Mendeleev, *Gde Stroit'*, 37.

[104]*Ibid.*, 37.

[105]*Ibid.*, 24.

[106]*Ibid.*, 68.

[107]*Ibid.*, 68.

[108]In one version of the story, the Nobels made their fortune by selling armaments to the Russian government during the Russo-Turkish War. The money from this endeavour was then used to expand the Nobels' oil business. As a result, it might be argued that the development of the Russian oil industry was stimulated by Russian capital. Nardova, 14.

[109]Mendeleev, *Gde Stroit'*, 41.

[110]*Ibid.*, 41.

[111]*Ibid.*, 22.

[112]*Ibid.*, 71.

[113]Parkhomenko, 206.

[114]Mendeleev, *Gde Stroit'*, 9.

[115]Ragozin, *Neft' i neftianaia promyshlennost'*, 67.

[116]Mendeleev, *Gde Stroit'*, 26.

[117]*Ibid.*, 26.

[118]*Ibid.*, 36.

Chapter Six:

Rothschilds, Pipelines and Batum

In Europe, "everything there is so organized that one person of very average ability can do the work of three very intelligent people here".

V.I. Ragozin[1]

"The subject of Batum cannot be dismissed without a reference to the great Trans-Caucasian pipeline ... This is the world's greatest and most costly oil pipeline ... This line should have been completed many years ago ... It is characteristic of the native supiness (sic) of Russian enterprise and the laissez faire procedure of the higher bureaucratic departments that the most important project has been desultorily discussed by successive ministers for the last fifteen years."

British journalist on Russia[2]

"Those involved in the Baku oil business must remember ... that industries belong to the government which gives them rent free [the oil lands] and freedom only with the will of the government. I believe, that those who are living profitably near Baku are happy to use the entire country, the right to extract mineral resources which are being used up ... [and to have] profitable trade inside and outside Russia and the availability of free workers to transform the natural resources of Russia. Until now, everything was more profitable than any other place in the world. Thus, it only makes sense, in the interests of all to solve the questions regarding the wide and intelligent growth of the oil business on the outskirts of Baku.

D.I. Mendeleev[3]

Eighteen eighty-six was the last year that Mendeleev traveled to study the Russian oil industry. Now fifty-two years old, he had been working on the oil industry for twenty-three years and had undoubtedly mastered all that there was to know about it. World famous and now settled into a new marriage and a new family, his work on the industry reflects a greater calmness. His writings, although still full of fire and statistics, lack the bitterness and anger seen in his attacks on the Nobels in 1880.

Times had changed. Russia now had an oil surplus, which meant that exporting Russian oil would not effect domestic supply, and in particular the supply of cheap kerosene for Russia's peasantry. With this over-riding concern met, Mendeleev could now advocate implementing the second part of his plan – the export of refined Russian oil abroad. This would affect the country in two ways: first, it would result in more cash for the Russian treasury; and second, Russian industry would grow in the form of refineries on the Black Sea coast.

With Russia awash in oil, the battle lines shifted, with Mendeleev taking up the cudgels in support of shipping oil refined in Russia to European markets, and his opponents wanting to export crude oil. This was not a new issue for Mendeleev, as he had written in 1876 that Russia should start exporting her oil resources once there were sufficient supplies to meet her domestic needs. However, a new factor had been added to the equation since then: the 1878 Treaty of Berlin created, quite literally, a port of opportunity for doing so. This treaty, which was the result of the Russo-Turkish War, gave to Russia cities along the Black Sea coast that were potential ports. This made it possible to export Baku oil to the West in potentially large quantities through the port of Batum, instead of by the much longer and costlier rail route to the Baltic Sea controlled by the Nobels.

There were three problems to be surmounted: Baku industrialists, money, and transportation. Money was necessary to build the refineries on the Black Sea Coast, and the Russian oil industrialists, who had already invested heavily in their own refineries, were understandably unwilling to invest in a second location. Furthermore, Baku oil would have to be transported across the historically unstable and mountainous Caucasus, a daunting task at the best of times. With traditional domestic sources of investment capital reluctant to participate in the project, where did the capital come from? From overseas markets, including such people as the Rothschilds – and it is interesting to note that in spite of Mendeleev's anti-Semitism, he did not seem to care that they did. This chapter traces the conflict between Mendeleev, Russia's oil industrialists and the Russian government over the development of the industry.

INTERREGNUM

In the beginning of 1881, V.I. Ragozin advocated a ban on the export of crude oil; Baku oil producers, along with Mendeleev's chemical nemesis, K.I. Lisenko, were completely against the introduction of this measure. Much to the joy of Ragozin, Mendeleev supported the Volga oil industrialist in the dispute. Although the Russian chemist had earlier written about the export of refined oil products, there was insufficient oil to produce cheap kerosene for the Russian peasants until the mid-1880s.[4] (It is important to note here that Mendeleev worked for Ragozin as late as 1884). Within two years, and in response to changing conditions in the industry, Mendeleev changed his mind on the subject, much to the chagrin of Ragozin.

In the summer of 1883, several new gushers were discovered in Baku and oil production soared by some eight million puds. Russia now had an oil surplus, and Mendeleev's dream of oil exports became realizable.[5]

At the same time, John D. Rockefeller's Standard Oil had begun to make great inroads into Europe. Although Russia's exports of crude oil and kerosene were miniscule by comparison – Russian kerosene had just recently displaced American kerosene from Russian markets - the surplus was far greater than local needs, thus creating new opportunities. The government decided to permit the export of a million puds of kerosene in 1884, thanks in part to Mendeleev's recommendations.[6] By 1885, kerosene exports had increased to 7.2 million puds, putting a serious strain on Russia's transportation infrastructure.[7] Baku producers were facing yet another crisis. In February 1884, believing that Russian oil was a competitive threat, Standard Oil publicly and scurrilously accused Russian kerosene of being unsafe.[8] (Mendeleev had earlier studied the issue of kerosene safety.) Fortunately for Russia's oil industry, a prominent oil journal wrote that Standard Oil was lying, stopping this underhanded attack cold. Russian oil was now clearly a world concern.[9]

An 1884 Ministry of Property report on the Russian petroleum industry stated that the industry faced a new problem: an excessive supply of oil. The "reason for the crisis is because there is far too much raw material, and the majority of refinery owners lack the capital necessary to improve the refinement of the material and [develop] markets for their oil products in the internal and external markets."[10] The report also highlights the one factor which, over the next few years, would give common ground to all the industry players -- the Baku refiners, the government, Mendeleev and Ludwig Nobel – namely, the absence of sufficient transport to ship the surplus oil abroad.[11] Other explanations for the

problems have been offered, in particular that by McKay who argues the Nobels were the root cause of the difficulties faced by the Baku refiners.[12]

There is of course something odd about this problem: although Baku oil producers were facing a crisis, Mendeleev's dream of an ever increasing source of cheap kerosene was coming to fruition. By 1883, the Russian government's policies – many of which embodied Mendeleev's thinking – had resulted in staggering growth in oil production. Production in crude oil had increased twenty times in twelve years and there had been a concomitant increase in kerosene production of fourteen percent a year.[13] From 1883 to 1886, the price of Russian kerosene tumbled from 45 kopecks a pud to 25; the use of kerosene increased from twelve million puds to eighteen million - much to Mendeleev's delight.[14]

By the early 1880s, the Russian oil fields were producing greater and greater quantities of oil. The results were astounding: from 1883 to 1886, exports increased fivefold.

Year	Exports
1883	1.4
1884	3.9
1885	7.0
1886	9.0

Oil exports in millions of puds

However, most of this oil left Russia by an increasingly strained railway system:

Year	Export by train
1884	2.7
1885	6.4
1886	6.9

Oil exports in millions of puds shipped by train.[15]

With its rail system strained to its limits, Russia now faced the question of how to export the rest of its oil.

THE MULTI-ETHNIC OIL FIELDS

One very Russian issue was the incredible ethnic complexity of Baku. While other empires obviously had mixtures of cultures, Russia's empire, which was uniquely contiguous to Russia proper, was very ethnically complex. British journalist A.B. Thompson's account of the Russian oil fields in Baku is both interesting and illustrative for the time:

> One cannot but admire the good-natured, thriftless, hard-drinking Russian labourer, who, although completely overcome by the vodka which he has too freely imbibed, contents himself with nothing more harmful than singing lustily, and who allows himself to be led home by a wiser companion or a dutiful wife ... The entire reverse is to be found in the Armenian workman, who rarely drinks, is thrifty in the extreme, and banks every copeck [sic] after purchasing the barest necessity of life; whose keen eye shows the business qualities inseparable from his race, and whose sharp retort proves the working of a fertile brain. The Tatar and Persian employees of the peasant class arouse a feeling akin to pathos by their absolute simplicity, their imperturbable countenance, that no amount of bullying will disturb, and their implicit faith in Allah...[16]

By this time, ownership of the oil fields was also typical of life in Russia. At one time, Russians owned most of the oil fields. Most of these owners were former Russian generals who had taken part in the conquest of the Caucasus. However, many proved to be bad businessmen and soon sold their holdings to the local Tatar and Armenians - even though the oil fields were located in Azerbaijan. As a result, many Armenians and Tatar "who could with difficulty write their names became unseemly wealthy".[17]

Thompson also made another anthropological assessment:

> The Caucasian-Tatar and Persian workmen are quite unfit for work of a laborious nature, and although they can endure a wonderful amount of exposure they are physically useless for heavy duties ... The Russian labourers have much more stamina and determination, and will exercise two or three times as much strength as Tatars; but no prolonged work can be undertaken with out liberal intervals for resting, smoking, and drinking vodka, and the smallest weight cannot be raised without a song in which the whole of the labourers take part.

After dispelling the image of Russians as being eternally lazy and morose and reinforcing the stereotype of a vodka swilling nation – as well as a few other stereotypes for other ethnic groups working in the oil fields - he continues:

> The fierce Lesghians and Gruzines (Georgians) exhibit undeniable traces of their mountain origin even to this day, and one can imagine the spirit that led them for so many years to resist the Russian invasion ... They belong to brave, fearless tribes with more than usual intelligence, and were it not for their quick temper they would form – and they do even now, to a large extent – one of the most valuable races for oil-field work.[18]

Today it is common for oil companies to engage in operations in exotic locales. However, in the nineteenth century, Russia and America were the only areas with any substantial oil production. So by comparison to the United States, the Russian industry faced unique problems -- ill-tempered Quakers do not pose a

substantial physical threat to life or property, and, furthermore, there was a common language in the region.

Returning to Mendeleev, his advice on an industry located in part of the Russian Empire that was as exotic to him as Moscow is to experts from New York and Cambridge, worked. It might be argued that the cacophony of nationalities that comprise the country is a vital component of Russia. Russians recognize this and simply adapt their policies to their cultural geography, the result being a frequently complex, quasi-Byzantine, maddening, inefficient, but ultimately sub-optimally workable series of compromises.

ETHNIC COMPOSITION OF THE OIL FIELD WORKERS

Ethnic Group	Numbers	Total Number	Percentage
Russians		6,163	25.6
CAUCASIAN TRIBES			
Armenians	5088		
Tatars	2383		
Lesghines	2687	10,387	43.3
Gruzines (Georgians)	143		
Ossetiens	85		
OTHER RUSSIAN SUBJECTS			
Tatars (Kazan)	1461		
Jews	149	1,835	7.6
Poles	108		
Other Races	117		
FOREIGNERS			
Germans	232		
English	13	5,633	23.5
French	10		
Other European Races	31		
Persians	5,347		
TOTALS	24,018		100.0

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The result was a typical Russian ethnic mixture: most of the mechanics and artisans in the shops were Russian, Armenian and German (50% of Germans

worked in these trades); day-to-day cleaning and menial tasks were carried out by Persians; Chechens were used as watchmen "owing to their fearless nature".[20]

TAXES

In the early 1880s, Ragozin and Nobel combined forces in a rare display of unity, arguing for a tax on crude oil. They reasoned that a tax on crude oil would hinder exports, increase tax revenues and discourage wastefulness. Mendeleev, however, opposed the idea and the proposition failed to go through.[21]

According to Parkhomenko, Mendeleev always supported the free export of oil by-products. Parkhomenko reasons that this fulfilled one of Mendeleev's greatest desires - Russian oil must be refined in Russia to promote industrial development. As well, by permitting the free export of *ostavki*, Parkhomenko notes, the pipeline would be more profitable.[22] This appears to be a rare factual lapse in Parkhomenko's work. In fact, in all the material examined, Mendeleev's reason for supporting an oil pipeline to Batum was in order to encourage the development of refineries on the Black Sea. Yet, the results were the same - Russian oil refined in Russia and the remainders shipped abroad.

In January 1886, the Finance Ministry received a letter from Nobel entitled *O naloge na syruiu neft'* (The Taxation of Crude Oil). As a result, the Ministry decided to re-examine the issue of excise taxes; they finally did in December 1886.[23] In 1886, the Nobels asked the government to set up another commission to study the oil exhaustion question and the appropriateness of tariffs to protect the oil industry.[24] Hardly the most selfless of acts, the Nobels demonstrated once again their willingness to use the Russian government as a shield to protect their hard earned and closely guarded near monopoly.

Mendeleev countered with a letter to Minister of Finance Bunge, arguing that under no circumstance should the state levy taxes on oil. Tossing all

modesty aside, the great chemist argued that the government should follow his advice because all of his previous suggestions had borne fruit. (In doing this, Mendeleev conveniently forgot that he was mistaken on the issue of oil in 1880). He writes:

> Having no more interest in the Russian oil industry than any other Russian, remembering that the Minister of Finance often favourably took into consideration my voice, and seeing realized businesses realize many of my conclusions, which were drawn by me from an impartial relationship to the affairs of the development of our petroleum enterprises, I dare to propose at this time my own observations about a tax on oil... [25]

He further argued that a tax on oil would literally give the European market to the Americans. Therefore, for the good of the Russian oil industry no further taxes should be levied.

A MONOPOLY AND FOREIGN INVESTMENT

Mendeleev was also concerned about the concentration of power in the oil industry. As has been discussed this was a concern of Mendeleev's in the 1860s when he argued for the sale of oil bearing land in small parcels in order to avoid anything approaching a monopoly. Since then, the actions of the Nobels had merely reinforced this belief. Although Soviet historians over-emphasize this at the expense of other issues and factors, they are accurate in arguing that it was a substantial problem and that the Russian chemist was very concerned about it.

In the early 1880s, five large firms joined together for a bit of chicanery. The most powerful of these was the Nobels. Collectively, these firms wanted to purchase all of the kerosene, set its price and sell it abroad as a single cartel.[26] While profit might have been the over-riding motive for this action, there is

another possible explanation for the Nobels: fear. The Nobels may have simply been concerned that the Rothschilds were a real threat to them.

The Nobels decided to pressure the government to grant them a virtual monopoly on the transportation of oil and its by-products. They encouraged the Russian government to enact a law that made all water transport of oil and its by-products illegal- except if it was aboard a Nobel vessel. This gave the Nobels a monopoly on all oil shipped into Central Russia: Only they had the tankers in sufficient number to move the thousands of tons of kerosene along the Caspian to the railheads for transshipments.[27]

Mendeleev, whose fondness for businessmen was tempered by distrust, writes that one of the reasons for the problems in the oil industry was the concentration of power in the hands of only the Baku oil producers who were being bullied by the Nobels. Mendeleev argues,"The shortcomings of the current situation of our oil business is due to the oil monopoly in the hands of Baku". In order to ensure that the industry prospered it was crucial that there "be no monopoly".[28]

Mendeleev believed that the construction of refineries and ports on the Black Sea was just as important for the export side of the oil industry, as the Volga plants were for the internal consumption of oil.[29] Parkhomenko's statement in reference to the Batum refiners that Mendeleev advocated the "growth of the national oil business and against the enslaving dependence of foreign capital" is wrong.[30] It was the lack of capital available to Russian industry, not it's source, which was his greatest concern: when faced with the choice between foreign capital developing Russian industry and leaving it undeveloped, Mendeleev clearly believed in the former. For Ragozin, the question was quite different: whether oil should be refined at home or abroad.[31]

Not wishing to compete with foreigners for Russia's crude oil, he of course proposed that oil be refined in Russia for Russians. Therefore, from his point of view, the proposed refineries in and pipeline to Batum was simply new competition for Russian crude.

THE NEW IMPORTANCE OF OIL: THE 1884 AND 1885 COMMISSIONS

In 1883-1884, responsibility for the Caucasus' oil fields was transferred from the Minister of Finance to the Minister of Property. Property Minister I.P. Arkhipov called for immediate improvements to be made in the industry.[32] In 1884, the government decided that the Baku oil fields were sufficiently important enough to warrant a yearly governmental conference where experts and industrialists could meet to discuss the future of their industry and berate those who disagreed with them.

Perhaps the most worrisome issue to arise at the conference was the argument made by a Russian engineer named Konshin that Russian oil supplies would last for only thirty years.[33] Anyone had an interest in the oil fields in and around Baku became very concerned. If Konshin's thesis was accurate, all policies on oil would have to be re-examined: for example, instead of exporting the current petroleum surpluses, it might be wise to limit oil production to ensure supplies over a longer period of time for Russian consumption. There were many other options to choose from, but it soon became apparent that the question of the duration of Russia's oil supplies would have a significant impact upon overall policy towards the industry. The Nobels, whose attempt to create an enduring export transportation monopoly had failed, leapt on this rationale to limit the exports of oil and save their *de facto* monopoly; Mendeleev, of course, countered.

The issue of oil supplies was the ultimate reason why the chemist went to Baku once again in 1886.

However, the immediate reason was that a consensus had formed in the Russian government that they needed to find a way to transport surplus oil to the West. The government therefore created a commission with the mandate to study the viability of a pipeline from Baku to the Black Sea.[34] The star of the commission was Mendeleev. In its deliberations, he argued that it would not be feasible to upgrade the existing military railway that ran to Tiflis for use by the oil industry as it lacked sufficient carrying capacity.[35]

An Englishman, Beri, also studied the issue for the Russian government, who then presented the report to the professor of the Technological Institute, Mendeleev's old friend and benefactor, I.A. Vyshnegradskii. Beri made extensive recommendations to the government on minute details of its proposed construction and viability. Although Vyshnegradskii interpreted many of Beri's statistics differently and subsequently reached different conclusions, both argued that it was viable.[36]

As for a Baku-Batum pipeline, the commission concluded that the government should undertake the construction of the pipeline.[37] The stated reason for this was that due to the massive oil revenues that might become available to the government, that it should undertake the massive venture. One suspects that the absence of large-scale capital resources amongst the Russian industrialists involved in the project was also a factor. Another question arose: would the pipeline be for kerosene or crude oil? The kerosene pipeline was quickly nixed because of its unfeasibility.[38] There was one additional proviso on the pipeline - Russians must do the work and must use Russian material.[39]

Minister Arkhipov made several suggestions himself on how to further the development of the industry:

1. To prevent the theft of oil drilling equipment, it should be placed under government contract, but not ownership.
2. Extremely high taxes should be imposed on crude oil in order to ensure that it was processed in Russia.
3. As the existing Caucasus Railway could not be made cost effective, an oil pipeline must be constructed from Baku to Batum. Furthermore, an oil refinery must be constructed in Batum in order to process Russian oil on Russian land.

Furthermore, in spite of opinions to the contrary, the Minister stated that he believed that the pipeline would prove both cost effective and profitable.[40]

Ludwig Nobel continuously opposed the oil pipeline project; in fact, at times he was almost the only naysayer that it had. Mendeleev vigorously charged into this debate arguing that the government needed the pipeline.[41] Mendeleev, still a powerful force in the Russian oil industry, made several additional suggestions about its construction. First, the pipeline should be built privately with no government financial guarantees. As well, the owner of the pipeline should be obliged to transport all oil at a fixed price. In addition, the company granted the pipeline concession must have it up and running within two years. Finally, a high export tax should be imposed on the export of crude oil to encourage its refinement in Russia.[42] This approach was typical Mendeleev: private ownership mixed with government controls on prices when a monopoly was created out of necessity. Those who failed to support recommendations to provide inexpensive oil transport were "in fact doing something very nice for the Americans."[43]

The commission made several recommendations. They argued that it was necessary to create some type of legislative limits to curb what was perceived to be rapacious oil practices by some of the oil companies. (This was obviously an attack on the Nobels.) It also recommended that legislation be enacted that would encourage crude oil to be refined in Russia prior to export. As well, it suggested that cheaper ways to transport Russian oil, internally and externally, be sought. [44]

Mendeleev must have been extremely pleased to see some of his recommendations adopted in some form, and to see the Nobels discomfited. Yet, Mendeleev made a large concession to the Nobels - the Batum refineries should not be constructed if they damaged the Baku refineries excessively: This was not really a concern to Mendeleev as he was absolutely certain that this would not be the case.[45]

McKay argues that, "Indeed, the whole Trans-Caucasian pipeline was to a large extent Mendeleev's project, serving as one striking example of the technical intelligentsia's influence on tsarist economic policy."[46] It should be noted that this was not always the case; as discussed during the 1880 debate, the tsarist government did not listen to Mendeleev's advice and instead followed the suggestions of Nobel. While, the pipeline was in large part the result of Mendeleev's drive and initiative- as was much of the development of the Russian oil industry – it would be dangerous to extrapolate from this that Tsarist economic policy was primarily guided by the "technical intelligentsia". This may well be the case, but one suspects that the Russian government's decision to follow many of Mendeleev's suggestions was as much the result of his impartiality and the weight that his fame carried, as much as it was his undoubted scientific genius. Furthermore, the government's policies were the result of

pressures from many groups and not just one towering and occasionally grumpy individual.

THE 1885 COMMISSION OF BAKU OIL PRODUCERS

In 1885, the Baku oil producers created their own commission, set up independently of the government. It represented a clear schism between the government experts, such as Mendeleev, sitting in St. Petersburg determining the fate of the oil industry, and those with vested interests in preserving their own monopoly, investing as little as possible and counting their money in the far away reaches of Baku. Any method of mass transport of crude oil away from Baku or other centres of oil production within Russia towards Batum for refinement was a threat to Russian producers. For once, they were able to stand united.

Their preferences were simple: to ship kerosene to Europe from their refineries in Baku or to ship the raw product abroad if need be. If a refinery in Batum was constructed, they feared having to compete with it for the crude oil that they needed for refinement into kerosene for domestic use. This would result in increased cost for kerosene, without a concomitant increase in profit, and fewer Russians would be able to purchase the end product. The result would be a decrease in profit for the industry. While admittedly crude economic logic, this is what they believed. Quite naturally, they reacted.

The debate on the Russian oil industry provides ample proof of the maxim that there are two reasons for advocating and/or doing something: a good reason and the real reason. Taking up the Nobels lead, the commission immediately stated that there was concern about the oil supply. [47] This of course would justify limits or bans on the export of oil, making a refinery in Batum, whose only purpose was to refine oil products for export, unnecessary. The first person to

come out in support for this was V.I. Ragozin, who had until recently been at odds with the Baku oil producers. This new threat brought them together.[48]

The warm relations between Mendeleev and his heretofore benefactor Ragozin now changed dramatically: Previous mutually complimentary statements turned a bit sour, especially those coming from the industrialist. While Mendeleev's personality could undoubtedly upset even those possessing the greatest equanimity, there might have been a more prosaic reason for the shift - money. For several years, Mendeleev had worked on a part-time basis for good pay. Now, Mendeleev was advocating a policy that might threaten Ragozin's well-being by increasing the number of his potential refining competitors in the bidding for domestic crude oil.

The willingness to abandon Ragozin, and in fact promote policies that would hurt him, might be viewed as proof that Mendeleev was an ungrateful mercurial turncoat. There is a more charitable view of Mendeleev. He had argued a year earlier that oil refining in Batum should only go ahead if it did not harm other Russian oil industrialists, which he was certain would not be the case. Mendeleev's grand vision of exporting Russian kerosene abroad had been enunciated as early as 1876; he was simply waiting for there to be sufficient quantities of oil to do so. While it is understandable that Ragozin was miffed, when placed in the context of Mendeleev's long-term plans for the industry, they are completely understandable.

Ragozin believed that Mendeleev was lying about everything: "Either we clarify the uselessness of the pipeline or set up tariffs and limits so that the pipeline is useful not just to us in Baku, but to the entire Russian oil industry."[49] (The Russian oil industry seems to have encouraged disingenuousness amongst all participants: the plan which would most likely make them rich, was inevitably

the one which would most greatly promote the Russian oil industry). Clearly, Mendeleev's analysis was no longer good enough for Ragozin, especially when it involved the "uselessness" of the pipeline.

At the same conference, Ragozin proposed that a pipeline be constructed from Baku to Tsaritsyn, the river port, to the centre of Russia.[50] This was an attempt to break the stranglehold of the Nobels on the transportation of oil inside of Russia, and reveals the fluid nature of alliances within the industry. While Ragozin was against Mendeleev, Mendeleev was also against Nobel, who was against Ragozin; before, Ragozin had been with Mendeleev, Mendeleev had been against Nobel, who was with Ragozin. Such shifting cross-alliances were not atypical of the oil industry.

THE TRANSPORTATION OF OIL AND THE MILITARY

In January 1884, the progressive Minister of Property, M.N. Ostrovskii, believed that the construction of a pipeline was "extremely useful" and that the current state of export transportation was hindering Russian refiners from competing with American kerosene beyond the reaches of the Empire. He writes:

> In this case we must follow the example of America, where iron [railway tracks] laid down early in oil bearing regions were replaced by pipelines, which permitted cost reduction for kerosene to such an extent that refining in the Caucasus is only possible because of our high protective tariff, in spite of the enormous distance separating Russia from America and the insignificant cost of Baku's crude oil.[51]

The debate over modes and routes for shipping oil that raged between Nobel and Mendeleev shows the chemist at his best. Armed with statistics, less bitter and ready for battle, Mendeleev argued that there was a need for an oil pipeline to Batum where the oil would be refined and shipped to Europe. Briefly,

the debate is representative of Mendeleev's approach to the industry: He studied the chemistry, the numbers, the geography, the geology; he thought about how to develop and strengthen Russian industry, and how to enrich Russian coffers. Unlike his earlier work on the oil industry, he had no other contracts or business connections with Russian oilmen, which by contemporary standards might appear to be a conflict of interest. As well, unlike his last battle with Nobel, Mendeleev was more restrained in his language. This was much more typical of him and probably reflects the more stable personal life that he now enjoyed.

Mendeleev's opinion on matters could change dramatically. In 1880, he argued that Russian oil must be kept in Russia for use by Russians; he also believed that oil refineries must be constructed in the centre of Russia, until such time as there was sufficient oil for Russians to use. Now, just a few years later, his views had dramatically changed: Russian oil should be shipped abroad and refineries should be constructed on the fringe of the Russian Empire.

Scholars wishing to understand Mendeleev must carefully trace his thinking from beginning to end, and not assume that what he believed to be true in 1860 was what he believed in 1880. It is interesting to note that Mendeleev was perhaps the first proponent of the use of pipelines to transport oil. He was thinking about it in 1863 when working for Kokorev, well before the Americans introduced the practice.[52] Furthermore, as early as 1876 Mendeleev mused about the potential to Russia for oil exports - after there was sufficient kerosene for Russian peasants.

Although oil was not yet the great factor in economic and foreign policy that it is in the modern day, it was becoming a growing source of interest for governments. The Ministry of Property clearly wanted to construct a pipeline in

order to compete successfully with the Americans.[53] Oil was becoming a key component in Russia's international balance of trade.[54]

The development of the Russian oil industry at this time also became intertwined with Russia's military concerns. For example, as early as 1865 Mendeleev and his friend Kokorev recommended to the Tsar that Russia send its military to Cheleken Island to promote the grandeur of the Russian state and make it safe for 'legitimate' oil men. Now with a surplus of oil that only foreign markets could absorb, Russia had to figure out how to get it out of the Empire. There were some alternative routes, but the most effective one was from the Caspian Sea to the Black Sea.[55] The best potential port on the Black Sea for this purpose was Batum, a relatively short thousand kilometers from the Caspian, but the direct route went through an extremely perilous, mountainous route.

However, had the question of oil transport to the Black Sea arisen a few year earlier, the question would have been much more difficult as Batum then belonged to the Ottoman Turks. Fortunately for the Russian oil industry, the 1877-1878 Russo-Turkish War occurred. During this war, Sir James Bryce, the British Ambassador to America, visited Batum – then in Turkish hands – and commented that it was a "small town with but little trade and only a few vessels lying off it". As for the town's future:

> In the hands of the Turks it is useless, while, if the Russians acquire it, they will make it the terminus of the railway to Tiflis and the outlet for all the Trans-Caucasian trade. Its transfer to them would, therefore, be really a gain to the world at large, as well as to the conquerors...[56]

Someone obviously shared his beliefs because Batum was ceded to the Russians under the Treaty of Berlin in 1878.

With their new lands, the Russian government became interested in extending a railway line to Batum from Tiflis for troop shipment; however, this

would not do for moving large quantities of oil to the Black Sea as even the recently completed Tiflis to Baku railway line was only sufficient to transport it in small quantities.[57]

However, the Nobels had other plans. In 1883, the Nobels decided to quickly capitalize on the oil surplus. They decided to ship their kerosene to Europe via their already well-developed ship and train system from their Baku plants. This required little extra capital investment, perhaps only the addition of a few more tanker cars. The route was to be rather lengthy, from Baku, along the Caspian Sea, up the Volga to Tsaritsyn, then by train to Latvia for transhipment on the Baltic Sea. Mendeleev did not approve of their plan to compete with the Americans. He states, "I don't think you have a chance in this battle; I think you will be defeated," furthermore, "In this system there is a lot glands, but little math".[58] While Mendeleev's comments might have been expressed with greater tact, merely looking at the geography shows that the Nobels' plans were unsound. Failing to convince the Russian government of the viability of their circuitous but already established transportation monopoly, the Nobels took up the argument already in circulation that Russia was running out of oil and should ban its export.

The history of the Baku-Tiflis railway, the first part of a Trans-Caucasian railway, also marked the first large-scale introduction of foreign capital into the Russian oil industry. The railway's construction – started against the wishes of the Nobels who would find their transport monopoly broken - was greatly slowed by the financial problems facing its owners, Palashkovski and Bunge, both of whom were refiners in Baku. [59]

The Rothschilds, who already had substantial oil concerns in Continental Europe, were looking for oil resources outside America and found them in Russia. In 1883, they registered the Caspian and Black Sea Company with £600,

000 in capital. Palashkovski and Bunge approached the Rothschilds for help, who agreed, but only after the Russian industrialists promised to sell all of their export kerosene for a given period to the bankers for a fixed price. The Rothschilds soon injected £2,000,000 into the railway, which was completed in April 1883.[60] It is interesting to note that the Nobels were so concerned.about this railway line that they purchased smaller companies in the Baku region in order to simply get hold of land in an attempt to block the railway right of way.[61]

The usefulness of this railway, however, was restricted because its terminus point was still a great distance from the Black Sea and because its carrying capacity was limited. As a result, the Minister of Finance suggested to Captain-Lieutenant A.P. Khaiaykova that he build a pipeline along with other businessmen. He agreed to do so, but only if they received the right to export oil without any export tax. The government refused. In March of the same year, A.M. Dopgukov-Korsakov developed another plan to construct a pipeline from Baku to Batum. This plan also fell through.[62]

WHERE TO BUILD THE REFINERIES

At the end of the day, Mendeleev's vision won out. The Russian government believed Mendeleev more than they did the Baku producers and the refineries were built on the Black Sea. Ragozin, still smarting from Mendeleev's "betrayal"- real or otherwise- and aghast that owners of Russian refineries would have names such as "Rothschilds, Nobel and Stuart," writes, "Isn't it true how many [of them are] Russians?"[63] There is no doubt that while Mendeleev might have preferred some more Russian sounding names amongst the group, he would not have been overly concerned by the foreign content. Most importantly for Mendeleev was ensuring the development of the Russian oil industry.

Parkhomenko writing in Soviet times, took a similar view of the results as Ragozin:

> The Rothschilds were able to put most of the Baku refineries in bondage (*kabal'naia zavisimost'*). Their banks gave them credit, but they (the refiners) were obligated to furnish all of their kerosene to them [in exchange] for export through the Black Sea.[64]

Parkhomenko properly points out that the absence of domestic capital made the expansion of the Batum refineries extremely difficult; the big Baku refineries simply did not want to invest the money. The Rothschilds *et al.* did.[65]

The issue of capital was perhaps the greatest problem for the development of the Russian oil industry after 1876. The Nobels' ability to access large amounts of cash and a willingness to risk – and later employ monopolistic measures to guarantee their investment - gave them a tremendous competitive advantage over poorer or more risk adverse Russians. This trend continued with the construction of the refineries in Batum. Once again Russian investors played a relatively small role in the region. The problems of capital concerned Mendeleev in all the work he did on oil and his solution was simple: permit foreign investment in the oil industry. Writing in 1884, before the Rothschilds became involved, I. Arkhipov was very uncomplimentary to the Baku oilmen. He believed that the Baku oil fields had been in the hands of businessmen who simply did not wish to take risks.[66]

CAPITAL CONCENTRATION IN THE RUSSIAN OIL FIELD

By 1886, the Russian oil industry was in the curious position of pumping out tremendous quantities of oil while many refineries were bankrupt. Of 136 refineries just a few years earlier only 36 were left. This curiosity was one reason for the Russian Government's interest in the region once more.

Baku Oil Production:

Year	1883	1884	1885
Nobels	6.4	9.5	10.2
Others	5.3	8.2	8.9

In million puds.[67]

When viewing these statistics, it is apparent that in spite of the closure of many refineries, the oil industry as a whole was doing very well; the Nobels' competitors also maintained their relative position to the Swedes.[68] As a result, it is difficult to accept the proposition that the Nobels - or any other oil industrialist, even the Rothschilds - maintained a monopoly, or anything approximating one. The Nobels were extremely powerful, but they were far from a monopoly. However, that is not to say that they did not want a monopoly.

The Nobels were hard at work trying to consolidate and improve their position; a less charitable and not implausible view is that the Nobels were forging ahead in their desire to create a monopoly or near monopoly position. In March and April 1886, many of the smaller producers, lacking the resources to create their own transport system, faced extinction and agreed to sell their kerosene to the Swedish oil concern.[69] In 1887, the Nobels tightened the noose further around the necks of the smaller refiners: They successfully lobbied the government to outlaw oil transport by wooden barge along the Volga. Because the Swedes maintained a near monopoly on non-wooden barges, they maintained a *de facto* monopoly on oil transport.[70] Clearly, an oil pipeline would break their hold.

THE BAKU OIL BUSINESS IN 1886

At the behest of the Russian government, Mendeleev traveled to Baku twice in 1886 - once in May and a second time in August - to study the taxation situation and to determine whether oil supplies were running dry.[71] If supplies were indeed running low, it was widely argued that a substantial tax should be levied on all exports in order to ensure domestic supply levels remained stable. The Baku refiners would be left alone with their monopoly. Mendeleev published his results in an article entitled *Bakinskoe neftianoe delo v 1886 godu.* (The Baku Oil Business in 1886.)

According to Mendeleev, those who supported taxing oil exports and opposed the pipeline (that is to say Nobel and Ragozin and other large refiners) believed that Baku was the only place for real refiners. Furthermore, they believed that oil in Baku was quickly disappearing, and that an oil pipeline to Baku would hurt the oil industry. Their remedy? An export tax of fifteen kopeks a pud.[72] Mendeleev believed this to be complete balderdash. Rising to the occasion, Mendeleev angrily recounts, "For twenty-five years I have personally known all areas and almost all of it in detail.... How I fought against the *otkup* and taxes, when they were the main brakes against the growth of our oil industry, and now I am against the introduction of any new strong tax on oil and against the fears of an oil pipeline." Tossing aside all modesty, he promises that if his plans were followed it would "result in the greatest growth of our oil industry."[73] He proved to be correct.

That Mendeleev was not a doctrinaire free marketer can be seen in the following quote:

> Those involved in the Baku oil business must remember ... that industries belong to the government which gives them rent free [the oil lands] and freedom only with the

> will of the government. I believe that those who are living profitably near Baku are happy to use the entire country, the right to extract mineral resources which are being used up ... [and to have] profitable trade inside and outside Russia and the availability of free workers to transform the natural resources of Russia. Until now, everything was more profitable than any other place in the world. Thus, it only makes sense, in the interests of all to solve the questions regarding the wide and intelligent growth of the oil business on the outskirts of Baku.[74]

The first issue Mendeleev addressed was that of oil supplies, upon which everything else depended. If Baku was in fact running out of oil, than it would make complete sense to somehow either limit or prevent the sale of Russian oil abroad. However, on the issue of oil supplies, it is almost certain that it was the industrialists such as the Nobels who were playing fast and loose with the facts. The only people who would have substantially profited from Mendeleev's support of the pipeline were the Rothschilds. That he would be now working for the Rothschilds is unlikely – the archive contains no hint of such an arrangement, and with Mendeleev's known anti-Semitic attitudes it would have been an improbable arrangement in the extreme. It also must be clearly stated that while Mendeleev skirted the edge of what modern sensibilities find acceptable, he never appears to have crossed the Rubicon of sleaziness. In fact, if ever any proof was needed that Mendeleev might be "rented" - as long as his views coincided with the industrialists' plans - but not "bought," the nasty rupture between the chemist and Ragozin is it. Finally, it must be restated that Mendeleev's *raison d'être* for the oil industry was to provide Russian peasants with cheap and plentiful kerosene - everything else was secondary. If Mendeleev feared or believed that the oil supply was threatened, he would not have consented to exports, as these would threaten the peasants' kerosene supply.

Piece by piece, Mendeleev dismantled the three major arguments that were advanced as proof that oil was running low. Briefly, these were that oil

wells, previously sunk to the depth from 280 to 420 feet, now had to be drilled to depths of 560 to 840 feet. Secondly, that once copious gushers were now a thing of the past. Finally, oil wells, which had pumped out large amounts of oil for years, were now running dry.

Mendeleev's immediate response was simple: output of crude oil had been increasing continually for the past several years. Never satisfied with the simple answer, he decided to go further into the question.[75] Mendeleev started his analysis by noting that the original drillings had hit oil in the highest strata. However, oil strikes, now being discovered in deeper strata, were producing just as much, if not more oil than the original strikes at much shallower levels. Furthermore, he pointed out that gushers were not the product of large oil strikes, but were merely the result of a mixing of trapped gas and oil. Once the gas was released, there were no more gushers but not necessarily less oil. Therefore, a reduced number of gushers did not prove that oil stocks were decreasing. Finally, the drying up of older wells was not necessarily proof that oil was disappearing. Instead, in many cases, the wells dried up because equipment and drilling sites had fallen into disrepair. Often, once repairs were completed, the wells began producing oil once again.[76] Therefore, as Mendeleev saw no immediate danger that Russian oil fields would run out of oil, he saw no reason for the levying of high export taxes on crude oil.

Mendeleev argued that one of the problems faced by the oil industry was Russian oil itself. American oil produced much more kerosene than Russian oil. American oil was simply better. Mendeleev the chemist went about fixing the problem, by creating something which he called *Bakuol'*, a type of oil which he believed was acceptable as a lighting source. Needless to say, this did not find

much support amongst Baku oil industrialists, as Mendeleev's recipe would have made their product even cheaper and less profitable.[77]

Mendeleev also pressed the case for building a pipeline. Proof was to be found in the oil fields of America:

> In America most of the pipelines were built when the daily production (1876) did not reach 200,000 puds of oil, while we were already producing 500,000 puds of oil a day. With the first pipeline in America, production already reached 320,000 puds a day. Nowadays, after ten years, it has reached 500,000 puds. Never doubt that our reserves in the Caucasus with the oil pipeline will grow to full strength.[78]

In his arguments for the pipeline, he is quite clear that it would be impossible for Russian kerosene to compete with the American product if it was shipped to the Baltic Sea by train - the preferred route of the Nobels. In fact, the cost of transportation would be sixty kopeks while shipping it via the pipeline to Batum would be two to three times cheaper.[79]

Mendeleev also argues that one of "the shortcomings of the current situation of our oil business is because of the oil monopoly which is in the hands of only the Baku refiners...." In order for the oil industry to reach its maximum potential, there should be refiners throughout Russia: in Batum, on the Volga and Baku. Russia would do best to emulate the United States where refiners existed throughout the country –and not just in one region – in competition with each other.[80] This would be dangerous for the Baku industrialists.

RAGOZIN'S RIPOSTE

After the publication of Mendeleev's work, Ragozin was predictably furious. He immediately leapt to attack publishing "*Proverka zapiski zasluzhennogo professora D.I. Mendeleeva o polozhenii neftianogo dela v 1886 g.*" ("Verification of the notes of the Honourable Professor D.I. Mendeleev on

the Position of the Baku Oil Business in 1886.) He also published *Russkaia neftianaia promyshlennost' v 1887 g. k voprosam ob utilizatsii nefteprovodov, kerosinovodov i aktsize na neft'* (The Russian Oil Industry in 1887 and Questions about the Utilization of Oil Pipelines, Kerosene Plants and Taxes on Oil).[81]

Ragozin began by questioning the entire purpose of Mendeleev's trip to Baku in 1886. Ostensibly, the trip was to determine for the Russian government the extent of Russian oil reserves in the area. However, Ragozin raises the very valid point of why Mendeleev made the trip: After all, Mendeleev had quite clearly set out his opinion two years earlier - there were massive oil reserves in the area. It at least appeared that sending Mendeleev south was simply an attempt to give an academic stamp of approval to the government's plan to build the pipeline.[82] Although Mendeleev could have returned with a different answer than the government wished, he had placed much of his professional credibility on previous arguments; failure to reach the scientific conclusion that Baku had more oil than was necessary for Russia's own needs would have thus been a personal embarrassment.

Ragozin clearly states that Mendeleev's talents and fame were formidable, and that questioning the chemist's conclusion was fraught with danger. Mendeleev's "book was written by one of the most talented fighters for the construction of the pipeline. After it, the oil pipeline army could say nothing; they could only report the words of D.I. Mendeleev.... This work has the last word on the oil pipeline question; one cannot add anything to it."[83] The purpose of Ragozin's work and the succeeding one in 1887 was a re-examination of Mendeleev's facts and arguments.

THE RESULTS

In the end, Mendeleev's struggle for an oil pipeline and tax-free oil was never decisively resolved. In late 1886, the Russian government decided against levying a tax on crude oil, but instead placed one on kerosene. As for Mendeleev's calls for a crude oil pipeline -- nothing came of them, as the intrigues of the Russian oil industry kept things in suspense until 1896 when a kerosene pipeline was finally constructed with government funds.

However, Mendeleev's support for the construction of the Batum refineries bore fruit. Built with Western capital, this is one of the most tangible proofs of Mendeleev's openness to Western capital. It is also interesting to note that, in spite of the absence of a pipeline to the region, these refineries were successful.

Why did the Russian government fail to follow all of the great Russian chemist's suggestions? While there was undoubtedly a great deal of political intrigue surrounding government policies, the state had enlisted his services to study the oil industry and then ignored many of his suggestions. From what we know about Mendeleev, there are two reasonable suggestions that explain the government's decision. First, Mendeleev had been proven wrong about the Nobels' plans in 1880. The Russian oil industry had flourished under the Swede's massive and expensive plans: the great Mendeleev was not infallible and this lesson probably stuck in government minds. It should also be recognized that the Russian oil industry continued to flourish after 1886 even though his advice was not religiously followed, so once again Mendeleev was proven wrong. Second, one cannot underestimate the influence of Mendeleev's temperament and scandalous personal life in the decision-making process. Mendeleev's temper had undoubtedly alienated many people, and as the years continued he made an

increasing number of enemies. In 1886, his tone was more polite than it had been in 1880, but by then the damage had been done. His divorce and subsequent remarriage had given his enemies the moral "weapon" they need to use against him. So while a certain amount of homage had to be paid to the great and famous Mendeleev, by 1886 his influence was fading in the Russian oil industry.

[1]John McKay, "Baku Oil and Tran-Caucasian Pipelines, 1883-1891: A Study in Tsarist Economic Policy," *Slavic Review*, 21 (1985): 457.

[2]Charles Marvin, *Baku: The Petrolia of Europe,* (London: R. Anderson and Co., 1881), 121.

[3]D.I. Mendeleev, *Nauchnoe nasledstvo; neftianoe delo Baku. Sochineniia* Vol. 10 (Leningrad-Moskva: Izdatel'stvo Akademii nauk SSSR, 1949), 318-319.

[4]M.N. Mladentsev and Tishchenko, V.E., *Dmitrii Ivanovich Mendeleev, ego zhizn' i deiatel'nost': universitetskii period, 1861-1890,* (Moskva: Nauka, 1938), 67.

[5]See: K.I. Lisenko's "Po povodu proekta transkavkazskogo nefteprovoda," *Tekhnicheskaia beseda* December 13,1885, 1. McKay writes that the gushers occurred in 1886. Lisenko and others write that they took place much earlier. See McKay, 615.

[6]See N.V.Nardova, *Nachalo monopolizatsii neftianoi promyshlennosti Rossii,* (Leningrad: Akademii nauk SSSR, 1974), 24.

[7]Nardova, 30.

[8]*Trudy kommisii pri Imperatorskom Russkom tekhnicheskom obshchestve po voprosu o nefteprovode i merakh k razvitiiu dela v Rossii.* (Sankt Petersburg: Brat'ev Panteleevykh, 1885), 146-147.

[9]B. Redwood, *Petroleum: A Treatise on the Geographic Distribution and Geological Occurrence of Petroleum and Natural Gas; The Physical and Chemical Properties, Production, and Refining of Petroleum and Ozkerite; the Characters and Uses, Testing, and Storage of Petroleum Products; and the Legislative Enactments Relating* 3rd Ed., (London: Griffin and Company, Limited, 1913), 149.

[10]See: *Trudy komisii pri Imperatorskom russkom tekhnicheskom obshchestve po voprosu o nefteprovode*, (Sankt Petersburg: Izd. Brat'ev Panteleevykh, 1885), 6.

[11]*Trudy komisii*, 12. Parkhomenko argues that in fact Mendeleev made recommendations for the construction of a pipeline from Baku to Batum as early as 1880. This appears to be a rare factual error on Parkhomenko's part. No other source supports this contention; furthermore it does not fit any of his writings or his lines of thought. As well, in 1877 an American oilman, Herbert Tweedle, along with a Russian, K.A. Bodinski, submitted plans to the Russian government for the construction of a Trans-Caucasian pipeline at their own expense and risk, but with the condition that they be given a monopoly. Their proposition was turned down. See: V.I. Parkhomenko, *D.I. Mendeleev i russkoe neftianoe delo,* (Akademiia Nauk: Moskva, 1957), 212.

[12]See, McKay, 608. While I do not disagree with Professor McKay's assessment, something appears at least amiss when Mendeleev does not argue that the source for the crisis lay with the Nobels. Mendeleev never missed an opportunity to attack the Nobels and one suspects that the Nobel cartel might not have been the cause for the crisis in oil – this time.

[13]McKay, 608.

[14]M.I. Lazarev, *Sovremennoe polozhenie russkoi neftianoi promyshlennosti i neftianogo eksporta*" (Sankt-Petersburg: Izd. Skopokhogoba 1889), 34.

[15]Nardova, 74.

[16]A. Beeby Thompson, The Oil Fields of Russia and the Russian Petroleum Industry: A Practical Handbook on the Exploration, Exploitation and Management of Russian Oil Properties. 2nd ed. (London: Crosby, Lockwood and Son, 1908), 376.

[17]*Ibid.*, 7.

[18]*Ibid.*, 376.

[19]*Ibid.*, 126. All spellings and names of ethnic groups his.

[20]*Ibid.*, 127.

[21]Nardova, 95.

[22]Parkhomenko, 216.

[23]Nardova, 102-103.

[24]*Ibid.*, 76.

[25]D.I. Mendeleev, "Zapiska ob aktsize na neft' " *Sochineniia* Vol. 10 (Leningrad-Moskva: Izdatel'stvo Akademii nauk SSSR, 1949), 722.

[26]Nardova, 77.

[27]*Ibid.*, 71-72.

[28]Nardova, 78.

[29]D.I. Mendeleev, *Po neftianym delam. Sochineniia* Vol. 10, (Leningrad-Moskva: Akademii nauk SSSR, 1949), 494.

[30]Parkhomenko, 215.

[31]V.I.Ragozin, *Russkaia neftianaia promyshlennost' v 1887 g.; k voprosam ob utilizatsii nefteprovoda, kerosinovodov i aktsize na neft'*, (Sankt-Petersburg: A.I. Transhel, 1887), 2-3.

[32]Nardova, 66.

[33]K.I. Lisenko, "Po povodu proekta transkavkazskogo nefteprovoda." *Tekhnicheskaia beseda.* March 7 (1885), 47.

[34]*Trudy komissii,* 48.

[35]*Ibid.,* 49. Calculations for the transportation by train may be found on 125.

[36]*Trudy komisii pri Imperatorskom russkom tekhnicheskom obshchestve po voprosu o nefteprovode i merakh k razvitiiu dela v Rossii,.* (Sankt Petersburg: Izd. Brat'ev Panteleevykh, 1885), 24-27.

[37]*Trudy pervogo s''ezda neftepromyshlennikov v gor. Baku,* (Izd. V. Nerucheva, 1885), 5.

[38]*Ibid.*, 5.

[39]*Ibid.*, 6.

[40]I. Arkhipov, *Mery predlagaemye Ministerstvom gosudarstcvennykh imushchstv dlia razvitiia neftianoi promyshlennosti,* (Sankt Petersburg: Izd. A.S Suborisha), 23.

[41]*O Baku- Batumskom nefteprovode,* I-go otdel 19 December, 30.

[42]*Trudy komissii pri imperatorskom R.T.O. po voprosu o nefteprovode*, 51. See as well, *Trudy komissii pri imperamotorskom russkom tekhnicheskom obshchestve po voprosu o nefteprovode i merakh k razvitiiu dela v Rossii*, 31.

[43]*Vyderzhka iz otcheta 8-ogo zasedaniia po voprosu o nefteprovode i merakh k razvitiiu neftiianogo dela v Rossii. Zapiski imperatorskogo tekhnicheskogo obshchesnva. Trudy I-ogo khimiko-tekhnicheskogo otdela, 1885*, 228.

[44]*Trudy komissii pri Imperatorskom Russkom tekhnicheskom obshchestve po voprosu o nefteprovode i merakh k razvitiiu dela v Rossii*, 169.

[45]*Ibid.*, 127.

[46]McKay, 614.

[47]*Trudy pervogo s''ezda neftepromyshlennikov v gor. Baku*, 5.

[48]*Ibid.*, 10.

[49]*Ibid.*, 16.

[50]*Ibid.*, 5

[51]McKay, 612.

[52]Parkhomenko, 211.

[53]M. I. Lazarev, *Sovremennoe polozhenie russkoi neftianoi promyshlennosti i neftianogo eksporta*, 19.

[54]A. Subbotin', *Neftianoi vopros s gosudarstvennoi tochki zreniia,* (Sankt Petersburg: Izd. V.D. Smirnova, 1887), 1.

[55]Ironically, the question of oil transport from the Caspian Sea to the Black Sea is once again a topic of world-wide interest, which has been compounded by the fact that one pipeline runs through Chechnya.

[56]B Redwood, *Petroleum: A Treatise on the Geographic Distribution and Geological Occurrence of Petroleum and Natural Gas; The Physical and Chemical Properties, Production, and Refining of Petroleum and Ozkerite; the Characters and Uses, Testing, and Storage of Petroleum Products; and the Legislative Enactments Relating Thereto; Together With a Description of the Shale Oil and Allied Industries; and a Full Bibliography.* 3rd Ed., (London: Griffin and Company, Limited, 1913), 10.

[57]McKay, 609.

[58]D.I. Mendeleev, "Lampovye voprosy i upotreblenie mazuta kak toplivo," Zapiski russkogo obshchestva, Vyp. I, 1883: 37.

[59]It is unknown if Bunge was the Minister of Finance or a relative of his.

[60]See: J.D.Henry, *Baku and Eventful History.* (London: Archibald Constable and Co., 1905), 14. The author, however, appears to make a substantial error in geography. For some reason, he believed that Tiflis was on the Black Sea- a few hundred miles short of the actual goal.

[61]Nardova, 71.

[62]*Ibid.*, 65.

[63]Ragozin, 113-129.

[64]Parkhomenko, 216.

[65]*Ibid.*, 216.

[66]Arkhipov, 76.

[67]*Ibid.*, 72-73

[68]*Ibid.*, 32.

[69]*Ibid*, 32.

[70]*Ibid.*,71-72.

[71]Francis Stackenwalt, "The Thought and Work of Dmitrii Ivanovich Mendeleev on the Industrialization of Russia, 1867-1907," (Urbana: University of Illinois, Urbana, 1976), 503. Stackenwalt mistakenly argues that the Russian chemist spent the time from May until August in Baku non-stop.

[72]D.I. Mendeleev, *Nauchnoe nasledstvo neftianoe delo Baku. Sochineniia* Vol. 10, (Leningrad-Moskva: Izdatel'stvo Akademii nauk, SSSR, 1949), 318.

[73]Mendeleev, *Nauchnoe nasledstvo*, 318.

[74]*Ibid.*, 318-319.

[75]D.I.Mendeleev, *Bakinskoe neftianoe delo v 1886 godu,* (Sankt Petersburg: Izd. A.S. Suvorina, 1886), 604.

[76]*Ibid.*, 611-613.

[77]Mendeleev, *Nauchnoe*, 319.

[78]Mendeleev, *Bakinskoe*, 694.

[79]*Ibid.*, 686 and 508.

[80]*Ibid.*, 655.

[81]V.I. Ragozin, *Proverka zapiski zasluzhennogo professora D.I. Mendeleeva o polozhenii neftianogo dela v 1886 g.*, (Sankt-Petersburg: A.I. Transhel, 1886)

[82]*Ibid.*, 4.

[83]K.I.Lisenko, "Po povodu proekta transkavkazskogo nefteprovoda." *Tekhnicheskaia beseda.* March 7 (1885): 45-76 and Ragozin, *Proverka zapiski,* 3.

Conclusion

This dissertation has examined Mendeleev's openness to Western ideas and capital in the development of the Russian oil industry. In doing so, it has examined a wide range of documents, ranging from private diaries to published articles from the five years during which he most intensively studied oil: 1863, 1867, 1876, 1880 and 1886. The answer is unequivocal: contrary to what Parkhomenko has argued, Mendeleev was extremely open to Western ideas and capital. Yet, one must recognize that Mendeleev's openness was motivated by his desire to improve the Russian oil industry with the goal of providing large quantities of cheap kerosene to the recently emancipated serfs. Thus, Mendeleev's primary goal was to solve, or at least begin to alleviate the most Russian of all problems, the poverty of the Russian peasant. For this reason, it is impossible to overstate the importance that Mendeleev placed on his work in the oil industry.

Mendeleev recognized the strengths and weaknesses of Russia's oil industry, and believed that it could learn a great deal from the West. The clearest examples were the importation of Western ideas on pipelines and the abolition of excise taxes. Western businessmen and their capital were also more than welcome. A *caveat* should be added: Mendeleev was adamant that policies were needed that ensured that anyone investing in the oil industry acted in a way that was ultimately beneficial to Russia as a whole and not only to themselves. Mendeleev was also no revolutionary in his approach to the oil industry. In this regard, it is important to remember his meeting with Turgenev in Paris when Mendeleev advocated a gradualist approach in all matters. The grand gradualist

theory that he espoused to Turgenev paralleled his views on the Russian oil industry.

Mendeleev's first exposure to the Russian oil industry in 1863 was by chance. The Russian industrialist, Kokorev, was trying to improve the profitability of his refineries in Baku and probably heard of Mendeleev through a German chemist. Newly married, a new father and in debt to the future Minister of Finance because of his personal indiscretions, Mendeleev jumped at the opportunity to earn extra money. His various recommendations to Kokorev broke new ground in terms of thinking in the Russian oil industry - for example, the construction of pipelines between the oil fields and the refinery – which early on set Mendeleev apart from others in the field. While there is no direct connection between this original foray into this industry and his later openness to Western thinking, it does provide some insights into this young and not so famous chemist. What is clear is that, prior to his meeting with Kokorev, Mendeleev had no discernible interest in the oil industry. Thus, without this initial exposure, it is much less likely that so much of Mendeleev's thought and work would have been devoted to it.

It is interesting to note that Mendeleev seriously entertained the idea of leaving academic life for full-time employment in the industry. One wonders if Mendeleev's youth spent as the son of a glass factory owner played some role in this flirtation. This possibility is amplified by the fact that Mendeleev adored his mother. It would be erroneous to overemphasize the influence of his family background upon his future life decisions, but neither should it be ignored. However, in large part due to his wife's tearful refusal to move to Baku, Mendeleev turned down this first offer to work full-time in the industry.

More troublesome is the letter to a high government official that Mendeleev co-signed calling for the use of the military in order to secure the Cheleken Peninsula across the Caspian Sea. The fact is irrefutable. Yet, Mendeleev never again advocated the use of force for financial gain. It is unclear whether this was an aberration, perhaps the result of pressure placed on him by Kokorev; or whether Mendeleev truly believed that this policy was the right solution to the problem. If this event had occurred several years later when Mendeleev was at the height of his powers, one would be certain that what he signed is what he believed. Two additional points are worthy of note. Firstly, although the original suggestion was rejected as being impracticable, Russia did eventually gain control over the region. Secondly, neither the fact that Mendeleev almost gave up scientific research for work in the Russian oil industry, nor his advocacy of military force has been discussed by Soviet scholars.

His trip to Paris in 1867 for the Russian government is the moment when, according to Mendeleev, Russian authorities began listening to his scientific views. In reading his private documents it is quite clear that Mendeleev had an objective mind, free of nationalist cant. He willingingly acknowledged that every country had its strengths and weaknesses, including Russia, and looked for ways in which Russia could benefit from what the West had already learnt.

In his published work on Paris, Mendeleev noted for the first time the great importance of kerosene in Europe and its export value to the Americans. After viewing the exhibits from Western countries at the Paris world fair, he made several crucial suggestions on how to improve the Russian oil industry. It was important to transport oil more efficiently and more effectively refine its by-

products. These were ideas that he would return to in his writings on the oil industry in 1880 and 1886. It was also at this exhibition that he first articulated his vision of kerosene and the Russian peasant. With Russia's long winter nights and a huge mass of recently emancipated serfs, kerosene would give the peasants an opportunity to be more productive.

Perhaps the most important idea with which Mendeleev returned was the abolition of the oil-bearing land leasing system, known as *otkup*. He forcefully argued for its end and, in its place, he advocated the introduction of private ownership in order to foster growth in the industry. While Soviet academics were wrong in downplaying Mendeleev's strongly held belief in private ownership for the oil industry, Soviet historians were accurate in noting that he was very concerned with monopolies: Mendeleev did not trust businessmen. To counter the potential threat that he saw monopoly as posing, Mendeleev argued that oil lands should be sold off in small parcels so as to ensure that no single businessman could become too powerful.

Mendeleev's meeting with the Russian writer I.S. Turgenev is revealing. In many ways they were opposites. Turgenev, who had permanently emigrated from Russia, wrote works highly critical of Russia. Mendeleev, a scientist who worked tirelessly to improve Russian industry and society, was homesick. But they connected on some level and -- according to Mendeleev in any event – it was their mutual emphasis on gradualism that was the key. This is an important point to stress, considering the way in which Soviet historians have tried to tie Mendeleev into supporting the Bolshevik agenda. While Mendeleev and the Bolsheviks may have some things in common – the issue of refineries in the Russian heartland, for example, or the role of science in industrial development -

- there is absolutely no doubt that Mendeleev would have been aghast at Bolshevik tactics and methods. Documents from this period also demonstrate the emotional aspect of Mendeleev's character. He wept upon receiving letters from his family, at times he wanted to return to Russia. He loved Paris, but it was not home.

Famous and powerful because of his discovery of the Table of Elements in 1869, Mendeleev's 1876 trip to America provides a very clear example of his receptiveness to Western ideas - at least when it came to the Russian oil industry - and his report was undoubtedly read by large numbers of Russia's intellectuals. Quite clearly Mendeleev did not believe that the United States was part of the civilized world. Its politics, social order and culture - or the lack thereof - was something that Russia should not emulate. However, with this criticism, Mendeleev was not suggesting that Russia could not learn anything from the West; only that America was not part of the civilized West. Mendeleev repeatedly made comparisons between America and Europe; repeatedly America came up short. It must be said that Mendeleev was in an ill temper during this trip, and that this is reflected in his writings from the time. Indeed, some of this ill temper undoubtedly influenced the way in which he viewed American society, for some of his views seem rather unlike Mendeleev in their judgements.

In spite of his ill humour and his intense distaste for America, Mendeleev neither dismissed its economy, nor did he fail to laud its accomplishments. This was much more typical of Mendeleev, as he was usually able to view issues in an objective balanced fashion. Thus, it is reassuring to see that while Mendeleev may have been unduly critical of American weaknesses in one area, he was also prepared to acknowledge its strengths in others.

Yet, in his final assessment Mendeleev was not impressed with the American economy on the whole. Saddled with massive war debts and the high cost of building its railway system, the American economy as a whole was not very strong. As for the American oil industry, Mendeleev credited its impressive results to the abolition of petroleum taxes, and argued that Russia would do well to follow its example. Of perhaps more historical importance, Mendeleev's report on this visit to America was the first place in which he publicly presented his grand plan for the Russian oil industry: The surfeit of oil that would result following the elimination of excise taxes would allow Russia to ship its surplus product to Europe and compete with the Americans in this lucrative market.

Mendeleev's writings on the oil industry in 1880 reinforce his openness to the West, and in particular to Western businessmen, or at least to the Swedes. It also demonstrates a rather vituperative side to Mendeleev's nature. Furthermore, it also shows that although he was a man of tremendous abilities and deep knowledge of the Russian oil industry, Mendeleev was not infallible.

By 1880, the Russian oil industry had experienced tremendous growth in large part due to the sagacious advice that Mendeleev rendered to the Russian government. The industry's success had created tensions over its future direction as two main factions engaged: one led by Nobel and the other by Ragozin. The former wished to create a gargantuan transport and storage system, produce kerosene in Baku and ship it throughout Russia; the latter planned to export the crude oil to his refineries in central Russia, closer to consumers. Mendeleev, who was in the employ of Ragozin, publicly supported his ideas. While this might at first appear to be a conflict of interest on Mendeleev's part, it appears that he had held these views long before working for Ragozin.

Mendeleev had reasons to battle Nobel other than his relationship with Ragozin: oil exports. The Nobels planned to export crude oil before Russia had sufficient cheap kerosene for its peasants. In Mendeleev's view, this would have exacerbated the political situation at the time. Mendeleev had always planned the export of the more valuable refined oil products - and not just crude oil – once sufficient was being produced to meet domestic needs. But this clearly was not the case in 1880, and Mendeleev was therefore absolutely against this proposal by Nobel. Thus, appearances aside, there was no conflict of interest here.

The Nobels' transportation and storage system proved to be their stroke of genius, permitting the cheap shipment of large quantities of kerosene throughout Russia and the Russian empire. A costly and daring endeavour, it was a fantastic success. Mendeleev had fought the Nobels every step of the way and his predictions were proven wrong: the Nobels' plan was more than viable. Mendeleev's battles with the Nobels, as each fought to encourage the Russian government to permit or promote their plans at the expense of the other, was just plain nasty from Mendeleev's side. The decision of the Russian government to permit the Nobels to build their railways and kerosene depots throughout Russia and the Russian Empire was a crushing repudiation of Mendeleev; its success simply made it more so. It must be stressed that Mendeleev did not attack Nobel because he the latter was Western. Mendeleev attacked the Swede because he believed Nobel was a dangerous fool.

Why was Mendeleev wrong? A simple and not wholly improbable answer is that he was simply fallible. However, his personal life undoubtedly had a large impact on his critical faculties. A long and passionate love affair

culminated in a scandalous divorce, re-marriage and child (not necessarily in that order) as well as heavy financial costs. These events would have distracted anyone.

The scandal also created another problem beyond its apparent effect upon his critical faculties - the apparent diminishment of his political influence. It should be kept in mind that, in the nineteenth century, the power created by copious amounts of genius, accomplishment, will and self-promotion could disappear quickly as a result of immoral acts becoming public knowledge. This scandal was public knowledge and his detractors and enemies now had a weapon to use against him.

By 1886, the situation had changed and Russia was now awash with oil; now, according to Mendeleev's way of thinking, it should export kerosene abroad in large quantities. To facilitate these exports, Mendeleev advocated that new refineries be built along the Black Sea, and that a pipeline be built from Baku to Batum to facilitate the shipment of crude oil.

Almost all of Russia's oil producers were aghast at this suggestion, including Ragozin and the Nobels. This is understandable, as they had invested huge amounts of capital in a risky venture that had proven to be extremely lucrative for them. From a selfish standpoint, why bother investing more money in more refineries? Mendeleev, who viewed the Russian oil industry from a more global perspective than the local needs of a few industrialists, supported this expensive operation against their desires because he felt it was important for Russia as a whole. The peasants had their copious cheap kerosene; it was time to use the excess oil for other purposes.

The Russian oil industrialists were not at all happy with the turn of events, especially Ragozin. As a result, they suggested that Russia was running out of oil: Its export now must be limited and, thus, the new refineries in Batum would not be necessary. Mendeleev's return to Baku in 1886 to prove that their accusations were false shows him at his best. His reports were full of energy, statistics and science, and proved that the oil wells were not running dry. He also demonstrated that an oil pipeline would be much more efficient than a kerosene pipeline. The Russian government partially supported Mendeleev's vision. They permitted the construction of refineries on the Black Sea, yet held up the construction of a pipeline until 1896.

Throughout the debate Mendeleev never rejected the idea of Western capital playing a role in the Russian oil industries. As long as it aided the growth of the Russian oil industry, he supported it - even if much of the capital came from the Rothschilds.

Interestingly, at the beginning of the twenty first century Russia is facing the same question that Mendeleev did in the last half of the nineteenth century: how to improve such a vital and capital intensive industry. Clearly he would support large scale Western investment in Russia today - if it served Russia.

Finally, one must wonder what would have happened if V.I. Kokorev had not introduced Mendeleev to the Russian oil industry in 1863. Thanks to Mendeleev's genius, ambition, energy, and ebullience, the industry was undoubtedly much stronger than if it had been left in the hands of industrialists – either Russian or Western - whose personal interests did not always coincide with the needs of Russian peasants or Russian industry. .The industry probably

would have also fared less well under the guidance of well-meaning government scientific advisors who lacked Mendeleev's combative and powerful character.

Epilogue

After 1886 Mendeleev no longer traveled to do research on the Russian oil industry. However, the lively professor was a sprightly fifty-four years old and continued contributing to Russia in many different ways, frequently at the request of the Minister of Finance, Sergei Witte.[1] World famous, Mendeleev took on varied tasks for the Russian government bringing his practical and scientific expertise to bear on numerous topics for short periods of time. The great scientist now took on responsibilities as varied as introducing the metric system to Russia, to participating in commissions on reform of the Russian calendar. In his personal life, the storm of Mendeleev's mid-life crisis passed and he settled into an apparently happy married life. The previously acerbic and cantankerous scholar appears to have mellowed somewhat with age and his mnew much younger wife.

During the 1886/1887 academic year Mendeleev focussed his attention on teaching. The summer vacation saw Mendeleev in Manchester, England attending a scientific conference, basking in his fame and recounting his discovery of the Table of Elements to respectful Western scientists. During the return trip to St. Petersburg, Mendeleev visited Vincent Van Gogh in Amsterdam.[2] The same year he took time out during to take a flight in a military hot air balloon. His friend, I. Repin was on hand to reproduce the event in a drawing. Mendeleev, whose expertise apparently extended to this topic, wrote an article for a newspaper recounting his trip.[3] In the same year Mendeleev began studying meteorology for the Russian government.[4]

In September, Mendeleev became involved in a cause which would eventually lead to his leaving the university. During this period, students were demonstrating for radical changes in the universities. Mendeleev arrived at one of the rallies in an attempt

to calm down the rambunctious youths. Sensing that the chemist was supportive of their cause the students gave Mendeleev a petition to pass onto the Tsar. Perhaps sensing that Alexander III would not be sympathetic to their cause or perhaps not wishing to expend political capital he failed to do so. Instead, he gave the letter to the university senate. However, it is clear that his sympathies were with the students.[5]

Mendeleev's main work for 1888 was a research trip to the south of Russia in order to study the region's coal industry. Paralleling his work on the oil industry, Mendeleev examined not only the economic importance of coal for Russia, but also studied transportation issues such as the viability of shipping coal by river or rail and various alternative routes. Mendeleev published his research in a general interest journal. It also discussed in broad terms the economic future of the region and touched upon other issues including industry, metallurgy and farming. The famous Mendeleev also discussed it with the Sergei Tolstoi, the son of the famous writer. A private report was also sent to Alexander III. [6]

The succeeding year saw Mendeleev with his wife abroad for site seeing as well as personal and government business. His first stop was in England, where he gave a lecture on his discovery of the Table of Elements thirty years after the fact.[7] The next leg of his trip was a stop in Paris to research smokeless gunpowder for the Russian Navy.[8] In 1890, Mendeleev once again went abroad to Paris in order to continue this research.[9] Beginning in 1891 Mendeleev continued his work on this topic for a year and a half. At Mendeleev's encouragement the Russian government opened a laboratory in St. Petersburg two years later to study the question.

However, before he began this research Mendeleev took the momentous decision –perhaps irrationally- to leave the university. In March 1890, the students were still not happy with their circumstances. Once again gave Mendeleev a petition to pass onto the government. This time Mendeleev took the request to the Minister of Education along with his own letter in support of the students. The Minister refused to examine either document and perhaps in what might have been a moment of impetuousness, Mendeleev quit his post at the university.[10] The sole reliable source of income was his textbook, the *Principles of Chemistry*, which was now considered to be a classic.

Mendeleev continued his work on the Table of Elements and published his new discoveries and addenda in each succeeding edition of this textbook.[11] Mendeleev's worldwide fame further increased with the publication of its fifth edition which was first translated into English and German in 1891 and French in 1895. Mendeleev took great pride in the work's success and wrote ," 'This translation brought me much happiness. In Oxford and Cambridge there are many copies of my book.' "[12]

In 1891, Mendeleev undertook another research trip to the south of Russia in order to study the coal industry . On a broader scale he continued working on economic questions, and tariff issues. Mendeleev's decision to continue this work was based upon his belief that there was insufficient technical and scientific work on these topics.[13]

Mendeleev's work for 1891 included a study on tariffs which he completed at behest of the Russian government. Mendeleev's ideas on these topics became known by Westerners such as Friedrich Engels who was impressed by the chemist's thinking on non-scientific topics.[14]

Although Mendeleev was temporarily unpopular with the Russian Minister of Education, his benefactor Sergei Witte was willing to put up with the rebellious professor who shared a similarly messy marital past. In 1892, at the request of Witte Mendeleev took on the massive task of revising Russia's system of weights and measures and introducing the metric system to Russia. Mendeleev now had the seemingly eternal task of updating Russia to Western standards.[15]

January 1893 saw another meeting between the energetic professor and Witte. The latter invited Mendeleev to act as one of Russia's representatives at the world fair in Chicago celebrating the discovery of America.[16] On June 8th of that year Mendeleev's work on the metric system came to fruition and the Ministry of Finance made it the law of the land. Twenty-one years France had done so and fifty-nine years after England.[17]

With the ascension of Nikolai II to power in 1894 Mendeleev wrote the freshly minted hapless tsar a letter in which he spelled out his views on tariffs. The letter also included Mendeleev's views on reforming the education system.[18]

1896 saw Mendeleev involved in as an advisor at the all-Russian trade and industry fair in Nizhnii-Novgorod. Again Mendeleev put forward his ideas on tariffs, discussed transport issues and the importance of technical education. Mendeleev's ideas on education began to bear fruit with the opening of the first polytechnic institute in Kiev two years later. Many attributed it to Mendeleev's writings on education. [19]

Never lacking in ideas on any topic in 1897 Mendeleev forwarded a letter to Witte on reforming the rouble and changing the structure of the Russian government.[20] The same year also saw Mendeleev on two very different commissions: one examined the reform of higher education and the other studied the choice of icebreakers for the Baltic

and Artic oceans. In the succeeding year Mendeleev also expanded his sphere of scientific curiosity to the Arctic and in 1898 would publish an article on exploring this region's ocean.

Later that year Mendeleev's son, Vladimir, an officer in the navy, died in a tragic accident. Vladimir Mendeleev, with the help of his father's connections had earlier taken part on Nikolai II's voyage which included an ill-fated stopover in Japan. The shattered Mendeleev wrote about the "accidental death of my smartest, loving, softest, nicest" Vladimir with such great pain and tenderness that one almost forgets his obstreperousness in battles with the Nobels *et al.*[21]

The year 1899 saw Mendeleev continue his work on reforming the calendar for Russia as well as a two month research trip through the Urals for Witte.[22] The following year Mendeleev continued his work on reforming the calendar. In 1900, he traveled abroad in March to Berlin to take part in a jubilee celebrating the 200th anniversary of its scientific academy. While there he also examined Germany's work on meteorology. Mendeleev also traveled to Paris twice that year. The first time as a representative of the Ministry of Finance at the world fair; the second time he took part in a world conference on weights in measures. The same year also saw him elected member of the Russian astronomical society. From 1901-1902 Mendeleev became intensely interested in astronomy and was instrumental in the construction of an observatory.[23]

By 1903 the tireless Mendeleev ended his years of service to the Russian state. In the same year Mendeleev wrote a letter to Witte outlining his lengthy work for Russia. The letter, however, was not to merely tell Witte what was already known by himself and most of Russia, but to ask for help. Mendeleev had almost no money and a young family

young family which he knew he would soon leave behind. Years of faithful work to Russia had not financially rewarded him. In light of his years of dedicated service to the state Mendeleev requested that the Russian government purchase from him a huge and worthless plot of land at a grossly inflated price. The Russian government agreed.[24] Had he taken up full-time work in the oil industry money would probably not have been an issue for him.

At the age of sixty-nine, Mendeleev's service to Russia was at an end. In the few remaining years of his life, he wrote a summation of his life and his views on the present and future of Russia. On January 20, 1907 the great Russian chemist died.

[1] Work on any period after his discovery of the Table of Elements is problematic at best as Soviet scholarship effectively ignores and at best glosses over his post-1869 life.

[2] See: A.I. Storinkii, ed., *Letopis' zhizni i deiatel'nosti D.I. Mendeleeva.* (Leningrad: Nauka, 1984), 256.

[3] *Ibid.*, 256.

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[17] *Ibid.*, 381.

[18] *Ibid.*, 390.

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