Poster presented at the 5th International Conference on History of Chemistry, “Chemistry, Technology and Society”, 6 – 10 September 2005, Estoril & Lisbon – Portugal

RODGERS, Glen E: *Scientific/Historical Travel Seminars in Europe*

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 “...There is something special about standing at the actual place where [scientific] history was made or seeing the actual tools by which the world of nature was forced to yield some of its secrets” (ref 1). **Scientific/historical traveling** places an emphasis on visiting sites related to the history of science. “**Traveling with the atom”** is the author’s phrase for scientific/ historical traveling with an emphasis on the history of the atomic concept. Starting in 1998 with a 9-week exploratory trip, the author and his wife have traveled to these types of sites together and twice have served as co-leaders of Allegheny College Center for Experiential Learning (ACCEL) “travel seminars” with scientific/historical themes. In 2002, the Rodgers led a group of seven science majors on the trip entitled “Traveling with the Atom: London and Paris”. In 2003, with some financial support from the College, the author set out on his own to explore scientific/historical traveling sites in Eastern Europe and Russia. He was accompanied in places by Professor Dr. Antoni Moskwa of the Department of Economics at Allegheny. These travels led to the second “Traveling in the Liberal Arts Tradition” seminar in 2004 led by Profs Moskwa and Rodgers and (in Germany)Professor Dr. Peter Ensberg of Allegheny’s German department.

One of the goals of the ACCEL program is to promote international seminars that foster cross-cultural and global awareness. As much as possible we wanted this awareness to be informed by the students’ own knowledge of, experience in, and approach to the “liberal arts”. [Liberal arts colleges are common in the United States. They encourage or even require their students to take a substantial number of classes in topics not directly related to their principal areas of study (sometimes called “majors”) or to their career goals. This is an effort to provide a "well-rounded" education. At Allegheny College, students are required to minor in an area not directly related to their major.] After presentations by faculty during the initial four-day on-campus sessions, students were responsible for presenting principal(8-12 min) and secondary (6-9 min) talks to their colleagues and mentors. The talks, often on site, were accompanied by academic papers submitted shortly after arrival back in the States. The itinerary and student presentation titles (some abbreviated) are given below in the following pages.

Some of the more interesting student papers and the sites at which they were given include the following. During the 2002 “Traveling with the Atom” seminar:(1) “He is Sir Isaac Newton” presented by his bust in Leicester Square, London; (2) “Lord Kelvin” presented in a whisper in Westminster Abbey(Kelvin is buried in the altar area so the group gathered around the memorial stone in honor of William Herschel (discoverer of Uranus) just outside the roped off altar area with an opening in the circle directed toward Kelvin’s grave; (3) “All Science is Either Physics or Stamp Collecting, a brief insight into the life Ernst Rutherford” presented beside the Rutherford exhibit in The Science Museum, London; (4) “James D. Watson and Francis Crick”, presented by a marker outside the Eagle Pub in Cambridge where in 1953 they came to celebrate their discovery of the helical structure of DNA; (5)”Louis Pasteur”, presented in his former office at the Ecole Normale Supérieure in Paris; (6) “Benjamin Franklin’s Contribution to Atomic Theory”, presented at the base of his statue in the Passy district of Paris.

During the 2004 “Traveling in the Liberal Arts Tradition” seminar: (1) “The History of the Hotel Bogota”, presented surrounded by the YVA photography exhibit on the third floor of the hotel in Berlin; (2) “Emil Fisher”, presented at the base of his statue at the Max Planck Institute, Berlin; (3) “Book Burnings at Babelplatz”, presented near the actual site; (4) “Beethoven”, presented in our hotel before a concert containing Beethoven works; (5) “Auerbach’s Kellar in Goethe’s *Faust*”, presented at the entrance to the original restaurant under the statues of Mephistopheles and Faust; (6) “Mendeleev’s Eka-Elements”, presented at the Leipzig Youth Hostel before our trip to Freiburg, where Clemens Winkler discovered Germanium; (7)”Movements of the Polish-German Border”, presented at the border upon entering Poland from Dresden; (8) “Basic Economic Statistics: Germany, Poland, Czech Republic”, on our coach traveling toward Warsaw; (9) “The Warsaw Uprising”, presented by the statue of “The Boy Insurgent” in the wall of old town Warsaw; (10) “Frederic Chopin”, presented by a chemistry major after a Chopin piano concert at the Chopin Memorial in Lazienki Park in Warsaw; (11) “Reuters News Agency”, presented at the agency; (12) “Marie Curie and Radium” and “Marie Curie’s Activities during World War I”, both presented by the statue of Skladovska-Curie at the Curie Cancer Center in Warsaw;(13) “Zyklon B in the Gas Chambers”, presented in our coach on the way to the Auschwitz-Birkenau concentration camp where the group saw a huge display of empty Zyklon B canisters; (14) “Johannes Kepler”, presented at the base of the statues of Kepler and Brahe in Prague.

Students earned academic credit for these seminars. Each seminar counted for the same amount of credit as an ordinary science or history course at the college. The grades for the 2002 course were either pass (P) or fail (F). Grades for the 2004 course were normal letter grades ranging from A to F. The grading criteria for determining these letter grades in the latter seminar are shown below.

Grading Criteria for 2004 Travel Seminar

Participation: 20%
Minor Talk: 7.5%

Minor Paper: 7.5%

Minor Content: 5%
Major Talk: 15%

Major Paper: 15%

Major Content: 10%
Journal: 20%

The “participation” grade included interest shown in talks, questions raised after others’ presentations, comments to presenters, and enthusiasm and involvement in the course. The “talk” grades included structure (clear introduction, middle, and conclusion) of the presentation, delivery (extemporaneous, evidence of rehearsal, and eye contact), and communication with audience (use of handouts, attractiveness of presentation, ability to answer questions, and generation of interest). The “paper” grades included structure, grammar, and proper use of resources. The “content” grades included accuracy of facts, basic points and problems set out and explained, and proper use of terminology. “Journal” grades were based on entries for each day, detail of descriptions, insightfulness, and observational abilities. The 2002 seminar had a prerequisite of one introductory science course. The 2004 seminar had a prerequisite of either one introductory science course or one social science course.

 The pre-trip, on-campus topics presented by faculty included the following (with emphasis on science history topics).

**2002: “Traveling with the Atom”**

The Greeks Start Us Off

The Contributions of Alchemists

The Early Laws Leading to the First Concrete Atomic Theory

* [Antoine Lavoisier](http://merlin2.alleg.edu/employee/g/grodgers/ScientificTravelingWebsite/Lavoisier.html) and the Conservation of Mass
* [Joseph Priestley](http://merlin2.alleg.edu/employee/g/grodgers/ScientificTravelingWebsite/Priestley.html)
* Joseph Proust and the Law of Definite Proportion
* [John Dalton’s Theory](http://merlin2.alleg.edu/employee/g/grodgers/ScientificTravelingWebsite/Dalton.html)

Looking for More Elements

* [Michael Faraday](http://merlin2.alleg.edu/employee/g/grodgers/ScientificTravelingWebsite/Faraday.html)
* [Humphry Davy](http://merlin2.alleg.edu/employee/g/grodgers/ScientificTravelingWebsite/Davy.html)
* [Johannes Berzelius](http://merlin2.alleg.edu/employee/g/grodgers/ScientificTravelingWebsite/Berzelius.html)

Organizing the Elements

* Early Efforts
* [Dmitrii Mendeleev](http://merlin2.alleg.edu/employee/g/grodgers/ScientificTravelingWebsite/Mendeleev.html)
* [Role of Inert Gases](http://merlin2.alleg.edu/employee/g/grodgers/ScientificTravelingWebsite/Ramsay.html)

Inner Structure of Atoms, Part I

* [J.J. Thomson](http://merlin2.alleg.edu/employee/g/grodgers/ScientificTravelingWebsite/Thomson.html) and the Electron
* [Wilhelm Roentgen](http://merlin2.alleg.edu/employee/g/grodgers/ScientificTravelingWebsite/Roentgen.html) and X-rays
* [Antoine Becquerel](http://merlin2.alleg.edu/employee/g/grodgers/ScientificTravelingWebsite/Becquerel.html) and Radioactivity
* The Amazing Story of [Marie-Skladovska Curie](http://merlin2.alleg.edu/employee/g/grodgers/ScientificTravelingWebsite/MarieCurie.html) and [Pierre Curie](http://merlin2.alleg.edu/employee/g/grodgers/ScientificTravelingWebsite/PierreCurie.html)
* [Ernest Rutherford](http://merlin2.alleg.edu/employee/g/grodgers/ScientificTravelingWebsite/Rutherford.html) and the Nucleus
* The Mass Spectrograph

The Nobel Prizes

Inner Structure of Atoms, Part II

* Light and Spectroscopy
* The planetary atom and its quick demise
* The Role of [James Clerk Maxwell](http://merlin2.alleg.edu/employee/g/grodgers/ScientificTravelingWebsite/Maxwell.html)
* Blackbody Radiation and [Max Planck](http://merlin2.alleg.edu/employee/g/grodgers/ScientificTravelingWebsite/Planck.html)
* The Photoelectric Effect and Albert Einstein
* The Wave-Particle Duality of Matter
* Electrons as Confined Waves

The Power of the Nuclear Atom

* James Chadwick and the Discovery of the Neutron
* The Joliot-Curies and Artificial Radioactivity
* Enrico Fermi and the Trans-Uranium Elements
* Nuclear Fission (Hahn, Meitner, Strassman, Noddack)
* The Manhatten Project
* The Heroes of Telemark
* The Atomic Bomb

**2004: “Traveling in the Liberal Arts Tradition”**

*Science/History Topics:*

“The Elements and the Periodic Table”

* The early ideas about atoms (Greeks, [Bruno](http://merlin2.alleg.edu/employee/g/grodgers/ScientificTravelingWebsite/Bruno.html), [Boyle](http://merlin2.alleg.edu/employee/g/grodgers/ScientificTravelingWebsite/Boyle.html))
* Examples of isolating elements (phosphorus, alkali metals, carbon)
* [John Dalton’s](http://merlin2.alleg.edu/employee/g/grodgers/ScientificTravelingWebsite/Dalton.html) first concrete atomic theory
* The contributions of [Jons Jacob Berzelius](http://merlin2.alleg.edu/employee/g/grodgers/ScientificTravelingWebsite/Berzelius.html)
* The contributions of [Dmitrii Mendeleev](http://merlin2.alleg.edu/employee/g/grodgers/ScientificTravelingWebsite/Mendeleev.html)

“The Role of Catalysts in Chemistry”

* The history of the Nobel Prizes (establishment by Nobel, deciding the winners of the early prizes, the role of Svante Arrhenius)
* Wilhelm Ostwald and his conversion of ammonia to nitric acid
* Fritz Haber and his production of ammonia from gaseous nitrogen and hydrogen

“The Discovery of X-Rays and Radioactivity”

* Background (including the discovery of the electron)
* [Wilhelm Roentgen](http://merlin2.alleg.edu/employee/g/grodgers/ScientificTravelingWebsite/Roentgen.html) and his rays
* [Antoine Becquerel](http://merlin2.alleg.edu/employee/g/grodgers/ScientificTravelingWebsite/Becquerel.html) discovered radioactivity
* The work of [Marie Skladovska-Curie](http://merlin2.alleg.edu/employee/g/grodgers/ScientificTravelingWebsite/MarieCurie.html) and [Pierre Curie](http://merlin2.alleg.edu/employee/g/grodgers/ScientificTravelingWebsite/PierreCurie.html)

*Other Topics:*

* Discussion and establishment of the criteria by which grades would be determined
* European geography and cultural expectations
* Some basic economics
* Elementary Polish (for the traveler)

Dr. Rodgers has a website ([www.travelingatom.com](http://www.travelingatom.com/)) that gives the details of these various trips. Many but not all of the sites visited are listed in works given in the references section. If you have suggestions for other sites that might be included in future travel seminars, please contact the author at glen.rodgers@allegheny.edu.

Abbreviated Itinerary

[“Traveling with the Atom: London and Paris”](http://merlin2.alleg.edu/employee/g/grodgers/ScientificTravelingWebsite/StudyTourChoicePage.html)

June 2 to June 23, 2002

June 2 to 6 On Campus Days

June 7 Free Day

June 8 Flight from Pittsburgh to London

June 9 Arrival in London

 [National Portrait Gallery](http://www.npg.org.uk/live/index.asp)

June 10 [The Royal Institution](http://www.rigb.org/rimain/heritage/index.jsp),

Host: Dr. Frank James, Reader in History of Science

 Free time in the afternoon and evening

June 11 [The Science Museum](http://www.sciencemuseum.org.uk/) (Host: Dr. Peter Morris)

 Free time from mid-afternoon on

June 12 [The Royal Observatory](http://www.greenwich2000.com/) (Greenwich)

Return to London on the Thames aboard the M.V.Greenwich Belle

 Free time from mid-afternoon on

 Group Dinner

June 13 Free Day in London

June 14 Coach to Cambridge University

Cavendish Physics Laboratory

 Group lunch in the cafeteria

 Tour of the [Museum at the Cavendish Laboratory](http://www-outreach.phy.cam.ac.uk/camphy/museum/tour.htm)

 Host: Dr. Gordon L. Squires, curator

 Group Dinner at Clare Hall

June 15 Walking Tour of the Old Cavendish Laboratory

 Hostess: Ms. Katie Eagleton, graduate student in the history of science

 Group Lunch at the Eagle Pub followed by free time from early afternoon on

June 16 Services at King’s Chapel or Free Time

 Coach to Oxford

[“Oxford Science Walk”](http://www.mhs.ox.ac.uk/features/walk/intro.htm) (walking tour)

 Group Dinner

June 17 [The Old Ashmolean Museum of the History of Science](http://www.mhs.ox.ac.uk/about/index.htm?history), Oxford

 Host: Dr. Stephen Johnston.

Free time after noon

June 18 Coach Travel to the [Bowood House](http://www.bowood-house.co.uk/) (where Priestley discovered oxygen)

 [The Great Circle at Avebury](http://www.sacredsites.com/europe/england/avebury.html)

 Hostess: Dr. Rosamund Cleal, Curator

 Group Lunch at Great Circle

 [Stonehenge](http://www.amherst.edu/~ermace/sth/sth.html) on the way to Salisbury

 Free time in the evening

 Stay at Salisbury Youth Hostel for the night

June 19 Coach to Waterloo Station in London

 Travel via the Eurostar (and the Chunnel) to Paris, Gare du Nord

June 20 The “Pioneers of Radioactivity” walking tour Contact: Ms. Ginette Gablot of the Parcours des Sciences

Group lunch

[The Pantheon](http://www.paris.org/Monuments/Pantheon/) and the Concierge

 [The Pasteur Museum](http://www.paris.org/Musees/Pasteur/info.html)

June 21 The Statue of Benjamin Franklin near the Jardins du Trocadero close to the Eiffel Tower

 [Conservatoire National des Arts et Metiers](http://www.arts-et-metiers.net/)

 Host: Thierry Lalande, Curator of Scientific Instruments

 [The Curie Museum](http://www.curie.fr/fondation/musee/)

June 22 Free Day in Paris

 Group Final Dinner: Seine River Boat/Dinner Tour

June 23 Return to the United States

Abbreviated Itinerary

[“Traveling in the Liberal Arts Tradition: Berlin, Leipzig, Warsaw, and Prague”](http://www.allegheny.edu/magazine/archive/2005spring/traveling.php)

Glen E. Rodgers and Antoni Moskwa (with assistance from Peter Ensberg)

May 11-31, 2004

May 11 -14 On-Campus Days

May 15 Flight from Pittsburgh to Berlin

May 16 Orientation Walk led by Dr. Ensberg

Talks at or near Europa Center Plaza

Talks at the Hotel Bogota

Free time in Berlin

May 17 Berlin-Dahlem, the [Fritz Haber Institute](http://www.fhi-berlin.mpg.de/history/) (Host: Prof. Karl Doblhofer and Christine Kolczewski)

 [Max Planck Society](http://www.mpg.de/english/aboutTheSociety/index.html) (Host: Dr. Eckart Henning)

 Free time in Berlin starting at 3:00PM

May 18 [“Discover Berlin Walk”](http://www.berlinwalks.de/v1/berlin_tours.html#tour1)

Free afternoon in Berlin

Group dinner

Concert at the Konzerthaus

May 19 Coach Trip to Leipzig

Free time to explore Leipzig

May 20 Coach trip to Wilhelm Ostwald [“Energy House”](http://www.allegheny.edu/magazine/archive/2005spring/traveling2.phphttp%3A/www.allegheny.edu/magazine/archive/2005spring/traveling2.phphttp%3A/www.wilhelm-ostwald.de/), Groβbothen

 Group Lunch at Werke House

 Group Dinner at Auerbach’s Keller

 Evening Concert at Gewandhaus (Bachfest – music of Mozart, Bach and Brahms)

May 21 Coach trip to Freiberg

Tour of [Clemens Winkler](http://merlin2.alleg.edu/employee/g/grodgers/ScientificTravelingWebsite/Winkler.html) laboratory and memorial

 Tour of [silver mine](http://www.lehrgrube.tu-freiberg.de/)

Evening: free time in Leipzig

May 22 Coach trip Leipzig to Wroclaw

Group Lunch in [Wroclaw](http://www.fact-index.com/w/wr/wroclaw.html)

Coach Tour of Wroclaw

Early Evening: Coach continues to Warsaw

May 23 Museum of History of Warsaw

Noon: Concert of Works by Chopin at the Chopin Monument in Lazienki Park

Group Lunch

Reuters (Warsaw office, host: Wojtek Moskwa)

 Evening Free in Warsaw

May 24 [Birthplace of Marie Sklodowska-Curie](http://www.ptchem.lodz.pl/en/museum.html)

[Maria Sklodowska-Curie Cancer Centre and Institute](http://www.uicc.org/publ/directory/plmscmc.html),

Afternoon and Evening: Free Time in Warsaw

May 25 Bus Tour of Warsaw

Evening Train to Krakow

May 26 Free Time in Krakow

 Coach to [Wieliczka Salt Mine](http://www.krakow-info.com/wielicz.htm)

May 27 Coach to [Auschwitz Death Camp](http://www.krakow-info.com/auschwit.htm)

Overnight train trip to Prague

May 28 Early Morning: arrive Prague

 Visit statues in honor of Tycho Brahe and Johannes Kepler in the Castle District

Walking Tour of Prague

Evening at the National Theater, [Laterna Magica](http://www.travelcook.com/English/country/prague_theater.asp)

May 29 Free day in Prague

Overnight train trip to Warsaw

May 30 Early morning arrival in Warsaw

Journals Collected

Free day in Warsaw

Group Dinner

May 31 Flight back to United States

Topics of Student Talks (gender, major, year in college of presenter)(Places Delivered)

“Traveling with the Atom: London and Paris”

1. “He is More Than Just a Picture: He is Sir Isaac Newton,”(M, physics, 2)(by bust, Leicester Square, London)
2. “Humphry Davy: the Poet, the Chemist, the Legend,”(F, chemistry, 3)(in Youth Hostel, London before trip to Royal Institution)
3. “Lord Kelvin,”(F, chemistry, 2)(in Westminster Abbey gathered at the grave of Wm. Herschel)
4. “All Science is Either Physics or Stamp Collecting, A Brief Insight into the Life of Ernest Rutherford,”(M, physics, 4)(The Science Museum, London)
5. “Sir Joseph John Thomson,”(F, chemistry, 2)(in coach on the way to Cambridge and the Cavendish)
6. “James Chadwick: the Mystery of the Neutral Particle,”(M, biophysics, 2)(in coach in transit)
7. “James Clerk Maxwell, A Bright Guy,”(M, physics, 4) (in coach in transit)
8. “James D. Watson and Francis Crick,”(F, biology, 1)(at the Eagle Pub, Cambridge where they celebrated)
9. “Stephen Hawking: Physicist and Family Man,”(F, chemistry, 3)(Steps of University College on Oxford Science Walk)

10. “Lavoisier: 13 Blinks into the Future,”(F, chemistry, 2)(in Victoria Station preparing for trip to Paris)

11. “Marie & Pierre Curie,”(F, biology, 1) (in Victoria Station)

12. “Louis Pasteur,”(F, chemistry, 2) (in his former office at the Ecole Normale Supérieure, Paris)

13. “Count Alessandro Volta, the Life,”(M, physics, 2) (on the steps of Musee Curie, Paris)

14. “Benjamin Franklin’s Contribution to Atomic Theory,”(M, biophysics, 2)(in front of Franklin statue, Passy District, Paris)

Topics of Student Talks (gender, major, year in college of presenter)(Places Delivered)

“Traveling in the Liberal Arts Tradition: Berlin, Leipzig, Warsaw, and Prague”

1. “Kaiser Wilhelm Memorial Church,”(F, Math,2) (at church)
2. “History of the Ku’-damm,”(F, Political Science, 2) (at Europa Plaza)
3. “The Hotel Bogota,”(M, Chemistry, 2)(at the Hotel Bogota)
4. “The Berlin Wall,”(M, Biology/German, 1)(at the hotel)
5. “Heisenberg and the German A Bomb,”(M, Chemistry, 2)(at hotel)
6. “Fritz Haber and Chemical Warfare,”(M, Chemistry, 1)(at hotel)
7. “Emil Fisher,”(F, Chemistry, 2) (base of statue at Max Planck Institute)
8. “History of the Brandenburg Gate,” (F, Math, 2)(at gate)
9. “Book Burnings at Babelplatz,”(F, Chemistry, 3)(at site)

10. “Reichstag and the Rise of Nazism,”(M, History, 4) (at hotel)

11. “Berlin after Reunification,”(M, Economics & Political Science, 1) (at hotel)

12. “Beethoven,”(F, Chemistry, 3)(at hotel just before concert)

13. “Johannes Brahms,”(F, Political Science, 2)(in coach in transit)

14. “Felix Mendelssohn,”(M, Biochemistry,4) (in coach in transit)

15. “Short History of WWI and WWII,”(M, History, 4) (in coach in transit)

16. “Economic Competitiveness in Germany,” (M, Economics, 2) (in coach in transit)

17. “Auerbach’s Kellar in Goethe’s Faust,”(M, Biology/German, 1)(under the statues of Mephistopheles and Faust at the entrance to the restaurant)

18. “Mendeleev’s Eka-Elements,”(F, Chemistry, 2) (YH before trip to Freiberg, home of Clemens Winkler)

19. “The European Union, History and Current Extension,” (F, Political Science/History, 2) (in coach from Leipzig to Wroclaw)

20. “Movements of the Polish-German Border,” (M, Economics, 3)(at the border)

21. “The History of Wroclaw,”(M, Political Science, 4)(overlooking the city)

22. “Basic Economic Statistics: Germany, Poland, Czech Republic,” (M, Economics, 2) (in coach heading toward Warsaw)

23. “The Warsaw Uprising,”(M, Political Science, 4)(by “The Boy Insurgent”)

24. “Frederic Chopin,”(M, Chemistry, 1) (at Lazienki Park after live Chopin piano concert)

25. “Stansilaw August Poniatowski, the Last King of Poland,”(F, Political Science/History, 2) (at his “Palace on the Water”)

26. “Reuters News Agency,” (F, History, 2)(at the agency)

27. “Marie Curie and Radium,” (F, Chemistry, 3) (at Skladovska-Curie Cancer Center)

28. “Marie Curie Activities in WWI,”(F, Biochemistry, 1)(at Center)

29. “Marek Edelman & the Ghetto Uprising,”(M, Biochemistry, 2)(at Traffica Bookstore, Warsaw)

30. “Comparative Corruption in Poland and Czech Republic,”(M, Economics, 3)(Traffica bookstore, Warsaw)

31. “History of Krakow,” (M, Economics, 2)(at hotel in Krakow)

32. “Zyklon B in the Gas Chambers,” (F, Biochemistry, 1) (in coach in transit to Auschwitz)

33. “History of Prague,” (M, Biochemistry, 2)(in hotel in Prague)

34. “Prague Spring,” (F, History, 2)(in hotel)

35. “Johannes Kepler,” (M, Biochemistry, 4)(at Kepler and Brahe statues in Prague)

36. “The Velvet Revolution,” (M, Economics/Political Science, 1) (in hotel)

37. “Similarities and Differences in Selected Products in Three Countries,” (M, Economics, 2) (in hotel)

38. “Comparative Educational Systems in Three Countries,” (F, Chemistry, 3)(in park in Warsaw)

References:

1. “The Scientific Traveler, A Guide to the People, Places & Institutions of Europe”, C. Tanford and J. Reynolds, John Wiley & Sons, Inc., New York (1992).

2. “A Travel Guide to Scientific Sites of the British Isles, A Guide to the People, Places and Landmarks of Science”, C. Tanford and J. Reynolds, John Wiley & Sons, NY (1995).

3. “Our Scientific Heritage, An A-Z of Great Britain and Ireland”, Trevor I. Williams, Sutton, Phoenix Mill (1996).

4. “Guide of European Museums with Collections on History of Chemistry”, compiled by Jan W. van Spronsen, Federation of European Chemical Societies, Antwerp (1996).