Universität Rostock · Traditio et Innovatio

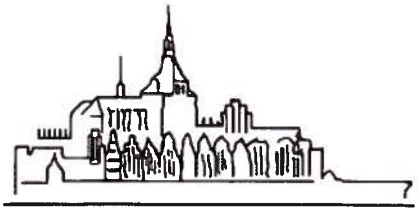
GDCh Gesellschaft Deutscher Chemiker

Working Party on History of Chemistry · EuCheMS

International Year of Chemistry 2011

Vortragstagung der Fachgruppe Geschichte der Chemie

12. - 14. September 2011 in Rostock



8th International Conference on History of Chemistry

September 14 - 16, 2011 in Rostock

Kurzreferateband · Teilnehmerliste

Book of Abstracts · List of Participants

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Grußwort / Welcome Address

Pathways of Knowledge is a very apt theme for a conference that also has a mission to transfer, and thereby transform, knowledge in the history of chemistry. Certainly, one of the most prominent tasks of both the Working Party on the History of Chemistry of EuCheMS and of the Fachgruppe Geschichte der Chemie of GDCh is the exchange of ideas, methods, and results in the scientific community. In this week, in Rostock, we engage in the experiment of having two conferences side by side. The German conference and the European one are, like a metallorganic sandwich-complex, connected by the award ceremonies of one national and one international prize. We hope that this combination will enhance the flow of ideas in our community. Rostock, one of the old Hansa cities engaging in trade between north and south, east and west, certainly will guide our thoughts in this regard.

It is my great pleasure to express my deepest gratitude to the people and organisations supporting us. They are too many to be named individually. The support of the University of Rostock, Evonik, and Ms. Loretta Lewicki of Prohama, Ludwigshafen-on-the-Rhine, is gratefully acknowledged. In addition, I wish to thank some of the colleagues who gladly invested their energy and determination. Without them, these conferences would not have happened. The team of the Gesellschaft Deutscher Chemiker, most notably Ms Christiane Dörr, Ms Caroline Kilb, and Ms Renate Kießling, were and are the most professional and efficient organizing group. The head of the programme committee of the Working Party, Dr Peter J.T. Morris gave us general direction, scholarly competence and attention to all details. The colleague who brought us here, who invented the master plan, and who carried it all through, with endless energy and enthusiasm, is Dr. Gisela Boeck. She made it happen! And I am sure that you will experience her Rostock spirit during this conference week in the same encouraging and uplifting manner as I have had the pleasure in the last two years of preparation and organisation.

Now, I wish you a most pleasant stay in Rostock, and lively discussions during the sessions!

Cordially yours,

Carsten Reinhardt

Vorsitzender, Fachgruppe Geschichte der Chemie, GDCh
Chairman, Working Party on the History of Chemistry, EuCheMS

Vortragstagung der Fachgruppe Geschichte der Chemie

12. - 14. September 2011 in Rostock

Programm der Vortragstagung 2011
12. – 14. September 2011 in Rostock

Montag, 12.9.2011

09:00 **Eröffnung und Begrüßung**

09:30	Konrad Herrmann, Berlin	Über die Herstellung und den Gebrauch von Kupferlegierungen im alten China
10:00	Alexander Kraft, Eichwalde	Wege des Wissens: Berliner Blau 1706 - 1726: Von der ersten zufälligen Herstellung, über die geheimgehaltene Produktion bis zum Bekanntwerden des Verfahrens
10:30	Wolfgang Hübner, Berlin	Achards Legierungskunde: Eine verpasste Chance
11:00	**Kaffeepause**	
11:30	Lothar Kuhnert, Berlin	Friedlieb Ferdinand Runge (1794-1867) - Chemiker und Künstler
12:00	Harald Gropp, Heidelberg	Julius Ruska (1867 – 1949) und seine Beiträge zur Geschichte der Alchemie
12:30	**Mittagspause**	
14:00	Arno Martin, Jena	Von den Anfängen des chemischen Universitätsinstituts in Jena
14:30	Peter Hallpap, Jena	Die Chemie in Jena in der Wende
15:00	Jiri Jindra, Prag/CZ	German Physical Chemistry in the Czech Lands (1882-1945)
15:30	**Kaffeepause**	

16:00 **Mitgliederversammlung der Fachgruppe Geschichte der Chemie**

Tagesordnung
1. Bericht des Fachgruppen-Vorstandes
2. Nächste Fachgruppentagungen
3. Mitteilungen und Publikationen der Fachgruppe
4. Arbeitskreis Industriegeschichte (Zeitzeugen-Berichte)
5. Anträge an die Mitgliederversammlung
6. Verschiedenes

19:00 **Gesellschaftsabend in Warnemünde (Getränke Selbstzahler)**

Dienstag, 13.9.2011

09:00	Wolfgang Scheinert, Leverkusen	Es begann mit Anilin: Organische Zwischenprodukte und anorganische Chemikalien bei den Chemischen Fabriken vorm. Weiler-ter Meer und ihren Vorgängerfirmen in Köln und Uerdingen
09:30	Günter Lattermann, Bayreuth	Triolin - ein wenig bekannter Fußbodenbelag der 1920er Jahre
10:00	Claus Christ, Kelkheim/Ts.	Das Element Chlor: Eine Betrachtung in unternehmensökonomischer Perspektive
10:30	**Kaffeepause**	
11:00	Christoph Poggemann, Salzbergen	Über den mathematischen Zusammenhang zwischen den Stöchiometrie-Gesetzen des Jahres 1792 und dem von Titius und Bode
11:30	Klaus-D. Röker, Garbsen	Die Suche nach der Struktur organischer Verbindungen: Auguste Laurents Kernhypothese und deren Adaption durch Leopold Gmelin
12:00	Klaus Dieter Schwenke, Teltow	Die Geschichte der Agrikulturchemie und die Humustheorie der Pflanzenernährung
12:30	Dietrich Braun, Darmstadt	Der lange Weg zum Makromolekül - Polymerforschung vor Hermann Staudinger
13:00	**Mittagspause**	
14:00	**Universitätsgeschichtliche Erkundungen**	
16:30	Ivan A. Shuklov, Rostock	Chemische Numismatik
17:00	Regine Zott, Berlin	Gelehrte im Disput um Musik
17:30	Maria und Witold Wacławek, Opole/PL	Marie Sklodowska-Curie and her Contribution to Radioactivity and Science
18:30	**Öffentlicher Abendvortrag "History of Chemistry in Experiments", Axel Schulz, Rostock**	
ab 19:30	**Welcome Party der 8th International Conference on the History of Chemistry (ICHC)**	

Mittwoch, 14.9.2011

09:30 Eröffnung der ICHC

10:00	Christoph Meinel, Regensburg	Communication and Discipline Formation: Pathways of Knowledge in 19th Century Chemistry
11:00	***Kaffeepause***	
11:30		Verleihung des Bettina-Haupt-Förderpreises der Fachgruppe Geschichte der Chemie an Dr. Florian Karl Öxler Verleihung des Paul-Bunge-Preises an Dr. Matteo Valleriani Preisträgervorträge

Über die Herstellung und den Gebrauch von Kupferlegierungen im alten China

Konrad Herrmann, Berlin
Dr. K. Herrmann, Mühltaler Str. 44, 12555 Berlin

Über die Kultur während der Shang-Dynastie (16 – 11. Jh. V. Chr.) im alten China weiß man vor allem anhand von archäologischen Funden gegossener ritueller Bronzegefäße, die sich durch vielfältige, kunstvolle und komplizierte Formen auszeichnen. Als Gusstechnologien fanden das Wachsausschmelzverfahren und aus mehreren Teilen zusammengesetzte Gussformen Anwendung. Indessen bleibt es rätselhaft, wie dieser Hochstand der Bronzegusstechnologie erreicht wurde, da über vorangegangene Entwicklungen bisher nicht bekannt ist.

In der Folgezeit fand die Bronze über religiöse Zwecke des Könighauses und des Adels hinaus allmählich weite Verbreitung für Waffen, Werkzeuge, Schmuck und Gegenstände des täglichen Gebrauchs, wie zum Beispiel Spiegel. Auch Glocken und Glockenspiele wurden kunstvoll aus Bronze gefertigt.

Ein besonderes Charakteristikum ist die Verwendung von Kupferlegierungen, insbesondere von Messing, für Münzen als Zahlungsmittel im alten China, deren chemische Zusammensetzung und Form sich über einen Zeitraum von etwa 2500 Jahren nur wenig änderten.

Eine Spezialität der Kupferlegierungen im alten China stellt Paktong, eine Kupfer-Nickel-Legierung, dar.

Alchimisten fanden bei metallurgischen Experimenten, um Gold herzustellen, dass sich durch unterschiedliche Zugabe von Arsen zu Kupferlegierungen golden beziehungsweise silbern aussehende Oberflächen erzeugen ließen, ohne Gold oder Silber verwenden zu müssen.

Die Gewinnung der Erze und die Herstellung der verschiedenen Kupferlegierungen sowie entsprechender Erzeugnisse werden anhand altchinesischer Quellen erläutert. Ein linguistisches Problem stellt der Wandel der Bezeichnungen für die Bestandteile der Legierungen dar. Die chemische Zusammensetzung der Legierungen aufgrund der schriftlich überlieferten Angaben wird mit Ergebnissen moderner chemischer Analysen verglichen.

Wege des Wissens: Berliner Blau 1706 - 1726

Von der ersten zufälligen Herstellung, über die geheimgehaltene Produktion bis zum Bekanntwerden des Herstellungsverfahrens

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Zur spannenden Geschichte der Erfindung und frühen Verbreitung des Berliner Blau konnten in den letzten Jahren neue, wichtige Erkenntnisse gewonnen werden. In diesem Beitrag wird ein detaillierter Überblick über den gegenwärtig erreichten Wissensstand gegeben.

Die zufällige Erfindung des Berliner Blau erfolgte im Zusammenwirken des Hessischen Theologen und Alchemisten Dippel mit dem Schweizer Johann Jacob Diesbach im Berlin des Jahres 1706. Da Dippel, erst seit 1704 in Berlin, die Stadt schon 1707 wieder fluchtartig verlassen mußte, tat sich Diesbach mit dem auch unternehmerisch begabten Lehrer und Naturforscher Johann Leonhard Frisch, einem Franken, zusammen, um das neue Pigment in Berlin herzustellen und zu vermarkten. Aber auch Dippel stellte Berliner Blau in seiner zeitweiligen neuen Wahlheimat den Niederlanden her.

Von der Berliner Herstellern des "Preußischen Ultramarin" weiß man, daß sie viel Geld mit ihrem Produkt verdienten. Daher versuchten die Produzenten natürlich, die Herstellungsprozedur für das Berliner Blau geheimzuhalten. Andererseits bestand von vielen Seiten ein großes Interesse, hinter das Geheimnis zu kommen. Dafür wurde von manchen auch viel Geld geboten. Andere versuchten, das Geheimnis durch eigene Experimente zu ergründen.

Letztendlich lies sich das Arkanum nicht auf Dauer geheimhalten. Allgemein zugänglich wurde es schließlich, nachdem der Berliner Hofapotheker Caspar Neumann, die z.T. von ihm nacherfundene Herstellungsrezeptur 1723 der englischen Royal Society zur Kenntnis gab. Hier wurde sie von John Woodward 1724 in den Philosophical Transactions veröffentlicht. Danach begann man nun vielerorts in Europa mit der Herstellung des Berliner Blau. Chemiker wie der Engländer John Browne oder der Franzose Etienne-Francois Geoffroy erweiterten durch eigene Versuchsreihen sehr schnell die Kenntnisse zu Herstellungsmöglichkeiten und Eigenschaften des Berliner Blau.

Achards Legierungskunde
- Eine verpasste Chance –

Wolfgang Hübner, Berlin

Friedrich Wilhelm Herschel baute 1789 ein Spiegelteleskop von 122 cm Durchmesser. Für die Spiegel benötigte er eine Legierung, die möglichst hell war und die sich gut polieren ließ. Nach vielen Experimenten griff er schließlich auf eine Kupfer-Zinn-Legierung zurück, die schon Newton verwendet hatte.

Er hätte es vielleicht einfacher haben können, hätte er Kontakt zur Preußischen Akademie der Wissenschaften gehabt. In deren physikalischer Klasse hatte zu dieser Zeit der Direktor Franz Carl Achard umfangreiche Experimente zu Eigenschaften unterschiedlicher Legierungen durchgeführt und deren Ergebnisse 1788 in Berlin unter dem Titel *„Recherches sur les propriétés des alliages métalliques“* veröffentlicht.

Bei diesen Arbeiten waren 894 Legierungen aus 10 Metallen hergestellt und die daraus gewonnenen Proben verschiedenen Prüfungen unterzogen worden. Die für Herschel wichtigen Eigenschaften Farbe, Bearbeitbarkeit und Korrosionsanfälligkeit waren Bestandteil der Untersuchungen.

Im ersten Teil des Vortrags wird ein Überblick über Achards Experimente gegeben. Die mitgeteilten Eigenschaften von Legierungen des Zweistoffsystems Kupfer/Antimon werden anhand eigener Untersuchungen des Autors an diesem System erläutert.

Obwohl Achards Arbeiten mit Fug und Recht als Beginn einer systematischen Legierungskunde angesehen werden können, wurde das Buch von den Zeitgenossen nie gewürdigt und offensichtlich vergessen. Achard wird als Chemiker stets gewürdigt, seine metallurgischen Arbeiten aber werden kaum erwähnt. Selbst in metallurgiehistorische Studien taucht das Buch nicht auf. Erst im 20. Jahrhundert haben einige Werkstoffkundler Achards Buch wieder entdeckt, und der amerikanische Technikhistoriker C.S. Smith zählt es sogar zu den „Outstanding researches in metallurgical history“.

Woran kann es gelegen haben, dass das Buch vergessen wurde? An den Experimenten selbst? Am fachlichen Umfeld des Achards, an den Arbeitsgegenständen, die die Wissenschaft damals beschäftigte? An der Auflagenhöhe oder der Verbreitung des Buches?

Im zweiten Teil des Vortrags wird versucht, Antworten auf diese Fragen zu finden.

Friedlieb Ferdinand Runge (1794 bis 1867) – Chemiker und Künstler

Dr. Lothar Kuhnert, Pionierstrasse 9, 13583 Berlin, (lkuhnert030@aol.com)

Als herausragende Leistungen Runges werden in den üblichen Nachschlagewerken vor allem seine Entdeckungen auf dem Gebiet der Phytochemie (Isolierung von Coffein, Chinin, Purpurin u. a.) und die Aufarbeitung des Steinkohlenteers genannt. Aus letzterem gelang ihm die Abscheidung von Anilin, Phenol, Pyrrol, Rosolsäure. Runge beschrieb weiterhin auf Basis dieser Produkte die Einfärbung von Baumwolle (Anilinschwarz) und Fichtenholz. Es waren die ersten synthetischen Farbstoffe aus dem damals lästigen Abfallprodukt bei der Herstellung von Leuchtgas. Damit hätte Runge zum Begründer der Farbstoffindustrie werden können. Aber die Verhältnisse, unter denen er damals in Oranienburg bei Berlin arbeiten musste, waren nicht so.

Die Anregung zur Untersuchung der Kaffeebohnen (Coffein) verdankte er einer Begegnung mit Goethe in Jena. In Jena erwarb Runge den medizinischen Doktorgrad, arbeitete bei Döbereiner und hörte Naturphilosophie bei Oken.

Runge war auch ein äußerst produktiver Autor. Hier soll nur sein mehrbändiges Werk über Farbenchemie erwähnt werden (1834, 1842, 1850). Im dritten Band hatte er bereits die Durchführung von Tüpfelreaktionen auf Filterpapier beschrieben. Im gleichen Jahr 1850 gab er als Fortsetzung dieser Reihe heraus: *Zur Farbenchemie. Musterbilder für Freunde des Schönen und zum Gebrauch für Zeichner, Maler, Verzierer und Zeugdrucker.* Fünf Jahre später erschien eine weitere Fortsetzung mit dem Titel: *Der Bildungstrieb der Stoffe, veranschaulicht in selbständig gewachsenen Bildern (Fortsetzung der Musterbilder).*

Beide Bücher enthalten zahlreiche auf *„Löschpapier"* durch chemische Reaktion und Kapillartransport entstandene bizarre Bilder. Diese sind als Originale jeweils eingeklebt. Damit stand Runge am Beginn der Stofftrennung durch Chromatographie, was er anscheinend richtig erkannte, aber nicht weiter ausführte. Stattdessen fühlte er sich als Künstler und rief mit Michelangelo aus: *„Anch'io sono pittore!?"* (Auch ich bin ein Maler).

Nach mehr als 150 Jahren ist er nun tatsächlich in der modernen Kunst angelangt. Roters, Begründer der Berlinischen Galerie, widmete Runges Werk eine Ausstellung und rief in Berlin den *„Friedlieb Ferdinand Runge Preis für unkonventionelle Kunstvermittlung"* ins Leben.

Gleichzeitig wurden Runges Bilder nachgeschaffen, der Mechanismus der Bildherstellung physikalisch-chemisch untersucht und mathematisch modelliert (gemeinsam mit Enderlein). Als Ergebnis wurde der Begriff Runge-Instabilität für die bei der Bildentstehung ablaufenden Vorgänge des Kapillartransports vorgeschlagen. Damit wurden Runges Arbeiten in die Traditionslinie des aktuellen Arbeitsgebietes der Selbstorganisation in physikalisch-chemischen Systemen eingeordnet (gemeinsam mit Niedersen). Runges Bilder besitzen eine fraktale Dimension und bei ihrer Entstehung beobachtet man auch, wie in anderen Systemen, den Mechanismus der Periodenverdopplung. Das sind Begriffe, die auch in der Chaosforschung eine Rolle spielen. Darin wird kein Widerspruch zur Definition als Kunstwerk gesehen. Warum sollten in Kunstwerken nur gerade Linien und kein „Chaos" vorkommen. Das neueste Projekt, zu dem die historische Forschung über Runge die Anregung gab, betrifft die Durchführung eines Runge-Experiments in der Schwerelosigkeit (Mikrogravitation), denn der Kapillartransport kann natürlich durch Gravitation beeinflusst werden. Von einer Arbeitsgruppe an der TU Dresden (Przybilski, Thome u. a.) wird ein derartiges Experiment vorbereitet, das im März 2012 mit der Höhenrakete Rexus hoch geschossen werden soll. Als Ergebnis würde auch ein unter Schwerelosigkeit hergestelltes Kunstobjekt resultieren.

Julius Ruska (1867 – 1949) und seine Beiträge zur Geschichte der Alchemie

Harald Gropp, d12@ix.urz.uni-heidelberg.de

Julius Ruska wurde geboren am 9.2.1867 in Bühl (Baden) und studierte nach dem Abitur 1884 an den Universitäten Strassburg, Heidelberg und Berlin die Fächer Mathematik, Philosophie und Naturwissenschaften. Seit 1890 war Ruska Lehrer an der Realschule in Heidelberg und absolvierte parallel ein Studium der Orientalistik, das er 1895 mit der Promotion abschloss. 1912 erfolgte Ruskas Austritt aus dem Staatsdienst als Lehrer, da ihm die gleichzeitige Habilitation in Orientalistik nicht genehmigt wurde. 1914 erhielt er wieder eine Lehrerstelle am Kurfürst-Friedrich-Gymnasium in Heidelberg. Diese Stelle behielt er bis zum 1.4.1924, ab 1922 als halbe Stelle. Am 22.11.1922 wurde in Heidelberg ein *„Institut für Geschichte der Naturwissenschaften"* gegründet (IGN).

Ruska leitete nach seinem Weggang aus Heidelberg 1927 in Berlin wie-der ein IGN bis 1930. In diesem Jahr wurde dieses IGN in ein Institut der Geschichte der Medizin und Naturwissenschaften integriert, wo Ruska bis 1937 arbeitete. Während des Krieges siedelte er wegen der zunehmenden Bombenangriffe auf Berlin nach Schramberg im Schwarzwald um, wo er am 12.2.1949 starb.

Ruska publizierte fast 200 Zeitschriftenartikel und fast 50 „andere" Werke. Diese lassen sich in acht Gruppen einteilen: (S) Schule, Pädagogik: z.B. Herausgeber des Pädagogischen Archivs; (K) Kristallografie, Mineralogie, Geologie; (C) Chemie und Alchemie: vor allem arabische Alchemie;(B) Biologie: z.B. ein Buch über Wirbeltiere; (Ber) Berichte über die IGN;(M) Mathematik, Astronomie; (P) Philosophie: z.B. Locke; (T) Theologie: Buch seines Schwiegervaters Merx nach dessen Tod.

Nach 1923 bildeten seine Publikationen zu (C) den Schwerpunkt, was Ruskas Tätigkeit als Wissenschaftshistoriker kennzeichnet. Der Geschichte der Chemie und der Alchemie, vor allem im islamischen Kulturraum, widmete Ruska von nun an seine meiste Zeit, in Heidelberg und später in Berlin. Darüber wird in diesem Vortrag vor allem die Rede sein. Mehr zu Ruskas Biografie und zu anderen Arbeiten findet sich in [1].

Literatur: [1]H. Gropp, Julius Ruska (1867-1949) — ein eigenartiger Wissenschaftler, in: M. Hykšová, U. Reich (hrsg.), Algorismus 76 (2011), 94-104.

Von den Anfängen des chemischen Universitätsinstituts in Jena

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Zum Sommersemester 2011 ist das Institut für Anorganische und Analytische Chemie der Friedrich-Schiller-Universität Jena in einen Neubau eingezogen. Damit endete für die Anorganiker die mehr als 65 Jahre währende provisorische Unterbringung in Räumen, die ursprünglich für andere Zwecke errichtet und erst nach dem 2. Weltkrieg zu Laboratorien umgebaut worden waren. Das Wissen von den Jahrzehnte dauernden Bemühungen um diesen Neubau war der Anlass dafür zu untersuchen, unter welchen Bedingungen in Jena die ersten chemischen Laboratorien entstanden sind.

Für die Finanzierung der Universität Jena waren bis 1918 die vier Ernestinischen Herzogtümer gemeinsam zuständig. Wegen der damit verbundenen Schwierigkeiten begann Herzog Carl August von Sachsen-Weimar-Eisenach 1778 mit einer eigenständigen „Wissenschaftspolitik" durch die Gründung von Institutionen, die mit der Universität zwar eng verbunden waren, aber von dieser unabhängig durch die Weimarer Kammer allein finanziert wurden. So wurde 1789 eine außerordentliche Professur für Chemie geschaffen, auf die man Göttling (1753–1809) berief. Als „Anschubfinanzierung" erhielt er die Ausstattung für ein Labor als persönliches Eigentum. Für die Betriebskosten dieses Privatlabors mußte er dann selbst aufkommen. Als Göttlings Nachfolger kam 1810 Döbereiner (1780–1849) nach Jena. Der Herzog ließ für ihn ein chemisches Institut mit Labor und Hörsaal einrichten, das er der von Goethe geleiteten „Oberaufsicht über die unmittelbaren Anstalten für Wissenschaft und Kunst" unterstellte. Für dieses Herzogliche Institut wurden Geräte und Apparaturen sowie die Bibliothek aus Göttlings Nachlass erworben. Es war zunächst in Nebengebäuden des Jenaer Schlosses untergebracht, erhielt 1816 ein umgebautes Wohnhaus als Sitz und 1833 dazu noch einen außerordentlich bescheidenen Neubau. 1849 aber wurde dieses Institut aufgelöst, da Döbereiners Nachfolger im Ordinariat für Chemie, Wackenroder (1798–1854), schon ein Privatinstitut betrieb. Als er 1854 gestorben war, entbrannte ein lang währender Streit um die Besetzung des vakanten Lehrstuhls zwischen der philosophischen und der medizinischen Fakultät, da erstere einen auswärtigen Professor berufen, letztere eine Hausberufung durchsetzten wollte. Die Weimarer Regierung entschied 1856 den Streit dadurch, dass sie Lehmann (1812–1863) aus Leipzig berief. Ihm wurde ein neues Labor zur Verfügung gestellt, das auf Kosten der Großherzogin Sophie eingerichtet worden war. Die Schenkungsurkunde für dieses erste chemische Universitätsinstitut hat sie 1858 bei den Feierlichkeiten zum 300. Jahrestag der Universitätsgründung dem Prorektor überreicht. 1863 folgte Geuther (1832–1889) als Institutsdirektor. Schon zu Beginn seiner Tätigkeit fand er die Einrichtung des Laboratoriums ungenügend und das Auditorium zu klein. Deshalb bemühte er sich über viele Jahre um die Verbesserung der Arbeitsbedingungen. Die Verhandlungen zwischen den vier Erhaltern der Universität zur Finanzierung des endlich für notwendig erachteten Neubaus kamen jedoch erst nach seinem Tode zum Abschluss.

110220Rostuzrcr

Die Chemie in Jena in der Wende

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Zwei Jahrzehnte nach der Wende wird die Diskussion über den Umbau der ostdeutschen Wissenschaftslandschaft leidenschaftlich weiter geführt, wie z. B. die Beiträge von ARNO HECHT („Die Wissenschaftselite Ostdeutschlands: Feindliche Übernahme oder Integration?", Leipzig 2002), FRANK KUSCHEL/HELMUT RINGSDORF („Der zerrissene Mensch und unser geteiltes Gedächtnis", Nachr. Chem. 58 (2010), 759; „Im Großen und Ganzen ein Grund zum Feiern", Nachr. Chem. 58 (2010) 1008), JOACHIM SAUER („Der zerrissene Osten und die gelungene Wiedervereinigung", Nachr. Chem. 59 (2011), 36) und DIETRICH DEMUS („Mit Sicherheit nicht alternativlos", Nachr. Chem. 59 (2011) 366) zeigen.

Es erscheint sinnvoll, diesen Rückblick am konkreten Beispiel der Chemie in Jena zu versuchen. Dazu werden analysiert:

- die Aktivitäten beim Übergang von der Sektion Chemie zur Chemisch-Geowissenschaftlichen Fakultät,
- der Umbau der Hochschullehrerschaft,
- die Situation des wissenschaftlichen Nachwuchses,
- die Veränderungen im Studiengang und in den Studieninhalten,
- die Planung und Realisierung der Verbesserung der Arbeitsbedingungen, insbesondere für die Gebäude.

Es erweist sich, dass dieser Umbau der Jenaer Chemie in seiner Schnelligkeit, einschneidenden Wirkung und längerfristigen Konsequenz historisch einmalig ist und anfangs mit hoher Intensität von innen heraus begonnen und zunehmend von außen gesteuert ablief.

German Physical Chemistry in the Czech Lands (1882-1945)

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With regard to the parallel existence of the Czech and German universities and technical universities till 1945 in the Czech Lands we must divide the scientific disciplines to Czech and German ones inclusive physical chemistry. Therefore, the physical chemistry one could studied in German on

a) Philosophical Faculty (later Faculty of Sciences) of German University in Prague,
b) Department of Chemistry of German Technical University in Prague, and)
c) Department of Chemistry of German Technical University in Brno.

Ad a) The first lectures on physical chemistry were given in the period 1882-1900 by physicists F. Lippich, G. Jaumann and J. Ritter von Geitler and by chemists C. Garzarolli, C. Pomeranz and V. Rothmund. In 1896 the Institute of Physical Chemistry was established and it was directed shortly by G. Jaumann, but 30 years by V. Rothmund. As assistent professors of Institute relieved successively A.Lessing, O. Flascher and K. Wagner. The last mentioned was an associate professor who directed Institute provisionally several years. In 1935 J. Böhm became a new institute director. Under Böhm worked as assistent professors F. Münzberg, W. Hoppe and H. Strosche.

Ad b) Probably some problems of theoretical chemistry were presented already by W.F. Gintl in his lectures on general chemistry at 1880-1900. The first lectures on right physical chemistry were lectures of associate prof. L. Storch who directed the Chair of Physical Chemistry since 1900 and the Laboratory for Physical Chemistry and Electrochemistry since 1905. It served mainly for the educational purposes. In 1931 professor H. Zocher was called on the empty Chair, after him the Chair was occupied in 1943 by O. Kratky.

Ad c) Systematically lectures of physical chemistry (mainly electrochemistry) started since 1900 by associate prof. J. Frenzel. In 1912 the Chair (Institute) of physical chemistry was established under full professor Frenzel. His assistent professors were successively R. Lang, H. Branek, R. Kralik, A. Kurtenacker, V. Urban , K. Scharrer, H. Kubuna, J. Holluta (since 1926 assoc. prof.), R. Leo, H. Metzl, A. Ludwig, H. Hadamid, Martini, Wegefeld, H. Werner, A. Czernotsky, R. Burian, A. Mutehin, A. Schönaich, and W. Herrmann. In 1940 the Chair was occupied by J. Holluta (since 1944 full professor). His assistent professors were W. Bogerth, O. Sturz, G. Jonak and E. Gregory.

The scientific activity of German lecturers of physical chemistry was different. E.g., H. Zocher was very active, he published during his engagement in Prague tens publications on colloid chemistry, liquid crystals etc. Also J. Holluta (Brno) was an hard-working author. On the contrary, the Prague professors L. Storch, G. Jaumann, V. Rothmund, K. Wagner and J. Böhm and the Brno professor J. Frenzel published rarely. They wrote gladly textbooks.

The dissertation (PhDr., RNDr. and Dr.tech.)defended on German schools give a notion on the problems studied on chairs of physical chemistry.. Lists of dissertations and lecturers on physical chemistry will be presented. Also, the survey of scientific activities of full, assoc. and assistent professors above mentioned will be presented.

Es begann mit Anilin: Organische Zwischenprodukte und anorganische Chemikalien bei den Chemischen Fabriken vorm. Weiler-ter Meer und ihren Vorgängerfirmen in Köln und Uerdingen

Dr. Wolfgang Scheinert, Leverkusen

2011 jährt sich zum 150. Mal der Beginn der Anilinölherstellung durch J. W. Weiler in (Köln-) Ehrenfeld. Dies ist gleichzeitig die historische Wurzel der Anilinherstellung der späteren Bayer AG. Das „virtuelle Jubiläum“ ist Anlass zu einem Rückblick auf die Entwicklung der industriellen Chemie der organischen Zwischenprodukte und anorganischer Chemikalien an den Standorten Köln und Uerdingen bis zur Integration des Uerdinger Werkes in die I.G. Farbenindustrie (die Kölner Betriebe wurden 1914 aufgegeben). Betrachtet werden insbesondere der Aufbau des Stammbaumes der Benzol- und Toluolderivate sowie Entwicklungsstadien der Schwefelsäureproduktion. Während die Technologie der Anilinfabrikation und ihrer Vorstufen in den ersten Jahrzehnten im Wesentlichen den in der zeitgenössischen Literatur belegten Hauptlinien folgte, stellt ein den Chemischen Fabriken vorm. Weiler-ter Meer 1909 patentierter kontinuierlich arbeitender Nitrierapparat eine eigenständige technische Entwicklung dar. Zur Erweiterung der Produktpalette und zur Einführung neuer Verfahren holte man sich auch externe Technologien in das Uerdinger Werk, so bei der Oxidation von Toluol durch Mangansalze mit elektrochemischer Regenerierung nach W. Lang (1906) sowie bei der Errichtung einer Kontaktschwefelsäureanlage nach Tentelew (1910/11). Ein „Highlight“ ist sicher auch die Weiterentwicklung des Eisenreduktionsverfahrens durch Julius Laux, das ab 1925 die Erzeugung von Eisenoxidpigmenten gezielter Farbnuancen ermöglichte. Abschließend wird ein Überblick über die nach dem Ersten Weltkrieg auch in Uerdingen begonnene Erschließung neuer Arbeitsgebiete gegeben.

Triolin – ein wenig bekannter Fußbodenbelag der 1920er Jahre [1]

Günter Lattermann

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Die frühe chemische Industrie hat verschiedene Wurzeln. Dies konnten Farbstoffe, Mineraldünger, Arzneistoffe, aber auch Pulver- und Sprengstoffe sein.
Im Werk Düneberg der ehemaligen Sprengstoffwerke Köln-Rottweil AG fing man 1920 an, Vulkanfiber (Hydratcellulose) der Marke „Dynos" und einen neuen Fußboden- und Tischbelag herzustellen. Zu beidem wurde das vorhandene Know-how aus der Celluloseverarbeitung bzw. der Produktion von Schießbaumwolle (hochnitrierte Cellulose) genutzt. Der Fußbodenbelag erhielt den Namen „Triolin".
Die Arbeiten daran basieren auf einem Patent von A. Rischke von 1919, dem das Triolin-Patent der Köln-Rottweil AG von 1920 folgte. Hiernach wird „Nitrocellulose" (niedrig nitrierte Cellulose, ‚Kollodiumwolle', wie sie auch für Celluloid verwendet wird) mit einem flammhemmenden ‚Gelatinierungsmittel' (heute würde man sagen ‚Weichmacher', z. B. Trikresylphosphat oder Toluolsulfonsäureamylester), mit Füllstoffen wie Korkmehl, Sägemehl, Kreide etc. und schließlich mit Mineralfarbstoffen vermischt und geknetet. Anschließend wurde diese Masse auf ein Jutegeflecht aufgepresst oder -gewalzt.
Große Reklame-Kampagnen und der starke Konkurrenzdruck im Vorfeld der damaligen Weltwirtschaftskrise riefen heftige Reaktionen der alteingesessenen deutschen Fußbodenbelagsindustrie hervor. Zum einen wurde dieser kostspielige Kampf noch 1925 durch einen Vergleich beendet. Die Köln-Rottweil AG gründete mit den bedeutenden Germania Linoleum Werken AG in Bietigheim eine gemeinsame Firma, die „Triolin AG". Zum anderen war die Köln-Rottweil AG durch diese Auseinandersetzungen, aber wohl auch durch die allgemeine, schlechte wirtschaftliche Situation, in eine dramatische Notlage gekommen. Sie nahm daher 1926 Kontakte mit der 1925 gegründeten I. G. Farbenindustrie Aktiengesellschaft auf und fusionierte mit ihr noch im selbem Jahr. Während hierdurch andere, neue Nachkriegsprodukte wie z. B. die Zellwolle „Vistra" aus dem Werk Premnitz der Köln-Rottweil AG einen enormen Produktionsaufschwung erfuhren, wurde die Herstellung von Triolin unter den gegebenen Umständen eingestellt. Die letzte zeitgenössische Erwähnung findet sich 1927 in einem Kurzbericht über die Untersuchungen der TH Stuttgart.
Im Werk Düneberg der nunmehr I. G. Farbenindustrie Aktiengesellschaft wurde jedoch die Fertigung von Fußbodenbelägen noch nicht aufgegeben. Zum einen wurde jetzt „Prisma"-Linoleum produziert. Es handelte sich dabei um ein Triolin-Folgeprodukt aus einer Schicht von zumindest teilweise Nitrocellulose, aufgebracht auf eine Nesselunterlage. 1931 wird berichtet, dass *„Prisma"-Linoleum ein verbessertes Produkt sei, welches nicht mehr die außerordentlich gefahrbringenden und gesundheitsschädlichen Eigenschaften des Triolins besitzen soll"*.
Die heute wohl prominenteste Verwendung von *Triolin* findet sich in Bauhaus-Bauten. Erstmals 1924 im „Versuchshaus" des Bauhauses, im „Haus am Horn" in Weimar erwähnt, wird es dann 1925/26 auch in den Meisterhäusern und in verschiedenen Bereichen des Bauhausgebäudes in Dessau verlegt. Nach mühevoller Wiederherstellung im Jahre 2004 und nach abgeschlossener Restaurierung des Bauhausgebäudes im Jahre 2006 ist es dort in einem Raum, dem Direktoren- oder Gropiuszimmer „in alter Frische" zu besichtigen.

[1] Günter Lattermann, *Triolin – ein wenig bekannter Fußboden der 1920er Jahre*, e-plastory Nr. 2, 1-8 (2010).

Das Element Chlor
- Eine Betrachtung in unternehmensökonomischer Perspektive -

Claus Christ, Kelkheim (Taunus)

Chlor ist infolge seiner zahlreichen Verwendung in der chemischen Produktion und den damit verbundenen vielfältigen Vor- und Zwischenprodukten sowie den daraus folgenden Endprodukten - mit und ohne Chloranteil - gewissermaßen das "Rückgrat" der industriellen Chemie (und nicht ein "Element des Teufels").

Häufig sind die Herstellverfahren mit Chlor mehrstufig. Dies prägt die Wahl und gegebenenfalls den Wechsel des Produktionsstandortes sowie den der Produktionsgesellschaft und den des Investors, wobei Innovationen und ökonomische Gesichtspunkte bestimmende Größen sind. Verflechtungen von mehreren Standorten treten auf; auch sind oft solche innerhalb eines Standortes gegeben.

Ausgehend von den ehemals Hoechster Standorten - beginnend mit Griesheim - werden deren Verflechtungen (Höchst, Griesheim, Gersthofen, Knapsack) dargestellt, zumal 1990 die Chlortransporte zwischen den Hoechster Werken 12% der Produktionsmenge ausmachten; auch fand ein solcher Transport von Vinylchrlorid (VC) statt.

Über Griesheim kam es zur Verbindung zum Standort Bitterfeld (Standort Verlagerung der Chlorchemie in 1925 nach dort), über den (produkt- und verfahrensmäßig) zu berichten ist. Eine weitere Chlor-Verbindungslinie nach einem weiteren Standort im mitteldeutschen Chemiedreieck verläuft nach Schkopau. Diese wird vermittelt durch die Uhde GmbH (Tochtergesellschaft der vormaligen HOECHST AG) mit der Errichtung (Ende der 1970er Jahre) der Anlagen des Komplexprogrammes: Chlor-EDC-VC-PVC, das mit einer kurzen Standortcharakteristik einbezogen wird.

Ebenso werden die standortinternen Verflechtungen (z. T. mit Außenwirkung) produkt- und verfahrensmäßig dargestellt. Hierzu sind die vormaligen Werke Höchst und Knapsack sowie Griesheim Beispiele, die auch anhand von Schaubildern verdeutlicht werden. Hinzu kommt die Problematik der Bilanz Chlor/Natronlauge, die in HOECHST und im Chemiekombinat Bitterfeld (CKB) auf unterschiedliche Weise gelöst wurde.

Die Umstrukturierungen der Chlorchemie sowohl von HOECHST (nach 1997) als auch vom CKB (nach 1989) sind dann Gegenstand der abschließenden Betrachtung.

Über den mathematischen Zusammenhang zwischen den Stöchiometriegesetzen des Jahres 1792 und dem Planetenabstandsgesetz von Titius und Bode

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Die von Jeremias Benjamin Richter (1762-1807) zwischen 1792 und 1794 entwickelte und auch so benannte "Stöchyometrie" ("Meßkunst chymischer Elemente) ist eine der experimentellen Grundlagen der etwa zehn Jahre später einsetzenden Quantifizierung der Atomvorstellung, mit der es gelang, die von den Ioniern entwickelte Idee der "atomoi" für die Chemie nutzbar zu machen. Üblicherweise nimmt man an, daß sich Richter von Kant hat inspirieren lassen, die Mathematik auf die Chemie anzuwenden. Aus der Analyse der bisher kaum gesichteten Primärquellen geht allerdings hervor, daß sich Richter schon lange vor seiner Disseration ("De usu Matheseos in Chymia", Königsberg,1789), mit der Mathematisierung der Chemie beschäftigte. Richter gibt ausdrücklich das Jahr 1778 als Beginn seiner autodidaktischen Studien an, so daß er bereits 8 Jahre vor seinem Studium bei Kant (1786-1789) die Chemie mit Hilfe der Ars-Inveniendi-Methode des Leibniz-Schülers Christian Wolff (1679-1754) bearbeitete, wobei Richter sich ausdrücklich auf Wolffs Werk "Anfangsgründe der Algebra" beruft.

Richters algebraisch formulierten geometrischen Reihen besaßen für ihn einen theologischen und ontologischen Charakter , denn diese Reihen nannte Richter "vom Schöpfer festgelegte Zahlenfolgen". Solange das Stöchiometriegesetz der äquivalenten Proportionen nicht über diese Reihen konstruierbar war, besaß dieses Gesetz den philosophischen Status des "non ens". Geometrische Reihen entschieden also darüber, ob ein chemisches Phänomen in eine Mathesis-Universalis-Enzyklopädie integrierbar war oder nicht. Richter wies ausdrücklich darauf hin, daß man über diese Reihen nicht nur das Astronomiegesetz bzw Planetenabstandsgesetz von Titius und Bode formulieren kann, sondern daß geometrische Reihen gleichzeitig 2:1 Proportionen (Oktavintervalle) und 3:2 Proportionen (Quintintervalle) erzeugen.

Im Zentrum der Stöchiometriegesetze stand die Ontotheologie als theologische Wissenschaftstheorie, von der Richter in der 6.These seiner Dissertation vom 30. April 1789 schrieb. Die über geometrische Reihen konstruierten Stöchiometriegesetze sollten dazu beitragen, die Ontotheologie als religiöse Enzyklopädie, die ALLE Einzelwissenschaf-ten koordiniert, zu verbessern und auf die Chemie auszuweiten. Die antipositivistische Wende in der Stöchiometrieinterpretation besteht folglich darin, nicht die „einzel"-wissenschaftliche Chemie in das Zentrum der stöchiometriehistorischen Interpretation zu stellen, sondern die "universal"-wissenschaftlich-enzyklopädische Ontotheologie, deren Verbesserung Richter nicht primär als Chemiker, sondern als studierter Universalwissenschaftler bzw. als Naturphilosoph anstrebte.

Im Referat werden die markantesten Gedankengänge des Richter'schen Konzeptes anhand von bisher nicht erforschten Primärquellen genauer untersucht.

Die Suche nach der Struktur organischer Verbindungen: Auguste Laurents Kernhypothese und deren Adaption durch Leopold Gmelin

Klaus-D. Röker, Garbsen/D

Der französische Chemiker Auguste LAURENT (1807-1853) war als Absolvent der École des Mines in Paris vom Kristallographen HAÜY (1743–1822) beeinflusst, der die verwirrende Fülle der Kristalle auf einige, wenige Kerne (*formes primitives*) zurückführte. 1836 veröffentlichte LAURENT in den Annales de Physique et Chimie einen Beitrag mit dem Titel „Théorie des Combinaisons Organiques", in welchem erstmals konkrete Vorstellungen zur räumlichen Anordnung der Atome in organischen Verbindungen bei Berücksichtigung ihrer chemischen Reaktionsfähigkeit dargelegt wurden: Laurent glaubte, dass alle organischen Verbindungen von neutralen Kohlenwasserstoff-Stammkerne (*noyaux fondamentaux*) ableitbar sind. In diesen Stammkernen können die Wasserstoffatome durch Fremdatome (z.B. Chlor oder Sauerstoff) substituiert werden. Diese abgeleiteten Kerne" (*noyeaux dérivés*) sind ebenfalls Neutralkörper. Die bei vielen Verbindungen beobachteten höheren Reaktivitäten erklärte LAURENT damit, dass Stammkerne und abgeleitete Kerne außerhalb des eigentlichen Kerns Sauerstoff, Wasserstoff oder Halogen anlagern können und diese Außenhüllenatome dann z.B. im Sinne von Säuren oder Basen reagieren. LAURENT entwickelte geometrische Vorstellungen und eine Nomenklatur zu seiner Kerntheorie. Diese erweckte erhebliches Aufsehen, stieß aber insbesondere bei BERZELIUS und LIEBIG auf erbitterten Widerstand und fand keine allgemeine Anerkennung.

Ab 1842 erschien das berühmte „Handbuch der Chemie" von Leopold GMELIN (1788-1853) in 4. Auflage. Der erste Band der Teils „Organische Chemie" wurde 1848 herausgegeben. GMELIN wählte für die organischen Verbindungen die Systematik der LAURENTsche Kerntheorie und belebte diese damit erneut. GMELIN stellte in seinem Handbuch „*Vermuthungen über die gegenseitige Stellung der Elementaratome im zusammengesetzten Atom*"[1] auf. Wie LAURENT beschrieb auch GMELIN geometrische Raumstrukturen: Stoffklassen wie z.B. Säuren haben gleiche Außenhüllen um die Kerne: Die Vorstellung funktioneller Gruppen deutet sich hier an. GMELIN beschreibt auch Reaktionsmechanismen auf der Basis der kerntheoretischen Vorstellungen.

LAURENT und GMELIN haben keine Bilder der von ihnen angenommenen geometrischen Körper veröffentlicht, diese aber exakt beschrieben: Die nach den Angaben der Autoren erstellten graphischen Darstellungen vermitteln die Geschlossenheit der Vorstellungen eindrucksvoll.

[1] Die Unterscheidung zwischen Atom und Molekül hatte sich zum Zeitpunkt des Erscheinens des GMELINschen Handbuchs noch nicht allgemein durchgesetzt

Die Geschichte der Agrikulturchemie und die Humustheorie der Pflanzenernährung

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Die Auseinandersetzung um die Lehre vom Humus als Nährstoffquelle der Pflanzen (*Humustheorie*) hat die Entwicklung der Agrikulturchemie in der ersten Hälfte des 19. Jahrhunderts wesentlich mitbestimmt. Erstmalig durch Johann Wallerius (1709-1785) Ende des 18. Jahrhunderts formuliert, wurde die *Humustheorie* in der Schule von Albrecht Thaer (1752-1828) zum Paradigma der Pflanzenernährung[1,2]. Danach fungierte der Humus des Ackerbodens in Form seines wasserlöslichen Zersetzungsproduktes, des „Extraktivstoffes", (neben dem atmosphärischen, durch Photosynthese fixierten Kohlendioxid) als wichtigste Kohlenstoffquelle der Pflanzen. 1826 widerlegte Carl Sprengel (1787-1858) durch die Entdeckung der Wechselwirkungen zwischen den organischen Bestandteilen des Humus, der „Humussäure", und den Bodenmineralien die *Humustheorie* seines Lehrers Thaer[3]. Sprengels neue Sicht auf den Humus enthielt im Kern bereits seine Mineralstofflehre der Pflanzenernährung. Die Vorstellung von der notwendigen Aufnahme organischen Materials in Form von Humus-Bestandteilen oder –Abbauprodukten durch die Pflanzenwurzel wurde jedoch in modifizierter Form von namhaften Gelehrten wie Théodore de Saussure (1767-1845), dessen *Chemische Untersuchungen über die Vegetation*[4] eine wissenschaftliche Grundlage der entstehenden Agrikulturchemie bildeten, Jakob Berzelius (1779-1848) und Gerrit Jan Mulder (1802-1880) weiterhin vertreten. Gegenstand der Mulderschen Humustheorie waren mehrere, durch oxydativen Abbau miteinander in Verbindung stehende, von ihm durch Elementaranalyse charakterisierte mehrbasische Humussäuren, die durch Bindung von Ammoniak und mineralische Basen geeignet sein sollten, die Pflanzen mit Kohlenstoff, Stickstoff und Mineralstoffen zu versorgen[5]. 1840 veröffentlichte Justus Liebig seine „Agrikulturchemie"[6], in der er rigoros gegen die Humustheorie zu Felde zog und als Nahrungsstoffe der Pflanzen nur die anorganischen Mineralstoffe des Bodens neben dem Kohlendioxid der atmosphärischen Luft sowie dem Ammoniak gelten ließ. (Von letzterem nahm er an, dass es gemäß seiner Philosophie vom Kreislauf der Stoffe ebenfalls aus der Atmosphäre stammend mit dem Regenwasser in den Boden gelange). Erst in einer späteren Auflage seines Werkes revidierte er seine Auffassung vom Humus wie folgt. *„Der Humus ernährt die Pflanze nicht dadurch, dass er im löslichen Zustand von derselben aufgenommen und als solcher assimilirt wird, sondern weil er eine langsame und andauernde Quelle von Kohlensäure darstellt, welche als das Lösungsmittel gewisser für die Pflanze unentbehrlicher Bodenbestandtheile und auch als Nahrungsmittel die Wurzeln der Pflanze…. in vielfacher Weise mit Nahrung versieht"*.

1. A. Thaer, Grundsätze der rationellen Landwirthschaft, 4 Bände, Berlin 1809-12; Bd. 1, S. 185, Bd. 2, S. 396-97.
2. K. D. Schwenke, Von der Humustheorie zur Mineralstofflehre – Die Schule Albrecht Thaers in der Geschichte der Agrikulturchemie, Naturwiss. Rundschau 62 (2009), 182-187.
3. C. Sprengel, Über Pflanzenhumus, Humussäure und humussaure Salze, Arch. Ges. Naturlehre, 8 (1826), 145-220.
4. Th. de Saussure, Recherches chimiques sur la vegetation, Paris 1804.
5. G. .J. Muilder, Versuch einer physiologischen Chemie, Braunschweig 1844-51.
6. J. Liebig, Die Chemie in ihrer Anwendung auf Agricultur und Physiologie, Braunschweig 1840.

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Abstract
Diskussionsvortrag Tagung der GDCh-Fachgruppe Geschichte der Chemie
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Der lange Weg zum Makromolekül - Polymerforschung vor Hermann Staudinger

Einem Vorschlag von J. J. Berzelius (1779 bis 1848) folgend werden seit 1833 unter dem Begriff „Polymerie" Stoffe zusammengefasst, deren Moleküle bei gleicher Elementarzusammensetzung ungleich groß sind. Daraus entstand schon im 19. Jahrhundert das zunächst nicht eindeutig definierte Wort „Polymere". Aber erst Hermann Staudinger (1881 bis 1965) wurde um 1920 zum Begründer der makromolekularen Chemie, also der Wissenschaft von den polymeren Stoffen mit hohen Molekulargewichten. Inzwischen ist die Bedeutung dieses damals neuen Zweiges der Chemie für Werkstoffe (Kunststoffe) und als Funktionsträger (Effektstoffe) in der Technik und in der lebenden Natur (Biopolymere) auf der Basis der Arbeiten Staudingers längst unbestritten.

Voraussetzung für Staudingers Forschung war das rasche Wachsen der organischen Chemie im 19. Jahrhundert; hierbei wurden -oft unbeabsichtigt und mitunter rein zufällig- noch nicht als solche erkannte hochmolekulare Stoffe erhalten, die meist als Harze, plastische Massen oder sogar als Schmieren bezeichnet wurden, weil sie sich mit den damals verfügbaren Methoden der Chemie nicht charakterisieren ließen.

Zu den Pionieren der hochmolekularen Chemie vor Staudinger gehört M. Berthelot (1827 – 1907), der 1863 das Verknüpfen organischer Moleküle durch Polymerisation („transformation polymerique") untersuchte und auch schon verschiedene Möglichkeiten zum Auslösen von Polymerisationen erörterte.

Die Begründung der Kolloidchemie um 1850 durch Graham und seine Nachfolger sowie der Aufschwung der physikalischen Chemie ab etwa 1880 führten, vor allem mit den damals entwickelten Methoden zum Bestimmen der Molmassen organischer Stoffe, zu Vorstellungen über die Größe und den Bau natürlicher und synthetischer Makromoleküle.

Gefördert wurde das Interesse an Polymeren durch die gegen Ende des 18. Jahrhunderts aufkommende Elektrotechnik mit dem schnell steigenden Bedarf an Isoliermaterialien und durch die seit etwa 1850 entstandene chemische Industrie in Europa mit neuen, synthetisch erzeugten Werkstoffen wie Celluloid, Bakelit und Galalith..

Der Vortrag schildert den langen Weg zu Staudingers „Makromolekül" durch das Zusammenwirken von organischer Chemie, Kolloidchemie und physikalischer sowie technischer Chemie im 19. Jahrhundert.

Chemische Numismatik

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Aus wissenschaftlicher Sicht ist die Numismatik ein Teilgebiet der Geschichte somit ist die chemische Numismatik ein Teilgebiet der Geschichte der Chemie.

Die Numismatik bietet zwei Optionen für die Geschichte der Chemie:

Das erste Gebiet lässt die Erfolge der Chemie und Metallurgie erkennen. Zum Beispiel folgen auf die Entdeckung und Isolierung von neuen elementaren Metallen häufig Münzprägungen aus diesen Metallen. Heutzutage sind Münzen aus elementaren Metallen sowie Nichtmetallen bekannt. Auch einige Irrtümer und Fehlern in der Wissenschaft kann man mit Hilfe von Numismatik beobachten wie zum Beispiel die so genannte alchemistische Transmutation der Metalle. Mehrere Münzen aus alchemistischen Silber oder Gold kann man in den Münzkabinetten von großen Museen finden (1).

Das zweite Gebiet sind die Gedenkmünzen, welche durch ihr Motiv an großen Entdeckungen der Chemie oder berühmte Chemiker erinnern. Die Münzen anlässlich großer Militärsiegen oder der Jubiläen des Kaisers wurden schon im Römischen Kaiserreich vor zwei tausend Jahren geprägt (2) aber erst im 20. Jahrhundert sind die Erfolge der Wissenschaft zum Münzmotiv geworden. Diese Münzen lassen die Anerkennung der Erfindungen in der Chemie in der modernen Gesellschaft bewerten. Sie können auch als Maß des Einflusses von Entdeckungen auf den Alltag dienen.

Die Information über die Münzen aus diesen zwei Gebieten wurde gesammelt und analysiert.

(1) Karpenko V.: Alchemistische Münzen und Medaillen., Anzeiger des Germanischen Nationalmuseums 2001, Nürnberg, **2001**, 49-72.
(2) M. Grant, Roman anniversary issues, Cambridge, University Press, **1950**.

Chemiker und andere Gelehrte im Disput um Musik

Regine Zott, Berlin

Über neun Jahre, von 1965 bis 1974, erstreckte sich die Geschichte der Bemühungen, im Rahmen der Max-Planck-Gesellschaft ein Institut für Musikgeschichte zu gründen.

In dieser beträchtlichen Zeitspanne engagierten sich mehrere Natur- und Geisteswissenschaftlern mit hohem Einsatz. Ihr Motiv waren zum einen ihre allgemeinen, humanistisch gebildeten musikalischen Interessen, zum zweiten individuelle Neigungen, Musik auszuüben, zu komponieren und über Musikgeschichte sowie zeitgenössische Interpretation nachzudenken. Das dritte Motiv resultierte aus ihrer Aufmerksamkeit für Trends in der allgemeinen Wissenschaftsentwicklung, aus dem Anspruch und der Notwendigkeit, auf die Herausbildung interdisziplinärer Probleme auf Grenzgebieten zwischen Natur- und Geisteswissenschaften sensibel zu reagieren.

Das Scheitern des jahrelang und gründlich erörterten Vorhabens erstaunt: Alle Gelehrte im Planungsgremium waren renommierte Wissenschaftler, meist auch Institutsdirektoren und Abteilungsleiter in der MPG, und auch die Nobelpreisträger Manfred Eigen, Werner v. Heisenberg, und Konrad Lorenz sowie außerdem auch Friedrich v. Weizsäcker waren nachdrückliche Befürworter. Trotz überarbeiteter Memoranden gab der Senat der MPG am 22.11.1974 den Vorschlag der zuständigen intersektionellen Kommission bekannt, dieses Vorhaben nicht zu verwirklichen. Klangvoller Auftakt – schweigsam resigniertes Finale.

Die Gründe für den Misserfolg resultierten zum einen aus aktuellen und tiefgreifenden Strukturdebatten in der MPG, zum zweiten aus der finanziellen und allgemein ökonomischen Situation der MPG jener Zeit, zum dritten jedoch aus streitbaren Auseinandersetzungen um die Musik und die Neuere Musik selbst, der Bestimmung der eigentlichen Schwerpunkte geplanter Musikforschung sowie um die Position von Musikern bei der Leitung eines solchen Instituts.

MARIE SKLODOWSKA-CURIE AND HER CONTRIBUTION TO RADIOACTIVITY AND SCIENCE

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Scientific life of Marie Sklodowska-Curie, a French physicist and chemist of Polish origin, is presented. Together with her husband Pierre Curie and thanks to the quantitative approach to their study, they discovered two new radioactive elements: polonium (July 1898) and radium (December 1898).

She assumed that the radioactivity is the result of a decay of atoms (1898-1900). This assumption was proved in 1902 by Rutherford and Soddy.

She found that the radiation of the radioactive substances causes chemical reactions. That was the beginning of the radiation chemistry. She established (1929) that the half-life of a particular kind of atomic nuclei does not depend on the external conditions, *ie* it is impossible to affect the radioactive decay in any way.

She won the Nobel Prize two times: in 1903 in physics (1/2 together with her husband; H.A. Becquerel won the other half) for the discovery of radioactivity and in 1911 in chemistry (being employed at the Sorbonne) for *her contribution to the development of chemistry through the discovery of radium and polonium, isolating radium and the study on the nature and the compounds of this element.*

Marie Sklodowska-Curie is the founder of radiochemistry as well as medical radiology.

8th International Conference on History of Chemistry

September 14 - 16, 2011 in Rostock

Wednesday, September, 14

09.30 am	Opening ceremony
10.00 am	Plenary lecture: *Communication and discipline formation: Pathways of knowledge in 19th Century chemistry,* Christoph Meinel (University of Regensburg, Germany)
11.00 am	**Coffee break**
11.30 am	Awards ceremony and lectures of the winners of the Bettina-Haupt-Award and the Paul-Bunge-Award
01.00 pm	**Lunch**

Session A1: ***The Knowledge Behind New Materials: Transfers and Comparisons*** Chair: Ernst Homburg	
02.30 pm	Pierre Teissier: *Chemistry of Materials in Europe since 1900: A Comparison of France and Germany*
03.00 pm	Joris Mercelis: *Scientists as Entrepreneurs. The Case of Leo H. Baekeland (1863-1944)*
03.30 pm	Alfred Neubauer: *Pathways of the Perlon-Knowledge*
04.00 pm	**Coffee break**

Session B1: ***Alchymy and Chymistry*** Chair: Marco Beretta	
02.30 pm	Matteo Martelli: *From the Nile to Byzantium: The Transfer of the Greco-Egyptian Alchemy*
03.00 pm	Adriaan Minderhoud: *Amsterdam. A Meeting Place on the Pathways of (Al)Chemical Knowledge in the 17th Century*
03.30 pm	Joel A. Klein: *Chymistry Goes Farther: The Foundational Role of Sensible Analysis in Early Modern Chymistry*
04.00 pm	**Coffee break**

Session A2: ***Chemistry and War*** Chair: Soňa Štrbáňová	
04.30 pm	Andrew Ede: *Learning a Hard Lesson. How the Battle of Ypres (1915) Transformed Chemistry in America*
05.00 pm	Malte Stöcken: *The Procurement, Examination and Distribution of Foreign Scientific Chemical Literature by German Institutions in the Course of the Second World War*
05.30 pm	Roman Mierzecki: *Clandestine Activities of Polish Chemists under German Nazi Occupation 1939-1945*

Session B2: ***Transferring and Exchanging Chemistry Knowledge between Europe and Latin America (19th and 20th Centuries)*** Organized by: Mina Kleiche-Dray and Hebe Vessuri Chair: Mina Kleiche-Dray	
04.30 pm	Andoni Garritz, Santiago Capella, José Antonio Chamizo, Julián Garritz: *Exiled Chemists of the Spanish Civil War's Footprint in Mexico*
05.00 pm	Mina Kleiche-Dray, Felipe León Olivares: *The Program of Scholarship from the Faculty of Chemical Science of Mexican National Universities*
05.30 pm	Hebe Vessuri: *In the Shadow of the Chemical Industry: Themes in the Development of Catalysis in Venezuela*

Thursday, September, 15

10.00 am	Plenary lecture: *The rise and fall of Chemical Russian,* Michael Gordin (Princeton University, U.S.)
11.00 am	Poster presentation and Coffee break P1 Ignacio Suay-Matallana: *José Casares Gil (1866-1961): Scientific Travels and the Making of Experts in the European Periphery* P2 Stamatis Avlonitis, Efthymios P. Bokaris: *The Introduction of Berzelius Chemistry in Greek speaking Region. The Teaching of Chemistry in the Ionian Academy*

Session A3:
Foreign Members: The Non-National Membership of the Major European National Chemical Societies, 1880-1939
Organized by Robin Mackie and Gerrylynn K. Roberts
Chair: TBA

11.30 am	Danielle M. E. Fauque: *What Place for Foreign Chemists in the Société chimique de France and the Société de Chimie Industrielle?*
12.00 am	Ernst Homburg: *Mirror of International Developments? The Foreign Membership of the Deutsche Chemische Gesellschaft, from about 1880 to 1914*
12.30 pm	Robin Mackie, Gerrylynn K. Roberts: *International Mobility?: Foreign Membership of the Chemical Society and the Society of Chemical Industry in Britain from the 1880s to 1944*
01.00 pm	**Lunch**

Session B3:
Crossing Boundaries: Bunsen's International Reception
Organized by: Christine Nawa
Chair: Michael Gordin

11.30 am	William H. Brock: *Bunsen's British Students*
12.00 am	Masanori Kaji: *Bunsen and Mendeleev: A Heidelberg Connection of Russian Chemistry?*
12.30 pm	Christine Nawa: *Bunsen in America*
	Commentator: Michael D. Gordin
01.00 pm	**Lunch**

Session A4:
Impact of German Chemistry
Chair:

02.30 pm	Stephen J. Weininger: *The Transformation and Consequences of Liebig-inspired Laboratory Instruction in American Land-Grant Colleges*
03.00 pm	Eva Vámos: *Influence of Berlin Chemistry on the Hungarian Chemical Science and Industry 1867-1914*
03.30 pm	Hao Chang: *Fresenius' Chemical Analysis in 19th Century China*
04.00 pm	Bernardo Jerosch Herold, Wolfram Bayer: *The Preparadores of Aguiar as Vehicles for Chemical Knowledge from Germany to Portugal and Goa*
04.30 pm	**Coffee break**

Session B4:
An Institute and a Discipline on the Move
Organized by: Thomas Steinhauser
Chair and Commentator: Dieter Hoffmann

02.30 pm	Helge Kragh: *Between Physics and Chemistry: The Controversy over Triatomic Hydrogen, 1911-1936*
03.00 pm	Brigitte Van Tiggelen, Annette Lykknes: *Ida and Walter Noddack through Better and Worse: An Arbeitsgemeinschaft in Chemistry*
03.30 pm	Jeremiah James: *A Turning Point for 20th Century Chemistry*
04.00 pm	Thomas Steinhauser: *Concepts and Traditions in West Berlin*
04.30 pm	**Coffee break**

Session A5:
Impact of German Chemistry *(ctd.)*
Chair: William H. Brock

05.00 pm	Galina Kichigina: *Late 19th Century Physiological Chemistry: Transformation, Communication, Transfer*
05.30 pm	Dietmar Linke: *Guest Speakers from West Germany on the 'Pathway of Knowledge' to East Berlin – Chemical Colloquia at Humboldt University around 1965*

Session B5:
Aspects of Atomic Theory
Chair: Annette Lykknes

05.00 pm	Stephen Irish: *William Wollaston, Crystallography, and the Atomic Theory*
05.30 pm	Gianmarco Ieluzzi, Luigi Cerruti: *Two Pathways for a University Chair – Cannizzaro in Piedmont, 1851-1855*

Friday, September, 16

09.30 am	Plenary lecture: *Stories about chemistry in the Industrial Revolution: Pathways towards what kind of knowledge?* Robert Bud (Science Museum, London, U.K.)
10.30 am	**Coffee break**

Session A6:
Instruments and Apparatus
Chair: Peter Morris

11.00 am	Laurence Lestel, Karin Winklhöfer: *How Knowledge Circulated between Germany and France: The Particular Case of their National Laboratories of Hygiene, 1876-1914*
11.30 am	Anders Lundgren: *Smell and Taste in the History of Chemistry: Textbooks and Laboratory Teaching in the End of the 19th Century*
12.00 am	Carsten Reinhardt: *Smell. Materializing a Sense*
12.30 pm	Apostolos Gerontas: *From Gas Chromatography to High Performance Liquid Chromatography; Mapping the Pathways of Knowledge between the Academia and the Instrument Industry in the US of the late 1960's and early 1970's*
01.00 pm	**Lunch**

Session B6:
Book, Language, Words and Formulae
Chair: Danielle Fauque

11.00 am	Isabel Malaquias: *Stirring towards a Chemical Modernization – A Curious Popularising Collection*
11.30 am	Evan Hepler-Smith: *"An Ensemble as Euphonic as Possible": The Thinkability of the Geneva Nomenclature, 1889-1898*
12.00 am	Vangelis Koutalis, Efthymios P. Bokaris: *Translating Histories: How Greek-speaking Scholars of the Early 19th Century Reconstructed the Temporality of Chemistry*
12.30 pm	Emre Dolen: *Different Ways of Writing Chemical Formulae and Equations in 19th Century Turkey*
01.00 pm	**Lunch**

Session A7:
Chemical Exiles
Chair: Thomas Steinhauser

02.30 pm	Ute Deichmann: *A Critical and Passionate Biochemist: Leonor Michaelis, Pioneer of Quantitative Enzymology, in Berlin and New York*
03.00 pm	Yael Epstein: *Immigration of Knowledge: The Case of the Jewish Refugees Chemists from the Nazi Regime – Adjustment and Scientific Achievements in the United States*
03.30 pm	Soňa Štrbáňová: *Exile of Czech Chemists during the Communist Regime in Czechoslovakia 1948-1989*

Session B7:
Periphery in the 18th Century
Chair: Hjalmar Fors

02.30 pm	Antonio M. Amorim-Costa: *Stahl's Animism brought from Germany to Portugal in 1733 by Joseph Rodrigues Abreu's* Historologia
03.00 pm	Marco Beretta: *Sven Rinman's Chemical Tour in Paris in 1747*
03.30 pm	Bjørn Pedersen: *When Lavoisier Came to Norway*

04.00-06.00 pm	**Meeting of the Working Party**

COMMUNICATION AND DISCIPLINE FORMATION: PATHWAYS OF KNOWLEDGE IN NINETEENTH-CENTURY CHEMISTRY

Meinel, C., Regensburg/D

Scientific disciplines produce, select and channel scientific knowledge. They are defined and internally structured by networks of communication and interaction. Since the production of scientific knowledge is local at first, pathways of knowledge transfer are required before it becomes generalised disciplinary knowledge. On the basis of quantitative data for a select group of leading chemists, the paper will examine structural changes the personal, textual and institutional pathways of knowledge underwent in the process of discipline formation. Particular attention will be given to travel, the formation of research schools, correspondences, journals, translations, congresses and more institutionalised forms of international cooperation.

Chemistry of Materials in Europe since 1900: A Comparison of France and Germany

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The study of matter became a crucial issue of science policy during the twentieth century. Materials were more and more thought to be the solution to win international economic and military competitions. Especially during the Cold War, it became national priority to produce new solid compounds. While the United States developed an original, interdisciplinary field of materials science, Europe relied more on disciplinary creativity, especially through its strong synthetic tradition of inorganic chemistry.

My paper shall describe the shaping of chemistry of materials in Europe during the twentieth century by focusing on two leading communities: the French and German ones. It will explain how inorganic chemists of the 1930s gradually became solid state chemists in the 1950s and then materials chemists in the 1980s. At the same time, chemical compounds became more and more conceived as useful materials. The comparison will be drawn at three intertwined levels: laboratory practices; research institutions; and collective identities. It will show how differences of national policy – the nuclear and aeronautic choices of France – and industrial orientations drove apart the two communities for the choice of most relevant materials – refractory materials were of crucial importance in France and poorly-funded in Germany. In spite of these differences, the two communities strove in the 1970s to build a European pot of chemistry of materials. This attempt was eventually covered by a larger international trend driven by (American) materials research, which made "interdisciplinary" the Holy Grail.

This historical sketch may open a discussion on the two "cultures of matter" embodied by inorganic chemistry and materials sciences that carried opposite conceptions of matter: composition-based versus goal-oriented, linear versus integrated, disciplinary versus interdisciplinary, solid state synthesis versus design of materials. These two "world views," which were in fact complementary, took part in an international division of labour in the Cold War.

Scientists as Entrepreneurs. The case of Leo H. Baekeland (1863-1944)

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Science education has been considered to be a most promising avenue for promoting innovation and economic growth. As regards research & development work, the importance of high-tech graduates to the 'science-based' industries emerging from the second half of the nineteenth century onward has been well-documented. By contrast, their impact on business strategies and cultures has not yet been comprehensively investigated. Accordingly, this paper explores whether and how companies led by chemists, physicists, mathematicians and/or engineers differed from their less 'science-based' counterparts. More specifically, it addresses the influence of corporate directors' educational backgrounds on 1) their commitment to research & development and 2) the career opportunities for scientists and engineers within their firms.

After briefly surveying the already available evidence, the paper elaborates the case of the Belgian-American chemist-entrepreneur Leo H. Baekeland (1863-1944), inventor of Bakelite. In his public and private rhetoric, Baekeland strongly distinguished companies 'based on scientific principles' from those led by financiers and/or 'hard-boiled businessmen'. As German chemical and electrical concerns most strongly embodied the former category, he held up their example to American entrepreneurs. At the General Bakelite Company and its successor, the Bakelite Corporation, Baekeland presided over the practical implementation of some of his stated principles. By separating the chemical preparation of phenol-formaldehyde resins from their mechanical processing, he and his German-American associates of the Roessler & Hasslacher Chemical Company pioneered a structure central to the synthetic plastics industry. The division helps explain the Bakelite Corporation's remarkably high spending on R & D, which Baekeland defended against his non-technical fellow directors. At the same time, Baekeland was skeptical about the economic value of basic research and at least equally rapidly lost his patience for scientists with no business acumen as for industrialists with no understanding of science.

Scientists and engineers not only manned Bakelite's research laboratories, but also conducted managerial, manufacturing and marketing duties. In this regard, the paper particularly elaborates the company's initial approach to advertising and sales. Baekeland insisted on primarily promoting Bakelite in professional journals, based on its technical qualities, and took pride in letting 'service engineers' rather than salesmen demonstrate the material's possibilities to prospective customers. In line with the conference theme, the paper analyzes these strategies from a transatlantic perspective. Although there are striking parallels with the business models of Roessler & Hasslacher and its German parent, the Deutsche Gold- und Silber-Scheideanstalt (*Degussa*), a direct transfer by no means occurred. In the conclusion, the paper more generally reflects on the appropriation of German innovation models in America.

PATHWAYS OF THE PERLON-KNOWLEDGE

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The starting point of the development and production of the polyamide fibre Perlon was the discovery that ε-caprolactam was polymerizable and one could spin the polycaprolactam. The scene of this event was the laboratory of the German chemist Paul Schlack (1897-1987) in
January 1938 at the Aceta-Werk GmbH in Berlin-Lichtenberg. The Aceta-Werk was founded by the IG Farbenindustrie and the Vereinigte Glanzstoff-Fabriken AG in Bobingen, Bavaria, in 1925. By this achievement Schlack had created the basis for a German competing product to the US-American Nylon fibre.

The beginning of World War II in 1939 promoted a rapid construction of a large scale production of Perlon silk which was used especially for making parachutes and tyres (reinforced by cord silk) for the German Air Force. The place of production became Landsberg an der Warthe (today Wielkopolski Gorzów, Poland) and started in spring 1943. The chemist Hermann Klare (1909-2003) became the head of the fabric part of the factory.

The more the bombing of Berlin by the western allies became heavier the more important institutions were evacuated. The laboratory of Paul Schlack was moved at the end of 1944 to the Vereinigte Glanzstoff-Fabriken AG in Bobingen. In April 1945 Schlack proceeded with 9 boxes of know how to the Agfa-Werk in Wolfen in Central Germany. There he fell in April 1945 into the hands of the US Army. In the end he reached the Vereinigte Glanzstoff-Fabriken AG in Bobingen which now belonged to the American occupation zone. There he succeeded in building up the first Perlon production in Western Germany which started in 1949.
The Perlon factory at Landsberg fell nearly undamaged into the hands of the Red Army in January 1945. The German staff escaped at the last moment and proceeded to Central Germany. The factory was dismantled and moved as reparations to the town Klin in Russia.

The high interest of the Soviet Union for getting an own Perlon production led after the war to the decision that pilot projects for producing Perlon silk, still existing in the Soviet occupation zone, had to continue their work. This process started already in summer 1945. Hermann Klare, who lived after the war in the Soviet occupation zone, became soon the head of the pilot project in Schwarza/Thuringia and produced now Perlon silk for the Soviet Union. Schwarza became the first plant on German soil where after the war polyamide fibres were produced. Such pilot projects were also places of learning for Soviet fibre-specialists. This knowledge transfer was a precondition for the reconstruction of the former Landsberg factory now in Klin. Also Hermann Klare and some further German specialists were integrated in this task and had to work in Klin from 1947 to 1949. In summer 1949 the large scale (5 tons per day) production of Soviet Perlon started. It got the name Kapron.

FROM THE NILE TO BYZANTIUM: THE TRANSFER OF THE GRECO-EGYPTIAN ALCHEMY

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During the first centuries AD in Egypt different cultural traditions seem to have given their own contribution to the first steps of a discipline – called 'holy and sacred art' or, less often, *chēmeia* – which has been the basis on which the Western alchemical knowledge developed. Greek, Persian, Egyptian and Jewish authors are supposed to have written many works which have been partially included into the Byzantine anthologies of alchemical treatises handed down by several Greek manuscripts. It seems possible to recognize an important moment of such a tradition between the 6^{th} and the 7^{th} century, when different sources – both inside and outside the collection of alchemical treatises preserved by the above mentioned codices – allow us to recognize the penetration of alchemy into the capital of the Byzantine Empire. On the one hand, some Byzantine Emperors are explicitly mentioned by the *Corpus alchemicum graecum*: in fact, alchemical works are ascribed to Justinian I and Heraclius, and others treatises, such as the lections of Stephen of Alexandria, are addressed to the same Heraclius. On the other hand, a few passages by the Byzantine chronographers, such as John Malalas and John of Antioch, point out the circulation of an alchemical knowledge in Byzantium by using the word *chēmeia* or some derivatives of it. After a quick overview of such a material, I should like to better understand its relationships with what we know of the precedent tradition, by trying to deal with some points of the following questions:
1) What kind of alchemy has been inherited by the first Byzantine authors? I would like to analyze what is still extant of their works with particular attention to the quotations of the earlier 'alchemists' and to the persistence of an ancient Greco-Egyptian background.
2) How much has the work of these Byzantine authors influenced both the definition of alchemy and the choice of the treatises that have been included into the alchemical anthologies?

AMSTERDAM. A MEETING PLACE ON THE PATHWAYS OF (AL)CHEMICAL KNOWLEDGE IN THE 17TH CENTURY.

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At the end of the 16th century after the establishment of the Dutch Republic, Amsterdam took over the role of economic centre from Antwerp. The number of inhabitants grew quickly from 50000 in 1600 to 150000 in 1650. The reformed church became the official religion but the city was tolerant towards other religions (e.g. Jewish, Roman Catholic, Mennonite and other Protestant denominations).Many immigrants were attracted by the economic opportunities but also because of the existing freedom, the persecution in their own countries and the state of war in parts of Europe. Amsterdam became a centre of editors and booksellers and even philosophers and scientists working in England, Germany or France had their books edited in the city.

In the 17th century a number of (al)chemists lived, worked and published during several years in or near Amsterdam, for example: Johann Rudolph Glauber, famous German chemist; Goossen van Vreeswijck, Dutch mining engineer and alchemist; Johann Moriaen, German correspondent of the Hartlib circle, the important international scientific network based in England; Johann Joachim Becher, German chemist; Theodor Kerckring, Dutch chemist and anatomist.

Amsterdam was also the place where the famous natural philosophers, teachers and writers René Descartes, Baruch Spinoza and Jan Amos Comenius worked and published.

Many contacts between the chemists and philosophers mentioned above have been established, many more relationships are likely. This paper will examine internal and external connections between them on the basis of the contents of their books, the editors where their books were printed, and the places where they lived in Amsterdam.

CHYMISTRY GOES FARTHER: THE FOUNDATIONAL ROLE OF SENSIBLE ANALYSIS IN EARLY MODERN CHYMISTRY

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Despite a resurgence of interest in the history of early modern 'chymistry,' many aspects of its influence and importance prior to the eighteenth century remain unclear. In this paper, I explore one particular, foundational experimental assaying practice from early modern chymistry, discussing the different ways in which it became influential within the seventeenth, and even into the eighteenth century. Many chymists believed that the fundamental constituents of nature – often called "principles" or elements – could be separated or analyzed using processes such as distillation, and that these same principles could be readily observed and recognized using human sensory faculties, such as taste, sight, and smell.

This notion that chymistry could provide sensible, empirical insight into the chymical makeup of natural bodies came to form a major part of the disciplinary identity of chymistry throughout the early modern period and was important in shaping the later "negative-empirical" definition of an element. It was also often used by practitioners as leverage against systems that were thought to be more speculative and less empirical, such as Aristotelianism and atomism.

Eventually, this sensory analysis of compound substances became a central part of the very definition of chymistry and was used to stake a claim to a particular level of nature that some chymists believed only their discipline could reach. I trace the evolution of this emphasis on sensible principles back to Paracelsus and argue for significant continuities in both the seventeenth and eighteenth centuries.

LEARNING A HARD LESSON. HOW THE BATTLE OF YPRES (1915) TRANSFORMED CHEMISTRY IN AMERICA.

Andrew Ede, Department of History and Classics, University of Alberta, Canada (aede@ualberta.ca)

During the Second Battle of Ypres, German forces under the direction of Fritz Haber release chlorine gas and initiated the era of modern chemical warfare. This event, along with the general curtailment of contact between American and European chemists caused by the war, forced the United States to evaluate and restructure higher education in chemistry, change business practices and drew the federal government into the world of scientific research. By looking at the circumstances of the war, we can gain a better understanding of the pathway to knowledge that led to the rise of American chemistry, and science more generally. As the American chemical community changed to adapt the war, they also laid the foundations for Big Science.

THE PROCUREMENT, EXAMINATION AND DISTRIBUTION OF FOREIGN SCIENTIFIC CHEMICAL LITERATURE BY GERMAN INSTITUTIONS IN THE COURSE OF THE SECOND WORLD WAR

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In this presentation, I am going to show how chemical literature was transmitted from foreign countries into Germany during the Second World War.

During this time obtaining foreign scientific literature was problematic for two reasons: First, the German administration imposed strict regulations on the import of scientific literature being potentially at conflict with ideological issues. Second, foreign countries disapproved of German R&D to profit from their own research results printed in their scientific literature.

I am going to demonstrate how the civil chemical sector, represented by the German Chemical Society, the "Deutsche Chemische Gesellschaft" (DChG) and the biggest chemical enterprise, the I.G. Farben AG, mobilised their resources in the first years of the war to obtain chemical literature. In cooperation, they developed a systematical procedure of procuring and distributing scientific literature from foreign countries to utilize it for their own R&D processes in Germany.

With the German army being pushed back since 1942, and with communication links to foreign partners and air connections to friendly states severed, the possibilities of transferring scientific knowledge via literature into Germany had become smaller. Furthermore, air strikes became a big problem for German R&D, as they hit libraries of universities, the science-based industry and laboratories.

Under these conditions, the DChG and the I.G. Farben cooperated with the Ministry of Armour and Warproduction and the Reich's Security Main Office (Reichssicherheitshauptamt), developing a mechanism to obtain scientific literature. In this respect, the DChG became responsible to examine and distribute literature.

In this situation, M. Pflücke, since 1925 chief editor of the German abstract journal, the "Chemisches Zentralblatt", and DChG's Secretary-General, was assigned to the newly created position of "appointee of scientific commentatorship" in the central research council, dealing mainly with war-related research, the "Reichsforschungsrat".

Pflücke was now made responsible for the rationalisation of the procurement, the examination and distribution of foreign scientific literature to the various chemical institutes of the military, the industry, the state and of private organisations like the Kaiser-Wilhelm-Society. Furthermore, he organised the supply of German literature to institutes and developed the so called "fast reports", wrapping up Germany's scientific progress in chemistry and aiming at a rapid exchange of information between all R&D sectors. To do so, Pflücke initiated a systematic cooperation between science, military, industry and the National Socialist administration, while the lead management was and remained inside the DChG.

What I am going to demonstrate, is how R&D in Germany could effectively work until the end of the war because of DChG's capability to self-mobilize resources and connections via an intelligent distributive system. Still in early 1945, German institutes received R&D reports very quickly, including those from foreign and even enemy countries.

CLADESTINE ACTIVITIES OF POLISH CHEMISTS UNDER GERMAN NAZI OCCUPATION 1939-1945

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In September 1939 during military operations an untold number of Polish chemists located in Warsaw and Kraków helped to protect laboratories and libraries from being destroyed, and, when German occupation began, from confiscation by new authorities. In October 1939 the Nazis organized a General Government (GG) from part of Polish occupied territory with Kraków as the capital. With the coming of this new General Government personal freedoms became strongly limited. Only Polish elementary schools remained opened, all high schools and universities — closed. To secure a constant supply of qualified workers for replacement of mobilized Germans vocational schools were organized; in Warsaw, the Chemical-Pharmaceutical School was formed and in 1942 the State Higher Technical School (with the Polish language of instruction). In such schools, in a clandestine way, the pre-war program of teaching higher levels came to be realized. The scientific societies have been forbidden. However, despite loss of personal freedoms, Polish scientists and teachers felt obliged to the Polish citizens to continue their duties.

50 000 children were brought into small groups (six to twelve per group) for these secondary underground teachings. The secret Chemistry Departments of the universities were active in Warsaw with forty students and in Kraków, fifteen students. Chemistry was also taught in other Departments as well. All told sixty-eight chemists in Warsaw and twenty-five in Kraków taught chemistry at the university level.

Many chemists were secret members of the Polish Home Army (Armia Krajowa) which was completely dependent of the Polish Government exiled at tie time to Paris, and later to London. These chemists played major roles in secret military operations, in particular during the unforgettable Warsaw Uprising, producing many of explosive materials. The value of their espionage actions were priceless for the Allied Nations. For instance, realised by Profs. J. Zawadzki and M. Struszyński analysis of the propulsion material of the rockets V-1 and V-2 (80% H_2O_2) stupefied London authorities. Chemists also created some poisons, fire-extinguishers for the war effort. As a result of their actions the Polish Home Army, and also the black home market were enriched by their secret production. Twelve scientific papers has been prepared during the German occupation and were published after the war ceased.

The clandestine activity of Polish chemists enabled a rapid development of chemistry in Poland after 1945.

In the years of the world war II 25 chemists have been killed during military operations including Warsaw Uprising; 72 chemists have been murdered in camps and prisons, 29 by Soviet and 43 by Nazi police-forces; 39 are missed in unknown circumstances; and 35 chemists dyed in natural way, often after being in prisons or as a result of heavy life conditions.

The International Year of Chemistry 2011 brings for the first time an occasion to represent for an international audience the miscellaneous clandestine activity of Polish chemists during the world war II for the Polish community and for the Allied Nations.

EXILED CHEMISTS OF THE SPANISH CIVIL WAR'S FOOTPRINT IN MEXICO

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The arrival to Mexico of thousands of Spanish Civil War refugees between 1938 and the early 1940s was the most important moment of mutual contact and influence between Spain and Mexico during the twentieth century.
In 1934 Lázaro Cárdenas assumed the Mexican presidency. He was the first president to expand the political system in order to include peasants and workers on his project, implementing a —socialist educationl. He, as well as others in Latin America, declared his sympathies for Spanish liberal and left-wing movements.
From the onset of the Spanish Civil War, the role played by Mexico was crucial supporting the Republic. Cárdenas' wife, Mrs. Amalia Solórzano, took the initiative in 1937 of arranging refuge for five hundred Spanish children, many of whom were orphans of the war —the famous —niños de Morelial. Furthermore, Mexico had been the only country to provide the Spanish Republic with armaments even before the Soviet Union started helping it in September 1936.
As the ending of the Spanish Civil War was approaching, Mexico was living a historical, cultural and political moment of transformation:

- A public technological education institution had been created in 1936 —the —Instituto Politécnico Nacionall;
- The petroleum expropriation took place on March 1938;
- The same year it was created an institution to receive Spanish intellectuals —the —Casa de Españal which later became a relevant research center, the —Colegio de Méxicol;
- Industrialization would start at the beginning of Second World War.

The Mexican scenario was fit to produce a local golden age for science and education. In that context, Cárdenas invited and received thousands of Spanish refugees, among them were found hundreds of scientists.
The analysis of this presentation will be centred on five chemists that provided a strong impulse to Mexican Chemistry: Antonio Madinaveitia Tabuyo; José Giral Pereira; Francisco Giral González; Modesto Bargalló Ardevol and José Ignacio Bolívar Goyanes.
The paper includes a short outline of this scientists' work in Europe, besides focusing in their contributions to the development of Chemistry in Mexico —Organic, Inorganic and Pharmacy.
To end this synopsis a short quotation of acknowledgment from Madinaveitia to Cárdenas is presented:

> *"I am pleased to express to the general D. Lázaro Cárdenas my deep gratitude, as a Spanish academic, for the deference to bring us to work in this country of brothers; giving us the chance to escape the horrors of Europe, where all scientific research is currently impossible."*

THE PROGRAM OF SCHOLARSHIP FROM THE FACULTY OF CHEMICAL SCIENCE OF MEXICAN NATIONAL UNIVERSITIE'S

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The aim of the this paper is to analyze the circulation of the knowledge in the field of the chemistry among Europe and Latin America through a study of case matter that the first program of scholarships that started the Mexican State to the beginning of 1920s, sending students of several disciplines scientists to be educated in Europe. The analysis of the Program of Scholarship of the Faculty of Chemical Sciences, today Faculty of Chemistry of the Mexican National Autonomous University (UNAM), will focus on its origin, its characteristics and the activities of the scholarship in Europe to understand its impact in the return to Mexico. The investigation is based in a work of revision of primary sources, up to now few studies. In their majority, students' files and academic personnel of the UNAM, located in the UNAM's Historical File wealth.

IN THE SHADOW OF THE CHEMICAL INDUSTRY: THEMES IN THE DEVELOPMENT OF CATALYSIS IN VENEZUELA

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We shall review the vicissitudes of the process of growth of catalysis in Venezuela, as an academic endeavor of university science that took place in parallel to the growth of scientific-technical capabilities within the nationalized oil industry, but quite distant from the demands and requirements of the industry they hoped to serve. Our approach combines perspectives of scientific capacity building, professional participation in international research networks and the evolution of scientific instrumentation. We shall briefly review the origins and nationalization of the oil industry, the role of two Europeans in the early development of catalysis work in both the university and industrial settings (Noller and Andreu), the idea of catalysis as useful knowledge, the professionalization and expansion of catalysis as a university discipline, characterization of University catalysis research linked from an early stage to international exchanges and dialogues.

The Rise and Fall of Chemical Russian

Michael Gordin, M., Princeton/USA

By 1850, scientific communication had recovered from the incipient Babel that emerged after the slow death of Latin as a universal language of scientific communication in Europe, a process that began in the early seventeenth century. From a cacophony of Dutch, Swedish, Italian, and other languages, there were essentially three languages that were dominant in scientific communication — and especially in chemistry — by 1850: English, French, and German. These three together comprised over 90% of publications in the sciences. Beginning in the 1870s, however, another language broke through to occupy a small but significant place in chemical communication: Russian. With the rise of the Soviet Union as a scientific superpower in the mid-twentieth century and the decline of French and German as languages of science during the Cold War, Russian soon became the second language of science in the world, with roughly 15% of scientific publishing (compared to English's 80%) by 1980. How did these transformations happen: both the surprising rise, and the staying power of Russian, a relative newcomer to scientific communication? This talk will examine two important moments in this story — first the 1870s, and debates over the status of Russian as a scientific language; and then the 1950s, as Western powers (principally Anglophone) began to come to terms with the persistence of Russian as a language of communication in chemistry.

Session Proposal:

Foreign Members: The Non-National Membership of the Major European National Chemical Societies, 1880-1939

Organizers: Dr Robin Mackie and Dr Gerrylynn K Roberts, The Open University/ UK; Contact r.l.mackie@open.ac.uk

Chair: Professor WH Brock (CV already submitted with the proposal by Christine Nawa for a Bunsen Workhop)

As has recently been explored in a major book on the early development of the European chemical societies, national chemical organisations were established in many countries in the final decades of the nineteenth century.[1] Yet, because these chemical societies were established on a national basis, and because many of them went on to become central pillars of the organisation of chemistry in their countries, it is easy to ignore that the largest of these societies, such as the Chemical Society of London, the Deutsche Chemische Gesellschaft and the Société chimique de France, also had large numbers of members living abroad. Thus, roughly 40% of the membership of the DChG were based outside Germany in 1913,[2] whilst a similar percentage of the successful applicants to the British Society of Chemical Industry came from outside the British Empire in the 1887-1917 period.[3] Foreign members also at times played a key role in the development of these societies: famously, most of the founder members of the Société chimique were foreign students in Paris.[4]

The papers in this session will look at the non-national members of these societies and consider their role in the internationalization of chemistry. To pick up two phrases from the call for papers, should they be seen primarily in terms of the 'movement of chemists' or of 'the transfer of ideas'? Who were these foreign members and why did they join chemical societies outside their home states? Was this a consequence of the geographical mobility of chemists, moving between countries to study or to work? To what extent was it a means for chemists in what might be perceived as the 'periphery' to stay in touch with developments in the major centres of chemistry? In what ways did this contribute to the transfer of chemical knowledge across the national boundaries that structured the organisation of the chemical profession?

The three papers in this session will look at the role of the foreign membership of the chemical societies in the three major European centres of chemistry in the late nineteenth and early twentieth century: Britain, France and Germany. Each paper will consider the role of non-national members in the chemical societies of one country. By looking at these issues over the period 1880 to the Second World War, in the cases of Britain and France and to the First World War in the case of Germany, we plan to consider change over time, and in particular, the extent to which the First World War represented a watershed in this aspect of the internationalization of chemistry. We intend that the session will generate a comparative discussion.

LITERATURE:
[1] Anita Kildebaek Nielsen & Sona Strbanova (eds) *Creating Networks in Chemistry. The Founding and Early History of Chemical Societies in Europe* (London, RSC Publishing, **2008**). [2] Jeffrey Allan Johnson, Germany: Discipline – Industry – Profession. German Chemical Organizations, 1867-1914, in Nielsen and Strbanova, p. 118. [3] Robin Mackie & Gerylynn K. Roberts, Un secteur à part? Les chimistes industriels et la *Society of Chemical Industry* dans le contexte de la communauté chimique britannique, in U. Fell (ed.) *Chimie et industrie en Europe* (Paris, Editions des archives contemporaines, **2001**), p. 133. [4] Laurence Lestel (ed.) *Itinéraires de chimistes, 1857-2007. 150 ans de chimie en France avec les presidents de la SCF* (Les Ulis, EPS Sciences, **2007**).

WHAT PLACE FOR FOREIGN CHEMISTS IN THE SOCIÉTÉ CHIMIQUE DE FRANCE AND THE SOCIÉTÉ DE CHIMIE INDUSTRIELLE?

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The Société chimique de Paris (later "de France", SCP/F) has been the subject of a growing number of studies in recent years, by such scholars as Ulrike Fell, Alan Rocke, Marika Blondel-Mégrelis, and Laurence Lestel (1). All of these studies point to the role of foreign chemists in the founding of the society (in 1857) and the society's early history. Among the names that stand out are those of two Italians - Jacques Arnaudon (who was president in 1857) and Giuseppe Ubaldini - and the Norwegian Hans Anton Rosing (president in 1858). A number of Russians, notably Alexandre Chichkoff and Alexandre Boutlerov, were also prominent among the early members (2). And several other foreigners pursuing careers in France made important contributions to the administration of the society; among them the Portuguese Roberto Duarte Silva, president in 1886, and Grégoire Wyrouboff, who was in charge of the library about the turn of the century.

Like many comparable societies, the SCP/F regularly elected foreign chemists to honorary membership, a practice that raised problems with regard to such members of German nationality at the time of the first world war. Fritz Haber and Emil Fischer, as honorary members, and Richard Willstätter, as an ordinary member, were among those whose status within the society came under discussion.

The Société de chimie industrielle (SCI), founded in 1917, had much in common with the corresponding British society, the Society of Chemical Industry, which had existed since 1881 (3). While the two societies retained their distinctiveness, they pursued common objectives in their policy of promoting links between themselves and similar national societies that were represented at successive congresses of industrial chemistry. The French SCI had a particularly strong international vision, which took concrete form in (among other initiatives) the establishment of associated sections, such as those in the USA and Czechoslovakia.

The preliminary reflexions that I offer in this paper bear exclusively on the French case. But they raise broader questions concerning the status of foreign members in the world of national societies in the field of chemistry between the mid-nineteenth century and 1939.

[1]. Ulrike Fell, Alan Rocke, The Chemical Society of France in its Formative Years, 1857-1914: Disciplinary identity and the Struggle for Unity, in Anita Kildebaek Nielsen and Sona Strbanova, *Creating Networks in Chemistry. The Foundings and Early History of Chemical Societies in Europe* (London, RSC Publishing, **2008**), 91-112. Marika Blondel-Mégrelis, Esquisse pour une histoire de la Société chimique 1857-2007, Dossier, in *L'Actualité chimique*, 310, July **2007**, I-XXIX. Laurence Lestel (ed.), *Itinéraires de chimistes, 1857-2007. 150 ans de chimie en France avec les présidents de la SCF* (Les Ulis, EPS Sciences, **2007**). [2]. Josette Fournier, La part des chimistes russes dans la naissance de la Société française de chimie (1857-1860) in *Journal chimique russe*, **51**, 6 (**2007**), 5-10. [3]. Ulrike Fell, Quelle liaison entre la science et l'industrie ? La Société de chimie industrielle entre les deux guerres (1917-1939), in Ulrike Fell (ed.), *Chimie et Industrie en Europe. L'apport des sociétés savantes industrielles du XIXe siècle à nos jours* (Paris, Éditions des archives contemporaines, **2001**), 70-95.

MIRROR OF INTERNATIONAL DEVELOPMENTS? THE FOREIGN MEMBERSHIP OF THE DEUTSCHE CHEMISCHE GESELLSCHAFT, FROM ABOUT 1880 TO 1914

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The Deutsche Chemische Gesellschaft (DChG) was established in Berlin in November 1867. Although originally a society with an almost exclusive Berlin membership, it developed into a fully German society, with international members, in a remarkably short period of time. Within two decades the membership grew to about 3,000. Thereafter a period of consolidation and more moderate growth set in. Foreign membership was more than 40 per cent during most of the period under investigation, reflecting the leading German position in (esp. organic) chemistry.

The paper will analyse the trends in foreign membership, and explain them in terms of Germans migrating abroad, foreigners studying in Germany, knowledge transfers in (organic) chemistry, and last but not least institutional changes outside Germany (education; founding of national chemical societies) that led to a turning point around 1900. Special attention will be paid to developments in Austria and Switzerland, the USA, Russia, the Netherlands, Japan, and in the British and Dutch colonies.

INTERNATIONAL MOBILITY?: FOREIGN MEMBERSHIP OF THE CHEMICAL SOCIETY AND THE SOCIETY OF CHEMICAL INDUSTRY IN BRITAIN FROM THE 1880S TO 1944

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For the British case, this paper will examine foreign membership of the Chemical Society [CS] (f. 1841) and the Society of Chemical Industry [SCI] (f. 1881). Internationally, they were the first national societies of their respective types. Both societies had international concerns from the start and had large numbers of overseas members during the period under consideration here. While chemists from the British Empire seeking association with the centre were particularly numerous, [1] members also joined from Europe and the USA; it is they who will be the focus of this paper. Foreign membership was less substantial in the Chemical Society than in the Society Chemical Industry, though the societies' membership trends were opposite in the periods either side of the First World War. Roughly 3% of those who joined the CS and a third of those who joined the SCI before the First World War were non-Empire foreign members, while 7% of those who joined the CS and 15% of those who joined the SCI in the interwar years were non-Empire foreign members. In both societies, members from the USA formed a considerably higher proportion of this foreign membership than did members from Europe. War-time hostilities provided particular challenges for the societies; how this affected the pattern of international membership in the interwar years will be investigated.

Chemists joining the British chemical societies in the first half of the twentieth century were highly mobile, both geographically and professionally.[2] Empirically based, this paper will consider the extent to which these national organizations contributed to that mobility by providing a locus for international scientific, personal and professional communication amongst chemists, thereby forming part of the mechanism for transferring both science and scientists across boundaries in an emerging global chemical employment market.

[1] G. K. Roberts and A. E. Simmons, Historia Scientiarum **2007**, 16, 103. [2] G. K. Roberts and A. E. Simmons, Annals of Science **2009**, 66, 103.

CROSSING BOUNDARIES: BUNSEN'S INTERNATIONAL RECEPTION

NAWA, C, REGENSBURG/D, BROCK, W.H., UNIVERSITY OF LEICESTER/GB, KAJI, M., TOKYO INSTITUTE OF TECHNOLOGY/JP, GORDIN, M.D., PRINCETON UNIVERSITY/USA

Bunsen's 200th birthday provides an excellent opportunity to take stock of his scientific impact. In this session we explore his international reception by focusing on students of different nationalities who travelled to Bunsen's laboratory to learn from him and later disseminated this knowledge in their home countries. Our common point of departure is Bunsen's tenure at the University of Heidelberg (1852-89).

In the second half of the nineteenth century, Heidelberg became an unparalleled hotspot for the development of the natural sciences. Renowned scientists and excellent working facilities attracted students from virtually all over the world. Right in the centre of this development was Bunsen with his newly built laboratory completed in 1855 and hold to be the best equipped in Europe and beyond. In the course of 74 semesters, more than 3500 students were trained by him, first and foremost learning methods developed and mastered by Bunsen, such as gas analytics and spectral analysis.
Every semester Bunsen's laboratory was attended by 50 to 60 practitioners, and according to the report of an anonymous American student, "scarcely more than half of them German". Indeed it seemed to this observer "that half of the nations of the world were represented". In the international laboratory group, there were in particular sizeable numbers of foreign students from Great Britain, Russia, and the United States. All these students worked side by side, shared the same experiences at the laboratory benches and in the lecture hall, becoming acquainted with the characteristic features of Bunsen's training.

In this panel we explore the differences and commonalities in the perception of Bunsen's scientific training by students of different nationalities, who had a diverse social life in Heidelberg. They also faced different conditions when they returned to their respective home countries and tried to apply the newly learned knowledge. With the local change which was attended by different conditions for the creation and communication of scientific knowledge, the set of knowledge, skills and operations that the students acquired in Heidelberg underwent a transformation. By following the pathways of some of Bunsen's pupils from Great Britain, Russia and the United States more closely, we want to show the way in which Bunsen's analytical methods, but also his approach to research and teaching, was spread around the world and which general or specific adaptations occurred in the course of this process.

Christine Nawa (session organizer), *Bunsen in America*

William H. Brock, *Bunsen's British Students*

Masanori Kaji, *Bunsen and Mendeleev: A Heidelberg Connection of Russian Chemistry?*

Michael D. Gordin, *Commentary*

BUNSEN'S BRITISH STUDENTS

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When Bunsen went to Marburg in 1838 he brought with him one of his students from Kassel, Heinrich Debus. Another assistant at Marburg was Hermann Kolbe, whom Bunsen inherited from Wöhler. Kolbe was the pathway for introducing gas analysis to the British when he spent some months in London in 1847 and befriended Edward Frankland. It was Kolbe's recommendation of Bunsen's qualities as a teacher that led to the first wave of British students studying with Bunsen. They included Frankland, John Tyndall, Thomas Archer Hirst, and Maxwell Simpson, all of whom became close friends with Debus and encouraged him to settle in England between 1851 and his retirement in 1888. It was undoubtedly the praise and recommendation of Bunsen's merits by the former Marburg pupils, as well as that of Debus, that led to further dramatic developments. In 1852 Bunsen succeeded Leopold Gmelin at Heidelberg, and received the first of his 115 British students in October 1853. The number of his chemical students is staggering and has not previously been registered by historians of chemistry. Bunsen's most distinguished British student was Henry Roscoe, who along with Richard Cartmell, was the pathway for British interest in spectroscopy. Like Debus and the Marburgian students, Roscoe strongly voiced Bunsen's merits as a teacher, as well as the charm and cheapness of an education at Heidelberg. Some 90 per cent of these students are virtually unknown to historians of chemistry, though it is possible to apply some prosopography to them. Comparisons with Liebig's earlier experience at Giessen are also in order. The paper will try to tease out the special qualities Bunsen's students brought back from the Heidelberg experience, and trace (where possible) their careers as teachers, academics, and industrialists.

BUNSEN AND MENDELEEV: A HEIDELBERG CONNECTION OF RUSSIAN CHEMISTRY?

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By far the largest group of foreign students that entered Bunsen's laboratory came from Russia. They even reached that critical mass necessary to develop a distinctive social sphere. Among them, Dmitrij Ivanovich Mendeleev (1834-1907) was an outstanding figure, both for his later fame and his being a focal point of Russian chemical life in Heidelberg apart from university structures. On April 26th, 1859 Mendeleev, the best known chemist of 19th century Russia, left St. Petersburg for Western Europe to further his studies. He arrived in Heidelberg on May 22nd and stayed there until February 19th, 1861, when he returned to Russia. During his two-years in Europe, he stayed mostly in Heidelberg. He first went to Bunsen's laboratory at the University of Heidelberg, but found it unsuitable for his planned research on measuring the surface tension of liquid organic compounds. As a result, he decided to set up his own laboratory in his apartment, using instruments ordered from Bonn and Paris.

It is often said that Bunsen was only interested in experimental chemistry and not in theory, so he did not pay any attention to the periodic law, Mendeleev's main contribution to chemistry. Therefore, it might be suggested that Mendeleev was disappointed by Bunsen's laboratory and Bunsen did not have a significant influence on Mendeleev.

However, Mendeleev did not leave, but remained in Heidelberg throughout his stay in Europe. Why? Possible main reasons could be the concentration of Russian students and immigrants in Heidelberg and that Mendeleev felt comfortable there. He regularly spent time with Russian immigrants, including Tat'yana Petrovna Passek, a cousin of A. I. Herzen, a famous Russian thinker. In his chemistry, Mendeleev could find a suitable atmosphere in Heidelberg where he worked comfortably. One of the factors contributing to this might have been the fact of there being some German chemists with whom Mendeleev was on good terms, for example Emil Erlenmeyer. Erlenmeyer got a lectureship (Habilitation) under Bunsen and was Privatdozent, when Mendeleev was in Heidelberg. Later, in 1871, Erlenmeyer helped to publish Mendeleev's long paper on the periodic system in German in Annalen der Chemie und Pharmacie as one of the editors of the Journal.

During his stay in Heidelberg, Mendeleev participated in the first International Congress of Chemists in Karlsruhe, not far from Heidelberg, from September 3rd to 5th, 1860. Its role in Mendeleev's later discovery of periodic law is well-known.
Thus, it would be worthwhile to reconsider Mendeleev's Heidelberg connection and that of Russian chemistry in general. It could even be said that Bunsen's experimental work did have some influence on Mendeleev, who measured surface tension meticulously.

BUNSEN IN AMERICA

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It is not uncommon today for American chemists to introduce themselves by referring to great figures in their scientific lineage such as Bunsen or Wöhler, thus giving vivid testimony to the past impact of, as well as to the current appraisal of these scientists. But my aim is not to construct charts of scientific genealogy up to the present day. I am interested in those chemists who actually travelled between the continents to obtain locally bounded scientific knowledge and who faced the challenge of adopting it to different conditions of research and teaching, of acquiring and disseminating scientific knowledge when they returned to their home countries.

Between 1852 and 1889 more than 100 Americans enrolled in chemistry as a field of study at the University of Heidelberg, most of them matching the common attribution of promising young men. First and foremost, they were the sons of immigrants, who went to Europe for university education. Already being part of an elite group by then, many of them gained high ranking positions after their return. Among them were later chemistry professors such as the organic chemist Charles L. Jackson (Harvard), the mineralogist Edward S. Dana (Yale), and Leonard P. Kinnicut, director of the chemical laboratory of Worcester Polytechnic Institute. Likewise there were numerous people who gained high ranking positions in 'industrial' chemistry such as Charles L. Reese, who later became the first director of DuPont's Chemical department. What is it that unites these different careers? What is it that these Americans may have learned in Heidelberg and how did it play a role in their further professional lives? Originally these men may have been attracted by the idea of going to a place with an excellently equipped laboratory. Or they might have been intrigued by the idea of learning the latest analytical methods from the inventor himself. But once they were there, Bunsen's specific style of teaching and research – likewise developed in and bound to the Heidelberg context – clearly left a permanent impression on the young students, not least because of intimate contact with the professor. In my talk, I will discuss the life of American students in Heidelberg and their reception and transmission of Bunsen's style of teaching and research. By following some selected life trajectories more closely, I am going to explore to what extent Bunsen's American students propagated his style in their later careers and which specific conditions they met in the United States, that would result in a transformation of the style with which they had been educated.

Several examples show that the migration and transformation of scientific knowledge between Germany and the United States was also accompanied by a high esteem for founding fathers still existing today, an esteem which might have outlived the dissemination of specific scientific contents – and that is not to be found in a similar way in today's Germany.

THE TRANSFORMATION AND CONSEQUENCES OF LIEBIG-INSPIRED LABORATORY INSTRUCTION IN AMERICAN LAND-GRANT COLLEGES

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The inclusion of laboratory exercises for undergraduate students was a major innovation in 19th century chemical pedagogy. It is well established that it began with Liebig and spread from Gießen throughout Germany and other developed countries. This program reached the US via Americans who studied in Germany and via German textbooks. However, the America context was often far different from the German one.

In 1862 the US government passed the Morrill Land-Grant Act, which gave large tracts of land to the states for establishing colleges "where the leading object shall be … to teach such branches of learning as are related to agriculture and the mechanic arts … in order to promote the liberal and practical education of the industrial classes …". As a result, a number of new colleges sprang up, especially in the mid-Western and Western states. In many cases these states had very few secondary schools for students wishing to enter university. Moreover, facilities were often inadequate and the professors' preparation below European standards. And the presence of female students strongly distinguished American from German universities. Many Land-Grant institutions were coeducational when founded, or became so soon after. Their strong emphasis on science meant that female and male students received, on an equal basis, a firm background in natural sciences such as chemistry, physics, and biology. At the same time, a great many female students were steered toward degree programs in such areas as Domestic Science, which were intended to prepare them for highly gendered occupations.

This talk will highlight the years 1970-1914. One emphasis will be on transformation of the Liebig-inspired laboratory teaching program under the conditions found on the American frontier. Principal resources drawn on include contemporary laboratory manuals, course curricula, and reminiscences of students and professors. A second focus will be the consequences of having substantial numbers of young women obtaining a substantial grounding in science, specifically in chemistry. While many graduates of the Domestic Science programs did become "Domestic Economists" – farmers' wives capable of managing a household along scientific lines – by no means all did. Others used their scientific training to enter fields such as teaching, pharmacology and journalism. Some even established careers as scientists. Whether programs such as Domestic Science were beneficial or otherwise for the participation of American women in science is a debated topic, and the opposing views will be examined. Finally, the talk will touch on the ironic situation whereby this German-derived teaching program led to sizable numbers of young American women studying science, at a time when their German sisters had little opportunity to do so.

INFLUENCE OF BERLIN CHEMISTRY ON THE HUNGARIAN CHEMICAL SCIENCE AND INDUSTRY, 1867-1914

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General peregrination statistics show that students from the Austro-Hungarian Monarchy, among them those of Hungarian origin formed, between 1885 and 1905, the second or third most numerous group of foreign students at Prussian universities. Between 1881 and 1914 a total of 1978 students were registered at the Berlin Frederic William University.

In chemistry, Berlin gained a leading role, after the new Institute of Chemistry had been opened (1869). Also the development of research in organic chemistry in Hungary was indirectly promoted by Emil Fischer, a Nobel laureate professor of chemistry at Berlin University. The first head of the first Department of Organic Chemistry in Hungary established in 1913 at the Technical University Budapest, Géza Zemplén (1883-1956), had been working for several years at the institute mentioned in Berlin. Upon the influence of the versatile Emil Fischer, Zemplén started dealing with amino acids and peptides as well as carbohydrates. It was in this latter field that he achieved his most important results. He also learnt from his Berlin master the importance of maintaining good relations to the pertinent branches of industry.

Another most influential personality of the epoch, this time of the chemical industry, was Adolf Kohner (1865-1937), who had studied at Berlin University between 1882 and 1886, and achieved his doctoral thesis in inorganic chemistry at the laboratory of professor Rammelsberger. Thereafter, however, he had to return to Hungary, owing to the family's engagement in the large-scale production of fertilizers and sulphuric acid. The family establishment "Hungária Fertilizer, Sulphuric Acid and Chemical Share Company" went developing from 1891 to 1938. For his personal merits and the importance of the family factory he was elected president of the Society of Hungarian Chemical Industrialists. He was convinced that only those can be successful leaders of a factory, who know their trade to the core.

The influence of the turn of 19th- and 20th-century Berlin chemistry can be traced in the career of Pál Szily (1868-1945), who – besides having achieved a degree of MD in Budapest – went to Berlin to gain a doctor's degree in biochemistry (1902-1903). His achievements of chemistry were of great importance: he invented colorimetric pH determination using indicators. Perhaps of even greater impact was his invention of using an appropriate mixture of primary and secondary phosphates, solutions of stable pH could be obtained. Thus he invented artificial buffer solutions. Unfortunately, after returning to Hungary, he stopped dealing with chemistry and devoted himself entirely to medicine.

Our examples were to show the influence of some Hungarian scientists, who – after having picked up a great deal of knowledge in different fields of chemistry in Germany – returned to their homeland to modernize chemistry and chemical industry in Hungary.

FRESENIUS' CHEMICAL ANALYSIS IN NINETEENTH CENTURY CHINA

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Fresenius' influential chemical analysis books were first translated into the Chinese language at the beginning of the 1880s. His *Quantitative Chemical Analysis*, for example, first published in 1876, was translated into Chinese in 1882 by Anatole Billequin and his student under the title of *Huaxue Chanyuan*. One year later, this book was also translated as *Huaxue Qioushu* by John Fryer and Xu Shou, who also rendered Fresenius' *Qualitative Chemical Analysis* as *Huaxue Kaozhi*. The introduction of Fresenius' chemical analysis provides a clear indication of the growth of Chinese chemistry after a decade of chemical education. Billequin, a French chemist who arrived in China in 1868, was employed by Tongwen College to introduce modern Western chemistry into China. In 1877, he analysed the content of the iron ore mine in the Kaiping area, and published his findings in the *Chinese Scientific Magazine*. This was considered to be the first academic article in analytical chemistry in China.

On the other hand, Xu Shou must be the first Chinese scholar who recognized the usefulness and application of chemical analysis; this was because he was interested in chemistry, and had been a long term collaborater with Fryer in rendering Western chemistry into Chinese at the Translation Department of the Jiangnan Arsenal. The aim of this paper is twofold: firstly, to study the meaning of the introduction of Fresenius' chemical analysis in the development of the history of chemistry in nineteenth century China; and secondly, to compare and contrast the translations of both Billequin and Fryer/Xu - not only with each other, but also with the original (Fresenius) version in order to research the different interpretations under their requirements and chemical knowledge.

THE *PREPARADORES* OF AGUIAR AS VEHICLES FOR CHEMICAL KNOWLEDGE FROM GERMANY TO PORTUGAL AND GOA

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Antonio Augusto de Aguiar (1838-1887) was the main author of the most important research in Organic Chemistry carried out in Portugal, during the 19th Century. In spite of not having attended any of the research schools in Germany, France or Great Britain, his main papers were published in *Berichte der deutschen chemischen Gesellschaft* between 1870 and 1874. How then did he acquire the knowledge, the inspiration and the experimental skills necessary for his research? The influence of his older colleague Agostinho Vicente Lourenço (1822-1893), a *élève* of Adolphe Wurtz, alone is not sufficient to explain the success of Aguiar's research. Some of his papers have as coauthors chemists with German surnames. From where did they come, and how did Lourenço and Aguiar recruit them? The first of them was Eduard Lautemann (1836-1868), a disciple of Hermann Kolbe. The knowledge of his biography was, until recently, rather sketchy. In my opinion, Chemistry historians underestimated in his exceptional skills and originality, because, due to his illness and early death, he was active in research for only about five years. Lautemann left Lisbon for Goa, in the formerjy so called Portuguese State of India, the birthplace of Lourenço to lecture on Physics and Chemistry at the *Eschola Medico-Chirurgica* in Goa. Another coauthor named Georg Alexander Bayer (1849-1928), who arrived later in Lisbon, had until recently evaded almost completely the attention of Chemistry historians, in spite of his interesting curriculum patronized by his elder, famous brother Carl Joseph Bayer (1847-1904). The Lisbon Polytechnic School employed both Eduard Lautemann and Alexander Bayer as demonstrators, called *preparadores*. There were not the only collaborators who Aguiar had come to Lisbon from Germany. Before Alexander Bayer there had been Friedrich Wilhelm Klaas and after him Carl von Bonhorst. These two, however, must have been more active in introducing and teaching methods of Chemical Analysis, than in doing research in Organic Chemistry. Except for the latter, these *preparadores* stayed in Lisbon only for a very short time. Carl von Bonhorst, on the contrary, remained in Lisbon teaching and practicing mainly Analytical Chemistry at the *Instituto Industrial e Commercial de Lisboa* and eventually became a Portuguese citizen. He contributed to the foundation of the Portuguese Chemical Society, who celebrates this year, her 100th anniversary. The three last mentioned *preparadores* had been disciples of Carl Remigius Fresenius in Wiesbaden. His teaching laboratory turns out to have been the hub of the itineraries of chemical knowledge from the German States to Portugal and Goa.

BETWEEN PHYSICS AND CHEMISTRY: THE CONTROVERSY OVER TRIATOMIC HYDROGEN, 1911-1936

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The history of triatomic molecular hydrogen (H_3) has scarcely been noticed by either historians of chemistry or of physics. Yet it played an important role for at least two decades, when it was hotly debated by chemists and physicists alike. Moreover, the unusual molecule, and especially its associated cation, continues to attract a great deal of attention in astrochemistry. The H_3 ion is in fact the most common molecular ion in the heavens.

The triatomic hydrogen molecule originated in the early 1910s in connection with J.J. Thomson's experiments with positive rays. Apparently justifieby atomic theory, the hypothesis was investigated by many physicists and chemists. Both Johannes Stark and Niels Bohr argued theoretically that the molecule would exist in a mechanically stable form. By the early 1920s triatomic hydrogen had gained a kind of semiofficial status and was accepted by at least a part of the chemical community. Among the main protagonists of the reality of the molecule were the American chemists Gerald Wendt and Robert Landauer, who conducted elaborate experiments to prove the existence of what they proposed to call "hyzone" and thought of as an unstable ozonic form of hydrogen. For example, they reported a form of "active hydrogen" which was unusually reactive and expanded in volume as if the contraction were caused by a transformation of H_3 into H_2.

However, whereas the existence of the H_3 ion was firmly established by experiments, including early mass-spectroscopy, the neutral molecule remained controversial. Not only did all attempts to obtain its spectrum fail, from about 1925 several chemists announced results that weakened the belief in triatomic active hydrogen. Abraham Bach in Russia, Fritz Paneth in Germany, Harold Urey in the US and several other scientists were unable to reproduce the results of the earlier experiments made by Wendt, Landauer and other supporters of the H_3 molecule. Following many experiments and theoretical arguments, by the early 1930s the molecule was accepted by only a minority of chemists and physicists. Five years later it was generally judged to be a mistake and consequently disappeared from the chemical literature (– if only to reappear in the 1980s, after Gerhard Herzberg had detected spectral lines from H_3 in cathode discharge tubes).

The story of H_3 is of interest from a number of perspectives.For one thing, it exemplifies the relationship between physics and chemistry in the interwar period. More importantly, it illustrates the evidential nature of scientific knowledge and how the balance of evidence can shift as a result of new experiments and interpretations. Although triatomic hydrogen was never disproved, the accumulated evidence pointed towards its non-existence, which to most chemists and physicists was reason enough to disbelieve in the hypothesis and declare it an unfortunate mistake.

Ida and Walter Noddack through Better and Worse: An *Arbeitsgemeinschaft* in chemistry

Brigitte Van Tiggelen and Annette Lykknes

When the German chemist Walter Noddack (1893-1960) suddenly passed away in December 1960, he apparently suffered from the heartache of believing his wife, chemist Ida Noddack-Tacke (1896-1978) to be dead. Truthful or not, this Romeo and Juliet-like example illustrates the close emotional bond that seems to have existed between the married couple. Contrary to many collaborators in science – married or not – whose joint work is often (publicly) credited to the male partner, the Noddacks are often depicted as a "work unit," or as Ida referred to it, an *Arbeitsgemeinschaft*. Parallel to this, analyses of the contribution by Ida Noddack on nuclear fission – which was not acknowledged by the contemporary scientific community – have emerged. But despite the many publications on Ida and/or Ida and Walter, little attention has been given to the *nature* of their collaboration and questions remain such as: Were Ida and Walter Noddack equal collaborators? How did they divide the work between them? Is it possible to identify separate research interests and specialties? How did Ida's (and Walter's) work progress as the couple moved from place to place and Walter assumed one position after another? We will use the concept of Arbeitsgemeinschaft to shed light on these questions.

There are many ways to look at collaboration. For the case of the Noddacks, we are privileged to have found rich archival material, including the Noddacks' laboratory notebooks. Our aim is to go beyond the romanticized description of their collaboration – to which especially Ida herself contributed retrospectively – and analyze how they actually shared the work, to which extent they defined their own specialties, and whether or not they shared the reward for joint work.

AN INSTITUTE ON THE MOVE

Presenters:
Jeremiah James, A Turning Point for 20th-Century Chemistry (james@fhi-berlin.mpg.de).
Thomas Steinhauser, Concepts and Traditions in West Berlin (tsteinhauser@web.de).
Dieter Hoffmann, Chair, Comment (dh@mpiwg-berlin.mpg.de).

It is now almost 100 years since the Kaiser Wilhelm Institute for Physical Chemistry and Electrochemistry (KWI-PC) was founded in Berlin as one of the first two institutes of the Kaiser Wilhelm Society. Through all these years and against all political odds the institute, later renamed as Fritz-Haber-Institut (FHI) of the MPG, did not change locations. Nevertheless there was constant change. Hence the movements we will address are the changes of staff, concepts, theories, methods, and instruments during the largest part of the 20th Century.

We will discuss on an extended time scale how ideas were brought to this institute or left it. Jeremiah James focus on the era of the famous founding director Fritz Haber, Thomas Steinhauser on the establishment as FHI at the MPG. Due to their changing interests scientists set up new research programs and dismissed old ones. They adopted new methods or adapted the already established infrastructure to new contexts under the roof of the institute. For different reasons there were periods of flourishing international contacts and times of limited connections to the scientific community.

The history of these developments also touches a broader issue: as an institute for Physical Chemistry it was not only a meeting point for scientists, but also a place to define intersections of chemistry, physics, and technology. And contacts of this kind gave the most significant impulses for the development of modern chemistry. Hence the successful and sometimes also failing attempts to install prestigious working programs at the institute can add to our knowledge how the pathways leading to the actual state of chemistry were explored.

A TURNING POINT FOR 20TH-CENTURY CHEMISTRY

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Fritz Haber is rightly remembered primarily for his synthesis of ammonia and his promotion and administration of gas warfare during World War I. However, it would be misleading to take these industrially oriented and largely secretive researches as characteristic of the institute he directed from 1911 to 1933, the KWI-PC.

From the outset, Haber planned to take advantage in his new Berlin institute of the international contacts he had established as a professor at Karlsruhe, particularly his close ties to William Ramsay's laboratory at University College London. He also announced, early in his administration, his interest in quantum theory and his belief that its further exploration would advance knowledge of general chemical principles;

although, Haber himself lacked the background in physics to pursue such research. The First World War had disastrous consequences for the international relations of the KWI-PC but aided Haber in promoting collaborations between chemists and physicists—collaborations that Haber would maintain at the cost of great effort after the war.

Some highly-lauded research stemmed from Haber's success in establishing his institute as a nexus of physical chemistry and physics, including the separation of ortho- and para- hydrogen by Karl Friedrich Bonhoeffer and Paul Harteck, and the demonstration of "negative dispersion," i.e. stimulated emission, by Rudolf Ladenburg and Hans Kopfermann. For both chemists and historians of chemistry, however, the most interesting result of the confluence of physicists and chemists at the KWI-PC is probably the research into reaction mechanisms and reaction kinetics performed there, immediately antecedent to transition state theory.

Although commonly associated with Michael Polanyi's research division, key contributions to kinetics and mechanism research at the institute in fact came from researchers in multiple divisions for both chemistry and physics, as well as from international guests. This not only highlights the closeness of the collaborations between physicists and chemists at the institute, it also demonstrates the degree to which the KWI-PC was able to re-establish itself as an international meeting point for researchers during the second half of the 1920s, in no small part thanks to fellowships from the Rockefeller Foundation. Perhaps most interestingly though, the development of this line of research runs counter to the increasingly common notion that the growth of quantum chemistry was slower in Germany than in the United States or Great Britain because chemists in Germany were less receptive to new ideas from physics.

CONCEPTS AND TRADITIONS IN WEST BERLIN

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After World War II efforts began to re-establish good working conditions and the prestige of the old KWI-PC under a new name. With the director Max v. Laue came the plan to form a center for structural research, but his successors initiated an orientation towards catalysis and surface science. The plan was clearly formulated and consequently executed by the new director Heinz Gerischer in the 1970s. This change gave the FHI the organizational shape and the scientific orientation of the current era.

The institute was completely deconstructed in 1945 and a large part of the scientific staff had left Berlin. The remaining scientists went on with their existing research programs, which were influenced by the application of highly modern analytical techniques like electron microscopy, X-ray or electron diffraction set up during the NS period. Despite the lack of equipment they maintained this orientation. Besides, the institute with its five completely intact buildings became a sanctuary for homeless local research groups and the director Karl Friedrich Bonhoeffer additionally introduced an electrochemical branch. On the other hand eminent scientists also left the institute due to the difficult political and economical situation in Berlin.

Laue became director in 1951 and managed to integrate the institute into the West German MPG, which provided a stable funding for the construction of a modern research infrastructure. He also made an effort to introduce a general scientific mission despite the quite different research interests of the existing groups. Based on his own research tradition in X-ray analytics he appointed new scientists to create a center for structural analysis of matter using physical instruments and crystallographic theories. But the institute remained heterogeneous and there was not much change, because most of the staff had personal ties to Berlin and in contrast, it was not easy to convince eminent scientists to come to an outpost of the Cold War period.

Institutional change came from the outside through the new directors elected by the scientific council of the MPG. At the end of the 1960s the majority of the scientific community regarded the old Laue concept as exhausted and non-productive. Hence the appointment of a new director was connected with a total scientific reorientation of the whole institute. Following a general tendency in the MPG, the organization and the hierarchies of the FHI changed too. Gerischer, an electrochemist and former student of Bonhoeffer, could use the beginnings under Laue's successor Brill when he presented his plan for a new center of surface science. The MPG agreed and the re-organization began. During the 1970s and 1980s a new generation of directors established the research programs and methods of surface chemistry and physics at the FHI.

After a difficult period of transition these fields turned out to be quite prolific. While the decisions shortly after 1945 were governed by tradition and the political circumstances, the change of the 1970s was planned on behalf of the general development of Physical Chemistry.

COMMENT

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LATE NINETEENTH-CENTURY PHYSIOLOGICAL CHEMISTRY: TRANSFORMATION, COMMUNICATION, TRANSFER

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The paper looks at the interplay of chemistry and experimental medical science during the second part of the nineteenth century. The topic enables to focus attention on some important institutional and cognitive factors precipitating the emergence of a distinct discipline of physiological chemistry. Chemical studies of "organic substances" from plants and animals carried out by the late eighteenth-century pharmacists and chemical craftsmen, as well as Antoine Lavoisier's investigations on animal respiration established an early-nineteenth century tradition of defining organic chemistry as the part of physiology that describes composition of the living body and its processes. By the 1830s a number of important chemical studies of physiological processes had come from the university laboratories of the leading chemists, such as Jöns Jakob Berzelius, Friedrich Wohler, and Justus Liebig. Around 1850s, the site for studies in "chemistry and physics of the body" shifted to physiological laboratories, such as the laboratory of Claude Bernard in Paris. In Germany, university based specialized institutes became important centers for research in medical sciences. Most notable among them were pathological institute of Rudolf Virchow in Berlin, physiological institute of Carl Ludwig in Leipzig, and pharmacological institute of Ostwald Schmiedeberg in Strassburg. It was from these institutes that there emerged future leaders of physiological chemistry, Felix Hoppe-Seyler, and his successor Franz Hofmeister at Strassburg, as well as Wilhelm Küne at Heidelberg.

The paper examines the career of Felix Hoppe-Seyler and his major contribution to the study of chemistry of hemoglobin and of blood gases. Hoppe-Seyler figures prominently in the institutional history of physiological chemistry as an important advocate for establishing separate departments for training and research in the new discipline. Hoppe-Seyler's laboratory at Strassburg University remained for decades an acclaimed place for post-doctoral studies, famous all over Europe. Nearly all notable biochemist of the later nineteenth- and early-twentieth century studied there. The paper also examines the contribution of another important discipline builder, Wilhelm Küne, and presents a comparative analysis of approaches, methods, and attitudes that comprised quite distinctive research styles in Hoppe's and Küne's laboratories. This comparative perspective gives us a clearer view of what is meant by German physiological chemistry, its institutional structure, and its influence on development of the discipline elsewhere, for instance in Russia. In particular, the paper shows how particular concepts and practices were disseminated into Russia, and how specific laboratory skills and instruments travelled swiftly there once innovations were introduced. Lastly, the paper looks at the early twentieth-century shift of dominance in blood gases research and in respiration chemistry from Germany to Scandinavia, and at contributions of the physiological laboratories of Christian Bohr and August Krogh that finally solved problems related to gaseous exchange in the blood and in the lungs.

GUEST SPEAKERS FROM WEST GERMANY ON THE 'PATHWAY OF KNOWLEDGE' TO EAST BERLIN – CHEMICAL COLLOQUIA AT HUMBOLDT UNIVERSITY AROUND 1965

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Invited lectures given by distinguished scientists from around the world are a common practice also in chemistry. At the time when the Berlin Wall and the Inner German border cemented the political division of Germany, such exchange of knowledge became more and more difficult. Nevertheless, a good number of lectures was realised, thanks to the efforts of the Chemical Society of GDR ('Chemische Gesellschaft der DDR', founded in 1953), and its representatives of the regional sections.
Examples are given for the so-called 'Chemische Kolloquien' at the Humboldt university on the base of original documents. They include invitation and answer letters and also many subsequent writings, e. g. such concerning entry permit and entry visa for the guest lecturer (often also for his wife and/or for other family members), frontier crossing point, hotel accommodation, money change regulations.

During the years 1963-1967 thirty five speakers from the Federal Republic (including West Berlin) had been invited, mostly from universities and technical universities (Aachen, Berlin, Bonn, Brunswick, Düsseldorf, Erlangen-Nuremberg, Frankfurt/Main, Freiburg, Gießen, Göttingen, Karlsruhe, Mainz, Marburg, Münster, Munich, Tübingen, Saarbrücken, Stuttgart), but also from Max-Planck institutes (Mülheim/Ruhr, Freiburg/Zähringen) and from the industry (Leverkusen, Hoechst). To emphasise is also the attendance of Dr. Rudolf Wolf, the first secretary general of 'Gesellschaft Deutscher Chemiker' (GDCh), at the 65th anniversary of Erich Thilo (1898-1977) on Oct 4, 1963.
– Around 1965, the numbers of German speakers from West and East were in the ratio of 1:1. But in subsequent years the political conditions complicated German-German intentions, as exemplified by the extinction of 'Chemisches Zentralblatt' in 1969.

To illustrate the various circumstances and difficulties which the organisers had to overcome before and after the invitations, details are given for six visits:
- Hellmut Bredereck (1904-81), Stuttgart, March 1965 (8 towns, 6 lectures);
- Günther Otto Schenck (1913-2003), Mülheim, November 1966 (40 documents including 13 letters from him);
- Kurt Dehnicke (1931-2011), Marburg, March 1966 (4 towns, 4 lectures);
- Otto Horn (1904-91), Frankfurt, Farbwerke Hoechst AG, November 1964;
- Wilhelm Klemm (1896-1985), Münster, May 1964 (1952/53 president of GDCh, 1965-67 president of IUPAC);
- Martin Schmeißer (1912-81), Aachen, September 1965 (4 towns, 3 lectures).

Indicative of the difficult conditions for German-German visits is the correspondence of Fritz Micheel (1900-1982), Münster, with the organisers. It includes eight, sometimes even long letters from him. Finally, the lecture itself – fixed on 1967, April 21 – did not take place, due to an engine-breakdown shortly before.

William Wollaston, Crystallography, and the Atomic Theory

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William Wollaston's (1766-1828) position regarding the atomic theory has been variously interpreted by historians. But most have discussed the question of Wollaston's atomism within essentially the context: his chemistry. They take the basic issue to be the linkage between Dalton's proposed physical theory of atomism and Wollaston's notion of chemical equivalents. This is the natural place to begin. But chemistry is not the only relevant scientific field. It is also possible to consider Wollaston's views on the atomic theory as they might have been influenced by his research in crystallography. Wollaston had been engaged in this emergent science well before his acquaintance with Dalton and knew well the work of its dominant theorist, the Abbé René Just Haüy (1743-1842). In the latter decades of the eighteenth century crystallography had developed somewhat independently of either chemistry or mineralogy, and the work of Haüy had given it a systematic theoretical expression. Haüy and his school understood crystals in terms of fundamental structural units. These were given a molecular, chemical interpretation and were linked to species. This theory did not quite anticipate Dalton's atomism but it created a context from which that theory could seem more plausible. The present paper will consider whether his crystallographic interests might in this way have helped to shape Wollaston's views regarding the atomic theory. If so, an appreciation of this dimension of Wollaston's work may also help to resolve his apparently conflicted position.

Two pathways for a University Chair Cannizzaro in Piedmont, 1851-1855

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On February 26, 1851 a young Sicilian presented his passport as a subject of the Kingdom of the Two Sicilies in an office of the police headquarters in Turin. Stanislao Cannizzaro was 24 years when entered the Kingdom of Sardinia with a personal past rather irregular.We retrace the paths followed by Cannizzaro to go from a modest teaching position to a university chair that allowed him to give the scientific world the famous *Sunto di un corso di filosofia chimica*. Cannizzaro's paths run along two directions. The first direction was the mainstream of scientific research and the second one, just opened in Piedmont, was that of the cultural activity in favor of reforming the public education. Our paper follows essentially the two main roads but the proper narrative is preceded by some information on the most significant moments of life before Cannizzaro's arrival in Piedmont. In particular, two different aspects are discussed: the contribution of the young Cannizzaro at the Congress of Italian scientists in Naples in 1845, and his participation in the Sicilian Revolution of 1848-49. Cannizzaro's stay in Alessandria, lasted from March 1851 to the end of 1855, and in this period he tought applied physics and and chemistry. In the autumn of 1855 he moved to Genoa where he had been promoted to the chair of General Chemistry. Until now historians have largely been silent on this period of life of Cannizzaro, but the rich harvest of information obtained from the State Archive of Alessandria, from papers held at the Accademia dei XL and from printed sources not previously studied, allowed us to reconstruct some aspects of Cannizzaro's life in Piedmont. At the distance of one and half a century, some historiographical data indicate that certain 'vices', which by then were in the Piedmontese society, after the Unity became property (so to speak) of the whole Italian society. Other data lead to a clear appreciation of the leadership of Cavour's Piedmont. Despite different political positions, local leaders promoted the rooting of the scientific and technical culture in Alessandria. The generosity of the Town Hall was at the limits of bleeding the municipal exchequer, but was thus, in a laboratory equipped at the expense of the municipality, that in 1853 Cannizzaro discovered reaction later known by his own name. The discovery of the reaction and of a new class of organic compounds (the aromatic alcohols) gave him an early international reputation. But not everything was accomplished in the narrow confines of Alessandria. In fact, the young Sicilian exile was welcomed immediately as a leader of the Società d'Istruzione e d'Educazione, and participated in leading positions at the congress of the Società. Ultimately, the undeniable success of Cannizzaro could be achieved at various levels because the leadership of Piedmont, beyond the severe political divisions, had a common strategic vision of the future of Italy.

Literature:

L. Cerruti, "*Concordia discors*. I chimici italiani dell'800, fra politica e scienza", in: A. Bassani (a cura di), *La chimica e le tecnologie chimiche nel Veneto dell'800*, Venezia: Istituto Veneto di Scienze, Lettere ed Arti, 2001, p. 11-72.

L. Cerruti, "La cultura scientifica: chimica", in: U. Levra, R. Roccia, (a cura di), *Milleottocentoquarantotto. Torino, l'Italia, l'Europa*, Torino: Città di Torino, 1998, pp. 237-246.

Stories about Chemistry in the Industrial Revolution: Pathways towards what kind of knowledge?

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The lecture argues that the introduction and early use of the terms applied chemistry and applied science should not be seen as the consequence of discussion between a few academics but rather were part of the emergence of the public sphere and the challenges of adjusting to an industrial society. It argues that the familiar stories popularly recounted about the achievements of applied chemistry were part of the definition of the field in the public sphere. Chemistry was the prototype applied science. Christof Meinel has shown how the phrase 'angewandte Chemie' circulated from the mid-18 th century first under the latin name of chemia applicata coined by Wallerius. From the early 19 th century, the term 'applied sciences' emerged first in England through the persuasive polemics of the avowedly Kantian Samuel Taylor Coleridge and his Encyclopaedia Metropolitana. This huge encyclopaedia planned by Coleridge in 1817 but only completed in the late 1830s both promoted a conservative model of the whole of knowledge at a time of cultural crisis, and a framework for the promotion of concepts of pure and applied sciences. The use of the distinction by his contributor Charles Babbage erroneously noted as the 'first' by the Oxford English Dictionary is a testament to its influence. As the balance between observation, theory and practice in science as a whole was being negotiated in early 19 th century science so the meaning of these terms was constructed and reconstructed, moving between diverse the very different academic, industrial and cultural contexts of Uppsala, Königsberg and industrial revolution London and between Latin, Swedish, German and English. With 'applied sciences' too, the French term 'la science industrielle' was integrated. These terms were used to in the discussions of how to organise education as well as to promote science as a whole and chemistry in particular within emerging industrial societies. This paper will also lay out an agenda for ongoing research and suggest that the stories frequently told about the achievements of applied chemistry, from Davy's invention of the miner's safety lamp to Liebig's Familiar letters on chemistry were themselves part of the process of defining the category in the public sphere. The historical use of digitised general interest periodicals to identify popular stories will be explored.

HOW KNOWLEDGE CIRCULATED BETWEEN GERMANY AND FRANCE: THE PARTICULAR CASE OF THEIR NATIONAL LABORATORIES OF HYGIENE (1876-1914).

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In the second half of the 19th century, the Alsatian chemists of Paris worked for the development of French chemical schools and laboratories based on German models. This has been already well-studied by several authors (Fauque, Carneiro, Pigeard, Rocke, ...). With the particular example of the Kaiserliche Gesundheitsamt of Berlin (KGA), founded in 1876, and of the Laboratoire du Conseil supérieur d'hygiène publique de France (CSHP), founded with the KGA as model, we would like to investigate the importance of the transfer of knowledge between the two laboratories.
In 1876, the Kaiserliche Gesundheitsamt was founded as a superior authority of the German Empire to observe public health. It was directly subordinated to the Ministry of Interior. From a small institution of only three scientists it developed to one of the leading research institutions before World War I. Soon a chemical laboratory and a hygienic laboratory were installed. In 1880, Robert Koch was appointed at the KGA and he installed a bacteriological laboratory. In these three laboratories, research on the quality of basic nutrients (water, milk, butter, flour, alcoholics ...), on infectious diseases, epidemics and river pollution was done. Based on the know-how of their time, the heads of the laboratories developed regulations for the basic methods used in their laboratories. These methods didn't change for years. It was important to guarantee a stable level of quality and comparability of results in their own experimental series of investigations as well as in investigations for third parties.
At the same time, the Conseil supérieur d'hygiène publique de France had several missions related to sanitation policy. Adolphe Wurtz, one of the leading Alsatian chemists of Paris, was a member of its committee since 1856 and became its president in 1879. He was greatly involved in the problem of water quality and asked for a laboratory dedicated to water analyses in 1877. In 1880, he brought to the attention of his colleagues the founding of the chemical laboratory of the KGA and again asked for a laboratory, with the KGA as model. The first director of the laboratory, founded in 1889, was Gabriel Pouchet, who had published criteria for drinking waters in 1885 and the chemists were trained at the Ecole Municipale de Physique et de Chimie de Paris. However, the laboratory was in competition with that of the Observatoire de Montsouris which was in charge of Paris' drinking waters analyses, and rapidly declined.
Through this particular example, we would like to emphasize the ways German chemical institutions were a model for French ones at the end of the 19th century. The question is whether the KGA was only a symbol of what ought to be done in France or if it served as a model for its organisation, the choice of analytical methods, administrative structure, etc.

SMELL AND TASTE IN THE HISTORY OF CHEMISTRY: TEXTBOOKS AND LABORATORY TEACHING IN THE END OF THE 19TH CENTURY

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Although seldom visible in scientific publications and articles, smell and taste have always played an important role in chemistry, but in order to study how it is necessary to leave the history of innovations and of theoretical breakthroughs and instead concentrate on routine activities in the daily laboratory work of a chemist. An important part of that work is teaching and learning, and this paper will concentrate on the place of smell and taste in chemical textbooks and in chemical teaching towards the end of the 19th century. Obviously all pathways in chemistry must sooner or later pass a laboratory, and every one working in a laboratory has had an education, which has influenced their way of doing and thinking about science.

An important part of teaching in chemistry is to learn the smell and taste of different substances, and the descriptive parts in the chemical textbooks of that time are filled with references to smell and taste. Although the seemingly terminological poverty in describing such phenomena as smell and taste, text books authors tried to reach a level of exactness and precision in their descriptions, which indicates both a consensus concerning how smell and taste should be considered, and a will to make these descriptions as scientific as possible. But chemistry could not be learned only by reading books. Basic chemical knowledge had to be learned at the spot, in the laboratory. Among the first things a student had to learn in the laboratory was how to smell, but he or she also has to learn to recognize different smells, which was done in a everyday handicraft way.

In this paper I will make an attempt to understand how chemical knowledge of such a subjective and qualitative character as taste and smell, was learned in a specific local situation, how it was used in the creation of new knowledge, how it moved and spread to other laboratories, and how it became part of, and how it could influence the development of chemistry as a science. It is my hope to be able, by discussing the role of smell and taste in chemistry to contribute to an increased understanding of the functioning of everyday chemistry, a precondition for all other chemistry.

SMELL. MATERIALIZING A SENSE

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The odor of things has always been crucial for their scientific, cultural, and social meaning, and in this perspective has been the theme of many works in cultural history. Cultural historians and historians of science alike have argued that during the 19th century a radical shift took place in the perception of odor in the laboratory, the boudoir, and in the city streets. In this period, smell has been played down in the pathways leading to reliable knowledge, partly condemned as a nuisance, and consequently removed from large parts of social life. According to this argument, the pathways of the sensory knowledge in both everyday life and the scientific realm were directed towards oblivion.

For the moment staying neutral with respect to this statement of 'deodorization', I argue that during the 19th and 20th centuries the scientific concept of odor changed, linking olfactory materials and the sense of smell in new ways. The investigations into sensory perception and the science of olfactory substances were shaped together. Among the most popular conceptions were lock-and-key relationships of olfactory substances and receptors. Thus, to a large extent, knowledge transfer between molecular biology, sensory physiology, analytical chemistry, model building, and the perfumers' art built up the science of smell. In my talk, I want to throw light on some of these concepts of the 1960s and 1970s. In addition, I will scrutinize the connections of the heuristic functions of smell and the classification systems of odorous substances, linking the epistemological and ontological dimensions. In sum, I wish to follow the scent of the chemical sense *par excellence*.

FROM GAS CHROMATOGRAPHY TO HIGH PERFORMANCE LIQUID CHROMATOGRAPHY; MAPPING THE PATHWAYS OF KNOWLEDGE BETWEEN THE ACADEMIA AND THE INSTRUMENT INDUSTRY IN THE US OF THE LATE 1960'S AND EARLY 1970'S.

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Although High Performance Liquid Chromatography (HPLC) has played a significant role in shaping chemical laboratory practice and the practices of related disciplines to what we today consider as modern, the method has been largely ignored by the mainstream of both history of science and technology. This paper attempts to bring into the fore the story of the invention of the first HPLC apparatus by Csaba Horváth (1930-2004) of Yale University, and the early steps of the technique, while demonstrating the value of this story as a case-study for the interaction and exchanges between academia and industrial R&D in the US during the important decade of the 1960s. It documents the connections between the birth and the meteoric growth of the new apparatus, to the expressed needs of the pharmaceutical industry of the period for high performance analytical tools and the influence of the R&D departments of the instrument industries on the overall process. Main argument of the paper is that, in the case of the development of the HPLC apparata, the industrial players did far more than picking up and commercialising academic research and inventions. Far from that, the industry was at the drivers seat: it shaped the final form that the new instrument would take, determined the extent of the market that it would target, built the basic features of the education related to its practice and use, and, to some extent, dictated the very research questions that the new instrument was meant to be a reply for. The story described is located at the dawn of the biotechnological era of the early 1970s and starts by documenting the interplay between researchers of the Yale Medical School and key factors of the scientific instruments' industry based in New Haven and elsewhere. It covers the key years that led to the passage from an almost dominant gas chromatography apparatus to the HPLC, and offers data concerning the basic industrial strategies for both faster development of, and faster and more extensive market coverage for the new machines. Furthermore this paper introduces historians of other scientific disciplines to the history of modern liquid chromatography.

STIRRING TOWARDS A CHEMICAL MODERNIZATION – A CURIOUS POPULARISING COLLECTION

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During 19th century the channels linking the public to scientific knowledge were more deeply developed. Following a positivist trend, science was perceived as a fundamental tool for developing citizenship. Scientific subjects were included in the secondary school curricula and this also contributed in a larger sense to popularisation of science. This knowledge diffusion movement led to the publication of low price volumes dealing with a wide range of subjects sometimes in the form of collections, frequently entitled "Libraries". Portugal followed the same trend with several examples being "Livros para o Povo" (Books for the People - 1859), "Educação Popular" (Popular Education - 1870), "Bibliotheca Popular ou instrucção para todas as classes" (Popular Library or instruction for all the classes - 1870), "Bibliotheca das Ideias Modernas"(Modern Ideas Library). Also other printed materials, such as magazines and newspapers contributed to this movement.

We will make a particular reference to a new collection of popularising books that appeared in Lisbon in 1881, with the suggestive designation of "Bibliotheca do Povo e das Escholas" (People and Schools Library). From the front cover one reads that the volumes were "Instruction Propaganda for Portuguese and Brazilians". The books were available in Portugal and Brazil as well as in a wider distribution network. The collection had a life time spread from 1881 until 1913. The range of topics covered was rather extensive and in it we find several books dedicated to chemistry.

"AN ENSEMBLE AS EUPHONIC AS POSSIBLE": THE THINKABILITY OF THE GENEVA NOMENCLATURE, 1889-1898

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The significance of chemical nomenclature crested in 1787 with the publication of the *Méthode de Nomenclature Chimique* of Lavoisier, Guyton, Fourcroy, and Berthollet. Notwithstanding their pride of place in the chemical revolution, however, names became an afterthought in nineteenth-century attempts to assimilate organic chemistry to the neat logic of inorganic theory. Instead, as the recent scholarship of Ursula Klein and Alan Rocke has persuasively argued, images and spatially manipulable formulae were the tools of choice in a series of theoretical innovations that culminated in structure theory.

Such insights highlight the peculiarity of the sudden emergence at the end of the nineteenth century of a nomenclature reform effort aimed at clearing a pathway to knowledge that had become overgrown with idiosyncratic terminology. The 1892 Geneva Nomenclature Congress produced an international standard for naming organic compounds, a system which has been canonized as the basis of modern IUPAC nomenclature. My research focuses on two questions regarding the "thinkability" of the Geneva nomenclature. First: after eighty years that had seen only piecemeal proposals by individual chemists for naming small classes of compounds, what made a collective, standard method of nomenclature thinkable in 1892? Second, how were the names that this method generated to be "think-able"; that is, what properties were they asked to satisfy in order to be useful terms for reasoning in organic chemistry?

My paper will focus on the thinkability of the Geneva Nomenclature in the second sense. The drafting and debate of the Geneva rules proceeded in dialectic fashion: nomenclators proposed rules, determined the settings – chemical journals, chemical indexes, everyday speech, textbooks – in which the reformed nomenclature could most properly be applied, and then adjusted the rules according to the needs of the chosen settings. The silent term that mediated this dialectic was a set of implicit principles for what chemical names could and ought to do. I argue, first, that the Geneva Congress restricted the intended application of the nomenclature to chemical indexes and in so doing set aside a number of qualities that would be demanded of a nomenclature to be used in the laboratory, research publications, or classrooms. Second, I argue that this decision created a fissure along which the Geneva Nomenclature fractured even as it was developed and extended during the 1890s. The Geneva system, today generally considered the foundation of standardized organic nomenclature, fell by 1898 to the status of one provisional set of recommendations among many. I argue that the Geneva Nomenclature's failure to achieve broad adoption was due in part to the persistence of linguistic demands that had been explicitly excluded from consideration in 1892. Chemical names refused to be constrained to indexes; when they failed to display the qualities considered necessary for use in other settings, they were seen to fail as names.

Translating histories: how Greek-speaking scholars of the early 19th century reconstructed the temporality of chemistry

Vangelis Koutalis and Efthymios P. Bokaris

Soon after Lavoisier's theory had been established as a new system of chemistry, the history of chemistry itself became a controversial issue. In the Greek-speaking regions of the Ottoman Empire this discussion, mostly concerning the role played by chemical revolution in chemistry's temporality, was appropriated, during the first quarter of the 19th century, through a series of historical narratives addressing the problem of chemistry's emergence, in a period where Greek-speaking audience was still unacquainted with the controversies accompanying Lavoisier's new chemistry.

In 1808, Konstantinos Koumas translated the *Lecons Elementaires de Chimie*, of Pierre-Auguste Adet, and composed a fairly extended sketch of the historical course of chemistry, as an introduction. Some years later, the Greek-speaking scholarly journal *Logios Hermes* (Hermes Orator) became the terrain of this debate over history. Daniel Philippides published there, in 1814, a narrative "on the origin, progress, ascent and decline of the sciences", in which chemistry, this "new science", was presented as the capstone of a progressive course where human liberation from the "tyranny" of fallacy was at stake. This text, in an extended version, and with a particular focus on chemistry, is also to be found in Philippides' manuscript translation of the *Elémens ou Principes physico-chymiques* of Mathurin Jacques Brisson, dated back to 1801 and now preserved in the Public Library of Milies. In 1818, Iosipos Doukas published in the same journal an adaptation of a short historical study "sur l' origine at les applications de la chimie à la medicine", which was published, under the initials "V., D.M.", in the *Journal de Pharmacie*. He informed his Greek-speaking readers that he was actually the writer of this piece, while studying in Paris under Georges Cuvier. That same year, the pharmacist Dimitrios Nitsos published another adapted historical narrative, drawn by Julien Joseph Virey's *Traite de Pharmacie*, in the form of a letter from Paris, where Nitsos then resided. In 1819, Nitsos published yet one more historical letter of his in *Logios Hermes*, this time from Pavia, thematizing the history of chemistry, and being unacknowledgedly an adaptation of Humphry Davy's "Historical View of the Progress of Chemistry".

Reading all these narratives we can detect a theoretical production having as its object the temporality of chemistry. In most cases, Greek-speaking scholars re-interpret, as they translate, their sources in order to highlight both the importance of ancient Greek philosophy in present-day chemistry's renovation, and the liberating aspect of scientific progress. At the same time, these reconstructions are interwoven with intense pedagogical concerns. Identifying the novelty of chemistry with the recovery of the ability to philosophize over the principles of nature, they reinforce the demand for universality inherent in scientific inquiry, and could thus be seen as manifestations of a didactical project comparable to that inspired by Davy's work, and alternative to that of Lavoisier, oriented as the latter explicitly was to the prosperity of the growingly competitive French national economy.

DIFFERENT WAYS IN WRITING CHEMICAL FORMULAE AND EQUATIONS IN 19TH CENTURY TURKEY

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Since ancient times, chemical substances and events had been represented with symbols for various purposes. In the middle ages, the use of symbols had become widespread, and the alchemists' creation of multiple symbols to be used for secrecy and for mystical reasons, had ended up in a chaos. In the second half of the 18th century, efforts towards creating chemical symbols in the denotation of chemical elements that could have been used in consensus, had been made. The latest being Dalton's symbols, all of them had been based on geometric shapes. From the beginning of the 19th century, in relation to the developments in chemistry, as writing the equations of the chemical components' formulae and reactions had become an issue, the symbols based on geometry had proven to be insufficient.
In 1813, Swedish chemist Jöns Jacob Berzelius (1779 – 1848), had codified the element symbols that we use to this day, in letters only, and the formulae of the chemical components, the equations of chemical reactions had started to be denoted in these symbols. In the 1840s, this system had been accepted, and had begun to be used by all chemists. Nations that use an alphabeth other than Latin, such as Russians, Chinese, Japanese and Greek, had adapted the symbols with Latin letters, and had used them as such.
There had been one exception to the general consensus in the denotation of chemical symbols and equations in Europe. Since the 1830's, French chemist M. Jean Girardin (1803 – 1884) had been persistent in not using the chemical symbols and formulae, and instead, he had developed a diagrammatic system to denote the formulae of chemical reactions. Such a denotation of chemical equations had not been accepted in Europe.
The first chemistry book published in Turkey is *Elements of Chemistry* (1848). The author of the book, Dervish Pasha (1817 – 1879), had studied mineral engineering in France, and in his book, although he had used Berzelius system in denoting symbols and formulae, he had followed Girardin's way in the denotation of chemical equations. With one exception, this style had not gained acceptance in the books of chemistry printed later on. This exception is H. S. Vahanyan's *Introduction of the Chemical Science*, published in Istanbul in Armenian, in 1853. The second particularity in Turkey lies in the use of chemical symbols. The author of the second chemistry book published in Turkey, Kirimli Aziz Bey (1840 – 1878), in his *Medical Chemistry* (1868), had adopted the Berzelius system, yet instead of using the chemical symbols in Latin, he had represented chemical symbols in Arab letters, and used these symbols in the denotation of chemical formulae and equations. This has had a permanent effect, the use of chemical symbols in Arabic letters in the denotation of chemical formulae and equations has lasted until the adaptation of Latin alphabeth in Turkey in 1928.
In this paper, the denotation of chemical equations in Girardin will be compared with those in Dervish Pasha and H. S. Vahanyan, and information will be provided on Aziz Bey's chemical symbols in Arabic letters.

A CRITICAL AND PASSIONATE BIOCHEMIST: LEONOR MICHAELIS, PIONEER OF QUANTITATIVE ENZYMOLOGY, IN BERLIN AND NEW YORK

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The biochemist and biophysicist Leonor Michaelis (1875, Berlin -1949, New York) is best known for his work on the physical chemistry of proteins and enzymes and the mathematical derivation, together with Maud Menten, of the affinity constant of the enzyme substrate bond, now known as the Michaelis-Menten constant. His thorough experimentation and careful theorising made him critical of many of his contemporaries in medical biochemistry, whose work did not withstand scrutiny. Unable to receive an academic position in Germany – his critical attitude as well as being a politically liberal Jew probably were causes – he accepted a professorship in Nagoya, Japan, in 1922, and at Johns Hopkins University in 1926. In 1929 he became a member of the Rockefeller Institute for Medical Research in New York. By combining the traditional approaches of organic chemistry with new approaches of physical chemistry and quantum mechanics, Michaelis was able to bridge conceptual gaps and contribute decisively to biochemical and biophysical research in the field of biological redox-reactions.

IMMIGRATION OF KNOWLEDGE: THE CASE OF THE JEWISH REFUGEES CHEMISTS FROM THE NAZI REGIME- ADJUSTMENT AND SCIENTIFIC ACHIEVEMENTS IN THE UNITED STATES

By Yael Epstein

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On April 7, 1933 the Nazis enacted the Civil Service Law, which instructed to dismiss any one who is not Aryan from public positions. As a consequence, many Jewish academics were expelled from their positions. This pattern of expelling first the Jewish or Non- Aryan intellectual elites, repeated itself in every country that Hitler conquered. A lot of The Jewish academics immigrated to the United States; Laura Fermi called them, the "Illustrious Immigrants". Among those academics were prominent chemists including several Nobel Prize Laureates, who are my research topic. My sample includes **35** Jewish chemists and biochemists, such as Herman Mark, Otto Meyerhof, James Franck, Max Bergmann, Fajan Kasimir, Carl Neuberg, Konrad Bloch, Otto Loewi, Fritz Lipmann and many more, among them **10** Nobel prize laureates.

In the presentation, I will focus on the European Jewish chemists and their adjustment to the American scientific community and incorporation in the United States. Many of these chemists had productive new lives in the United States, and actively participated in the development of science and industry. At the same time, some had difficulties of adjustment. To illustrate, Otto Meyerhof, a German chemist, who received the Nobel Prize at 1922, when arriving to the United States got low salary and smaller laboratory space in the University of Pennsylvania. Moreover, the Professor of pharmacology Otto Loewi, also a Nobel Prize Laureate, received unsalaried post at the faculty of the New York University College of Medicine.

Until now, the most well-known and researched scientific impact of Jewish – European scientists in the U.S is of those who participated in the development of the atomic bomb in the Manhattan project. In the literature, historians mainly emphasize the physicists and their achievements, and neglect the achievements in other fields, such as in chemistry and biochemistry. I will discuss in the presentation, the contribution of the Jewish chemists to American science. One of them is James Franck, who received the Nobel Prize in 1926 in physics. In the United States he was a Professor for physical chemistry at the University of Chicago, where a special laboratory was established for his photosynthesis research.

EXILE OF CZECH CHEMISTS DURING THE COMMUNIST REGIME IN CZECHOSLOVAKIA 1948-1989

Štrbáňová, S., Prague

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The onset of the communist regime in Czechoslovakia in 1948 forced many citizens to emigrate in two big waves: soon after the communist coup in February 1948 and after the occupation of Czechoslovakia by the Warsaw Pact armies in 1968-1969. The grant project *Czech Scholars in Exile 1948 – 1989*, financed by the Academy of Sciences of the Czech Republic, has focused on the reasons, process and consequences of the two exile waves in the domain of humanities and sciences using as a relevant sample university educated workers of the Czechoslovak Academy of Sciences (CSAS) who emigrated in the years 1952-1989. Their database disclosed that the so-called "illegal abandonment of the Republic" referred to about 740 specialists, which corresponds to 6 – 7 % of employees of the CSAS. The strongest group among them in both waves was the chemists comprising around 200 people, that is about 27% of all Academy's émigré employees. The main directions of their flights were the USA and Western Europe – especially Great Britain, West Germany and France. The numbers do not encompass some scholars with chemistry background who took themselves for geochemists, physiologists, immunologists and like, so that the total number would be even higher. Among the main outcomes of the project is an encyclopedia of exile [1] that will be published by the time of the Conference. It contains detailed scientific biographies of selected Czech émigré scholars, among them around 29 chemists.

The sources available - the database, the biographies of the most outstanding chemists, as well as interviews with some exiles, allow us to state that the highest share of émigré chemists represented organic, physical and macromolecular chemistry. These sources also allow us to deliberate about the motivations, process and consequences of this forced brain drain. We may conclude that in most cases the chemists were motivated to escape by family or personal experience of persecution, on the one hand, and expectation of better use of one's abilities and realizing one's scientific projects. The disastrous effects of forced emigration in Czechoslovakia were impairment of scientific progress, especially in the fields where the brain drain was enormous, that is in chemistry; not talking about enormous social, cultural and moral loss. The paper will also show some of its positive consequences, like enhanced dissemination, circulation and cross-fertilization of new ideas which brought about progress in several domains of chemistry.

Literature:

[1] Štrbáňová, S. – Kostlán, A. (eds.), *Sto českých vědců v Exilu* [One Hundred Czech Scholars in Exile]. Praha: Academia, 2011.

STAHL'S ANIMISM BROUGHT FROM GERMANY TO PORTUGAL IN 1733 BY JOSEPH RODRIGUES ABREU'S *HISTOROLOGIA*

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Georg Ernst Stahl's (1660-1734) theories in the mid-seventeenth century were very important marks in the history of chemistry and medicine. In Chemistry, it was the phlogiston theory; in Medicine, it was the so-called Stahl's animism, defending a deep gulf between living beings, possessed with a soul, and the inorganic world [1-2].

In Portugal, at that time, in the Faculty of Medicine of the unique Portuguese University of Coimbra, medical instruction was a residual mixture of the galenic medicine with iatrochemical practice and theories of reforming chemists of the period in other European countries. This was the accepted pharmaceutical chemistry for preparing chemical drugs by the apothecaries. It is, namely, the treatment of chemistry of the Curvo Semmedo, Caetano Santo Antonio, Fonseca Henriques and Joam Vigier *Polyanthea Medicinal* (1697), *Pharmacopea Lusitana* (1704), *Apiarium Medico Chymicum* (1711), *Thesouro Appolineo* (1714) and *Pharmacopoea Ulissiponrnse Galenica and Chimica* (1716), respectively [3]

It was in this context that Sathl's chemical and medical works were received in Portugal through J. Rodrigues Abreu, a distinguished physician, born in 1682, in Évora (Portugal). Having completed his studies in Medicine and Theology in the University of Coimbra, in 1709, he went to Brasil where he dedicated himself to an intense medical activity for some years. Returned to Lisbon in 1714, he travelled for some time in Italy where he became deeply acquainted and influenced by Stahl's theories. His interest in these theories was so great that he worked on them, for several years, in Lisbon, where he published in 1733, the first volume of an extensive Treatise on medical practice, with special emphasis on Stahlian animism, under the general and full title "*Medical Historology, Founded and Established on the Principles of Georg Ernest Sthal, the very Famous Writer of our Century and adjusted to the use of our Country*". With an introduction of 49 pages and more than 960 pages on the considered, this was just the first volume of the Treatise. A second volume was published some years later, in1739, encompassing more than two thousand pages [4]. In our presentation, we will analyse the impact of this Rodrigues Abreu's so-long Treatise in Portuguese science which seems to go far beyhond the author's purpose.

Literature:

[1] Stahl, G.E.,*Specimen Becchertanum* **1703**, Joh.Ludov.Leipzig (appended to Becher's *Physuca Subterranea*); Idem, *Zymotechnia fundamentali* ... ,**1697**, Christop. Salfeld, Halle. [2] Oldroyd,D., Ambix, **1973**, 20 36-52. [3] Amorim daCosta, A.M, Revolutions in Science, **1988**, William R. Shea Ed., Science History Publications/USA, 239-265. [4] Abreu, J.R., *Historologia Medica, Estabelecida nos Principios de George Ernesto Stahl, Famigeradíssimo Escritor do Presente século e ajustada ao uso dete Paiz*, **1733** Tom.I; **1739** Tom.II, Officina da Musica, Lisboa Ocidental.

Sven Rinman's chemical tour in Paris in 1747

Marco Beretta
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Sven Rinman is one of the most important Swedish metallurgical chemists of the 18th century. His works on iron has become a landmark of chemical literature. Sent by the Board of Mines to a European tour in 1746-7, Rinman stayed in Paris for a few months where he had the opportunity to meet with the most prominent chemist of the time, Guillaume François Rouelle. He visited Rouelle's private laboratory and, on his return to Sweden, he built a laboratory at Leuftabruk based on the same principles. In my presentation I shall illustrate the background of Rinman's visit.

WHEN LAVOISIER CAME TO NORWAY

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He never came, but I will report on a study of when and how his ideas about chemistry came to Norway at the end of the 18th century.

It must have come to Kongsberg. That was the only place where chemistry was taught. Norway was then part of the union Denmark-Norway, and the only universities in the union were in Copenhagen and Kiel. In Kongsberg it was a mountain school (the Kongelige Norske Bergseminarium) established in 1757. It was a small school with only one teacher, and he was also physician (bergmedicus) at the Silver mine. The mine dominated life in the town, the next largest town in Norway then.

In 1786 the school got its own building with a separate laboratory (both still standing) and curriculum. The number of teachers increased to three. Peter Thorstensen (1752-92), with a doctor's degree in medicine, taught physics, chemistry and mineralogy. He had a fairly large collection of books and was a very active man. After his early death the job was taken over by Christian Elovius Mangor (1734-1817) to 1800. We have a handwritten protocol covering the period from 1786 to 1805 with questions and answers used during examinations telling what the students were expected to learn. This is a valuable source of information about the development of chemistry in the school. The protocol is handwritten in Danish using gothic letters, and work is in progress to transcribe the text. The results will be reported at the meeting.

Chemistry was also taught at the pharmacy in Kongsberg. The owner and head dispenser was Nicolai Tychsen (1751-1804) from 1788 to 1800. Tychsen had taught chemistry in Copenhagen from 1785-88 and was well known for his handbook in chemistry published in 1784. At Kongsberg he published a revised and enlarged edition of the handbook in three volumes in 1794. One year earlier he published a small book on French nomenclature in Danish. Many Norwegian pharmacists went to Kongsberg to learn from Tychsen. They must have discussed Lavoisier's ideas with him. In the 1794-edition chemistry was explained using both phlogiston and antiphlogiston theories. A third edition of the handbook was published just after Tychsen was dead. Then phlogiston had disappeared and everything was explained according to Lavoisier.

JOSÉ CASARES GIL (1866-1961): SCIENTIFIC TRAVELS AND THE MAKING OF EXPERTS IN THE EUROPEAN PERIPHERY

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This paper analyzes the importance of scientific travels in the appropriation of chemical knowledge and practices. It is focused on José Casares Gil (1866-1961), one of the main Spanish analytical chemists and professor of chemistry in Barcelona and Madrid. It analyses his role as expert, leader of a research school and supporter of the renovation of Spanish science. He travelled to Germany in several occasions between 1896 and 1920 and to USA (1902). These travels allowed him to meet important chemists and to discover full equipped laboratories and new experimental practices. He came back completely convinced of the importance of teaching practices in the development of modern chemistry, so he made public claims for a substantial university reform.

Casares was one of the founders of the *Junta de Ampliación de Estudios*, (JAE, Council for Widening Studies) he favoured travelling and living abroad for talented students. He also made scientific travels all over several universities in Europe and the USA to design the campus of the *Complutense* University of Madrid and others as national representative in different events.

This paper discusses the importance of travels of learning, not only regarding the creation of international contacts but also taking into account the renewal of experimental practices in the use of new instruments and purchase. It also pays attention to the influence of international networks in the creation of research groups, the transference and adaptation of new practices and lessons learned or the discussion and adaptation of new disciples. The evolution of these factors relate to the creation of a research school in the country of origin, driving local publications, promoting new scientific institutes or emerging new researchers and has a great importance in the strengthening of a scientific discipline.

Some preliminary studies indicate a tendency in this direction. The importance of Casares Gil grew as researcher and academic (director of Customs Chemical Laboratory, director of the Royal Academy of Sciences and the Royal Academy of Pharmacy). He was also a noted politician (he was Senator and Member of Parliament).

It is noteworthy that in contrast to other leading scientists, Casares remained in Spain and sympathized with the military regime of Francisco Franco. Thus it is rarely studied its role within the suppression of the JAE and the creation, in 1939, of the *Consejo Superior de Investigaciones Científicas* (CSIC, Superior Council of Scientific Research). Casares was a founder member and director of several research centres belonging to this scientific institution.

The importance of Casares Gil as a distinguished analytical chemist, as university professor and as an influential politician makes a good case for studying the processes of circulation of scientific knowledge, the international exchanges, and the appropriation and consolidation of new scientific ideas and techniques.

The introduction of Berzelius chemistry in Greek speaking region. The teaching of chemistry in the Ionian Academy

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In this paper we study the introduction of the chemistry of Berzelius in Greek speaking region by studing the life and works of Athanasios Politis who forst incorporated elements of Berzelius work in his book published in Corfu 1847 and he was professor in the Ioanian Academy.

The Ionian Academy was founded in 1817 in Corfu (Greece) by the efforts of Lord Guilford, during the British rule, and opened in 1824 until 1864. It was the first University in the Greek-speaking world. In the beginning the Ionian Academy comprised of the following schools: Theology, Law, Medicine and Philosophy (which was divided in two sections, Science and Philosophy). Later the School of Science renamed as School of Natural Science and included the Chemical Philosophy. The establishment of schools was based on social and professional prerequisites. In 1837 the schools of the Academy were: Literature, Philosophy, Theology, Law and Engineering. In 1841 the School of Pharmacy was established and in 1845 the Medical school had the Department of: Medical-Surgical, Pharmaceutical and Obstetrics. The curriculum of the Medical Faculty of the Academy included the course "*Practical and Theoretical Chemistry*" which was taught by Athanasios Politis until the function of the Academy was halted. Athanasios Politis was the first professor of chemistry in a Greek speaking University.

Athanasios Politis was born in Lefkada in 1790. He completed his undergraduate studies in Corfu and then studied medicine at the University of Pavia in Italy. At 1816, having completed his medical studies he went to Paris to study chemistry at the University of Sorbonne with financial support from Guilford. In 1824 he was appointed Professor of Chemistry of the Ionian Academy, position that he hold until his death in 1864; besides his teaching work he established a chemical laboratory with the financial support of Ioannis Kapodistrias, the first governor of the newly founded Greek state.

The main work of A. Politis was an epitome of courses in chemistry at the Academy, which was published in Corfu in 1847 entitled "*Elements of Chemistry*". Several topics that Politis dealt in his chemistry were borrowed from JJ Berzelius work: 'Lehrbuch der Chemie" published in 1825. Till this date several chemistry books had been translated in Greek and were used as textbooks. Namely : A. Fourcroy's, "Chemical Philosophy" translated by Athanasios Iliadis (1802), Brisson's work "*Elements or Physicochemical Principles*" translated by the monk Demetrious-Daniel Philippides (1801) and Adet's "Lecons Elementaires de Chimie, a l' usage des Lycees" translated by Koumas (1808).

In this paper is explored Politis' work on chemistry in the context of the 18th-19th century Greek didactical traditions (oriented in Newtonian Chemistry) and the theoretical transformations of the Newtonian tradition due to the introduction of the work of J.J. Berzelius.

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