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BIBLIOGRAPHY ON PHILOSOPHY OF CHEMISTRY

The term philosophy of chemistry is here construed broadly to include some publications from the history of chemistry and chemical education. Of course this initial selection of material has inevitably been biased by the interests of the author.

This bibliography supersedes that of van Brakel and Vermeeren (1981), although no attempt has been made to include every single one of their entries, especially in languages other than English. Also, readers interested particularly in articles in German may wish to consult the bibliography by Dittus and Mayer which also contains some material not included here (Dittus and Mayer, 1992).

The aim is to maintain an up-to-date version of this bibliography and to publish a revised version in due course. Suggestions for further inclusions should be sent to the author.

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REFERENCES

- Abe, Y.: 1981, 'Pauling's Revolutionary Role in the Development of Quantum Chemistry', *Historia Scientiarum* **20**, 107–24.
- Abir-Am, P.: 1987, 'The Biotheoretical Gathering, Transdisciplinary Authority and the Incipient Legitimation of Molecular Biology in the 1930s', *History of Science* **25**, 1–70.
- Abir-Am, P.: 1992, 'The Politics of Macromolecules: Molecular Biologists, Biochemists and Rhetoric', *Osiris 2nd series* **7**, 210–37.
- ACS: 1963, American Chemical Society Council Committee, 'Chemistry and Chemists', *Chemical Engineering News* **41**, 70–1.
- Akeroyd, F. M.: 1993, 'Laudan's Problem Solving Model', *British Journal for the Philosophy of Science* **44**, 785–88.
- Akeroyd, F. M.: 1991, 'A Practical Example of Grue', *British Journal for the Philosophy of Science* **42**, 534–9.
- Akeroyd, F. M.: 1990, 'An Oscillatory Model of the Growth of Scientific Knowledge', *British Journal for the Philosophy of Science* **41**, 407–14.

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- Akeroyd, F. M.: 1988, 'Research Programmes and Empirical Results', *British Journal for the Philosophy of Science* **39**, 51–8.
- Akeroyd, F. M.: 1986, 'A Challenge to the Followers of Lakatos', *British Journal for the Philosophy of Science* **37**, 359–62.
- Akeroyd, F. M.: 1985, 'Popper's Philosophy and Vitamin Theory', *Journal of Biological Education* **67**, 806–8.
- Akeroyd, F. M.: 1984, 'Chemistry, Biochemistry and the Growth of Knowledge', *Journal of Chemical Education* **61**, 434–6.
- Akeroyd, F. M.: 1984, 'Chemistry and Popperism', *Journal of Chemical Education* **61**, 697–8.
- Alborn, T. L.: 1989, 'Negotiating Notation: Chemical Symbols and British Society, 1821–1835', *Annals of Science* **46**, 437–60.
- Albury, W. R.: 1972, 'The Logic of Condillac and the Structure of French Chemical and Biological Theory', Ph.D. Dissertation, Johns Hopkins University, Baltimore.
- Alexander, P.: 1985, *Qualities and Corpuscles: Boyle on the External World*, Cambridge University Press, Cambridge.
- Allchin, D.: 1992, 'How Do You Falsify a Question? Crucial Tests Versus Crucial Demonstrations', *PSA* **1**, 74–88.
- Allchin, D.: 1994, 'The Super Bowl and the Ox-Phos Controversy: "Winner Takes All" Competition in Philosophy of Science', in D. Hull, R. Burian (eds.), *PSA 1994*, Philosophy of Science Association, East Lansing, MI, pp. 22–33.
- Allchin, D.: 1996, 'Cellular and Theoretical Chimeras: Piecing Together How Cells Process Energy', *Studies in History and Philosophy of Science* **27**, 31–41.
- Amman, A. and W. Gans: 1989, 'Theoretical Chemistry en Route to a Theory of Chemistry', *Angewandte Chemie, International Edition in English* **28**, 268–76.
- Amman, A.: 1992, 'Must a Molecule Have a Shape?' *South African Journal of Chemistry* **45**, 29–38.
- Anderson, W. C.: 1984, *Between the Library and the Laboratory: The Language of Chemistry in Eighteenth Century France*, Johns Hopkins University Press, Baltimore.
- Assmus, A.: 1990, 'Molecular Structure and the Genesis of the American Quantum Physics Community 1916–1926', Ph.D. dissertation, Harvard University, Cambridge, MA.
- Assmus, A.: 1992, 'Molecular Structure and the Genesis of the American Quantum Physics Community, 1916–1926', *Historical Studies in the Physical Sciences* **22**, 209–31.
- Bachelard, G.: 1933, *Les Intuitions Atomistiques: Essai de Classification*, Ancienne Librairie Furne, Paris.
- Bachelard, G.: 1932, *Le Pluralisme Cohérent de la Chimie Moderne*, Vrin, Paris, 2nd edition, 1973.
- Baird, D.: 1993, 'Analytical Chemistry and the Big Scientific Instrumentation Revolution', *Annals of Science* **50**, 267–90.
- Balaban, A. vb T.: 1986, 'Symmetry in Chemical Structures and Reactions', *Computing and Maths with Applications* **12B**(3/4): 999–1020.
- Balashov: 1992, 'On the Evolution of Natural Laws', *British Journal for the Philosophy of Science* **43**, 343–70.
- Balzer, W., U. Moulines, and J. D. Sneed: 1987, 'The Structure of Daltonian Stoichiometry', *Erkenntnis* **26**, 103–27.
- Bantz, D. A.: 1976, 'The Structure of Discovery (Chemical Bond)', Ph.D. dissertation, Urbana University, Urbana.
- Barkan, D. Kormos: 1990, 'Walther Nernst and the Transition to Modern Physical Chemistry', Ph.D. dissertation. Harvard University, Cambridge, MA.

- Barkan, D. Kormos: 1992, 'The Usable Past: Creating Disciplinary Space for Physical Chemistry', in M. J. Nye et al. (eds.), *The Invention of the Physical Sciences*, Kluwer, Dordrecht, pp. 157–202.
- Barrio, C.: 1992, 'Química Estructural: Genesis, presupuestos y reconstrucción histórica', *El Basilico* **13**, 59–73.
- Bayer, O.: 1964, 'Die Rolle des Zufalls in der organischen Chemie', Vortrag, Köln, Opladen.
- Bechstedt, M.: 1980, 'Gestaltliche Atomlehre Zur Deutschen Chemie im NS-Staat', in H. Mehrtens and S. Richter (eds.), *Naturwissenschaft, Technik und NS-Ideologie*, Suhrkamp, Frankfurt am Main, pp. 142–165.
- Benfey, O. T. (ed.): 1963, *Classics in the Theory of Chemical Combination*, Dover, New York.
- Benfey, O. T.: 1975, *From Vital Force to Structural Formulas*, American Chemical Society, Washington, D.C.
- Benfey, O. T.: 1982, 'The Concepts of Chemistry-Mechanical, Organicist, Magical or What?' *Journal of Chemical Education* **59**, 389–95.
- Benfey, O. T.: 1963, 'Concepts of Time in Chemistry', *Journal of Chemical Education* **40**, 574–7.
- Benfey, O. T.: 1957, 'Dimensional Analysis of Chemical Laws', *Journal of Chemical Education* **34**, 286–8.
- Benfey, O. T.: 1965, 'The Great Chain of Being and the Periodic Table of the Elements', *Journal of Chemical Education* **42**, 39–41.
- Ben Gershom, E.: 1983, 'Ethical Aspects of Clinical Chemistry', *Journal of Medical Ethics* **9**, 207–10.
- Bensaude, B.: 1974, 'Histoires de la Chimie', *Critiques Françaises* **30**, 790–9.
- Bensaude-Vincent, B.: 1990, 'Un essai de vulgarisation', in *Etudes sur Hélène Metzger*, Brill, Leiden.
- Bensaude-Vincent, B.: 1983, 'A Founder Myth in the History of Science?' in L. Graham, W. Lepenis and P. Weingart (eds.), *Functions and Uses of Disciplinary Histories* vol. viii, Kluwer, Dordrecht, pp. 53–78.
- Bensaude-Vincent, B.: 1990, 'A View of the Chemical Revolution through Contemporary Textbooks: Lavoisier, Fourcroy and Chaptal', *British Journal for the History of Science* **23**, 435–460.
- Bensaude-Vincent, B.: 1993, *Lavoisier: Mémoires d'une Révolution*, Flammarion, Paris.
- Bensaude-Vincent, B. and F. Abbri (eds.): 1995, *Lavoisier in European Context: Negotiating a New Language for Chemistry*, Science History Publications, Canton, MA.
- Bent, H.: 1980, 'Einstein and Chemical Thought', *Journal of Chemical Education* **57**, 395–405.
- Bernatowicz, A.: 1970, 'J. Dalton's Rule of Simplicity', *Journal of Chemical Education* **47**, 577–579.
- Bhushan, N. and S. Rosenfeld: 1995, 'Metaphorical Models in Chemistry', *Journal of Chemical Education* **7**, 578–82.
- Bigot, B. and F. Volatron: 1984, 'Parlez-vous chimie théorique?', *Actualité Chimique*, November, 43–51.
- Blinder, S. M.: 1981, 'Quantum Chemistry via the Periodic Law', *Journal of Chemical Education* **58**, 761–3.
- Bogaard, Paul, A.: 1978, 'The Limitations of Physics as a Chemical Reducing Agent', *PSA* **2**, 345–56.
- Boll, M.: 1913, 'La Philosophie chimique', *Revue Positiviste Internationale* **13**, 269–289.

- Bradley, J.: 1962, 'Discussion of Professor Paneth's Article', *British Journal for the Philosophy of Science* **13**, 316–7.
- Bradley, J.: 1955, 'On the Operational Interpretation of Cassical Chemistry', *British Journal for the Philosophy of Science* **6**, 32–42.
- Bredig, G.: 1923, 'Denkmethode der Chemie', J. A. Barth, Leipzig.
- Brescia, F.: 1976, 'Equivalents – a Winner or a Dead Horse', *Journal of Chemical Education* **53**, 362–365.
- Brock, W.: 1992, 'Essays on Chemical Ideas, Review of Ideas in Chemistry, A History of the Science', in D. M. Knight (ed.), *History of Science* **30**, 339–442.
- Brock, W. H. and D. M. Knight: 1965, 'The Atomic Debates', *Isis* **56**, 5–25.
- Brock, W. H. (ed.): 1967, *The Atomic Debates: Brodie and the Rejection of the Atomic Theory*, Leicester University Press, Leicester.
- Brock, W. H.: 1986, 'The British Association Committee on Chemical Symbols in 1834', *Ambix* **33**, 33–37.
- Brooke, John, H.: 1975, 'Laurent, Gerhardt and the Philosophy of Chemistry', *Historical Studies in the Physical Sciences* **6**, 405–29.
- Brooke, John H.: 1973, 'Chlorine Substitution and the Future of Organic Chemistry', *Studies in History and Philosophy of Science* **4**, 47–94.
- Brooke, John, H.: 1971, 'Organic Synthesis and the Unification of Chemistry', *British Journal for the History of Science* **5**, 363–92.
- Brooke, J. H.: 1987, 'Methods and Methodology in the Development of Organic Chemistry', *Ambix* **34**, 147–155.
- Brown, T. M. and A. T. Dronsfield: 1991, 'The Phlogiston Theory Revisited', *Education in Chemistry* (March), 43–45.
- Brunold, C.: 1930, *Le problème de l'affinité chimique et l'atomistique: Étude du rapprochement actuel de la physique et de la chimie*, Masson, Paris.
- Buchdahl, G.: 1959, 'Sources of Scepticism in Atomic Theory', *British Journal for the Philosophy of Science* **10**, 120–34.
- Bud, R. F. and G. K. Roberts: 1984, *Science versus Practice: Chemistry in Victorian Britain*, Manchester University Press, Manchester.
- Bunge, M.: 1982, 'Is Chemistry a Branch of Physics', *Zeitschrift für allgemeine Wissenschaftstheorie* **13**, 209–23.
- Bykov, G. V.: 1965, 'Historical Sketch of the Electron Theories of Organic Chemistry', *Chymia* **10**, 199–253.
- Caldin, T.: 1950, 'Science and Philosophy', *British Journal for the Philosophy of Science* **1**, 196–210.
- Caldin, E. F.: 1961, *The Structure of Chemistry in Relation to the Philosophy of Science*, Sheed and Ward, New York.
- Caldin, E. F.: 1959, 'Theories and the Development of Chemistry', *British Journal for the Philosophy of Science* **10**, 209–22.
- Caldin, Edward F.: 1958, 'Scientific Method in Chemistry', *Proceedings of the Chemical Society*, 269–74.
- Carrier, M.: 1988, 'Some Aspects of Hélène Metzger's Philosophy of Science', *Corpus* **8/9**, 135–150.
- Carrier, M.: 1990, 'Kants Theorie der Materie und ihre Wirkung auf die zeitgenössische Chemie', *Kantstudien* **81**, 170–210.
- Carrier, M.: 1986, 'Newton's Ideas on the Structure of Matter and their Impact on Eighteenth Century Chemistry', *International Studies in Philosophy of Science* **1**, 85–105.

- Carus, P.: 1907, 'Professor Ostwald's Philosophy: An Appreciation and Criticism', *The Monist* **17**, 516–40.
- Cassebaum, H., G. B. Kauffman: 1971, 'The Periodic System of the Chemical Elements, The Search for its Discoverer', *Isis* **62**, 314–27.
- Cassier, E.: 1923, *Substance and Function*, Open Court, Chicago (extensive use of chemical examples).
- Causey, R. L.: 1971, 'Avagadro's Hypothesis and the Duhemian Pitfall', *Journal of Chemical Education* **48**, 365–67.
- Causey, R. L.: 1972, 'Uniform Microreductions', *Synthese* **25**, 176–218.
- Cavanna, D. and S. Rochietta: 1959, 'The Symbolic Language of Chemistry', *Minerva Farm* **8**, 204–8.
- Chayut, M. and J. J. Thomson: 1991, 'The Discovery of the Electron and the Chemists', *Annals of Science* **48**, 527–44.
- Christie, J. R.: 1990, 'Helène Metzger et l'histoire de la chimie du XVIIIe siècle', in *Etudes sur Helène Metzger*, Leiden, Netherlands.
- Christie, M.: 1994, 'Philosophers versus Chemists Concerning Laws of Nature', *Studies in History and Philosophy of Science* **25**, 613–29.
- Churchman, C. W. and B. G. Buchanan: 1969, 'On the Design of Inductive Systems', *British Journal for the Philosophy of Science* **20**, 311–23.
- Cole, T. Jr. and Dalton: 1978, 'Mixed Gases, and the Origin of the Chemical Atomic Theory', *Ambix* **25**, 117–30.
- Cotham, J. C.: 1982, 'Philosophic Insight into Theory Development and Chemical Education', *Journal of Chemical Education* **59**, 294–5.
- Coulson, C. A.: 1974, 'Theoretical Chemistry: Past and Future', in S. L. Altman (ed.), *Lecture delivered before The University of Oxford, 23 February 1973*. Clarendon, Oxford.
- Craig, D. P.: 1964, 'The Changing Concept of Aromatic Character', *Education in Chemistry* **1**, 136–43.
- Crosland, M. R.: 1962, *Historical Studies in the Language of Chemistry*, Heinemann, London, Melbourne, Toronto.
- Dahaner, W. J.: 1988, *Insight in Chemistry*, Lanham, London.
- Danzer, K.: 1967, 'Das Periodensystem der chemischen Elemente als grundlegendes Strukturgesetz der Chemie', *Wissenschaftliche Zeitschrift der Humbolt-Universität zu Berlin*, Mathematisch-Naturwissenschaftliche Reihe XVI, pp. 977–978.
- Davies, M.: 1990, 'C. R. Bury, L. Vegard, and the Electronic Interpretation of the Periodic Table, A Note', *Archive for the History of the Exact Sciences* **41**, 185–7.
- Debus, A. G.: 1988, 'The Chemical Philosophy and the Scientific Revolution', in: W. R. Shea (ed.), *Revolutions in Science: Their Meaning and Relevance*, Science History Publications, Canton, MA, pp. 27–48.
- Dehler, M.: 1983, 'Once Again on the Relations Between Physics and Chemistry [in German]', *Deutsche Zeitschrift für Philosophie* **31**, 373–5.
- Delacré, M.: 1923, *Essai de philosophie chimique*, Payot, Paris.
- Del Re, G.: 1987, 'The Historical perspective and the Specificity of Chemistry', *Epistemologia* **X**, 231–40.
- Del Re, G.: 1986, 'G. Villani and P. Severino: On the Specificity of Chemical Explanation', in: *Atti del Congresso Logica e Filosofia della Scienza (Band 2)*, Bologna, pp. 263–266.
- Del Re, G.: 1986, 'Modelli matematici della struttura molecolare', *Synthesis* **2/3**, 77–85.
- Del Re, G.: 1974, 'Current Problems and Perspectives in the MO-LCAO Theory of Molecules', *Advances in Quantum Chemistry* **8**, 95–136.

- Del Re, G. and P. Severino: 1985, 'Reaction Mechanisms and Chemical Explanation', *Proceedings of the First Italian Congress of History of Chemistry*, Turin.
- Del Re, G. and P. Severino: 1986, 'On the Specificity of Chemical Explanation', *Atti del Congresso Logica e Filosofia della Scienza II*: Bologna, pp. 263–266.
- Deltete, R. J.: 1983, 'The Energetics Controversy in Late Nineteenth Century Germany: Helm, Ostwald and their Critics', Ph.D. dissertation, Yale University, New Haven.
- deMilt, C.: 1953, 'Auguste Laurent, Founder of Modern Organic Chemistry', *Chymia* **4**, 85–114.
- deMilt, C.: 1948, 'Carl Weltzien and the Congress at Karlsruhe', *Chymia* **1**, 153–69.
- Denbigh, K. G.: 1985, *Entropy in Relation to Incomplete Knowledge*, California University Press, Cambridge, UK, New York.
- Denbigh, K. G.: 1981, *The Principles of Chemical Equilibrium: With Application in Chemistry and Chemical Engineering*, 4th ed., California University Press, Cambridge, UK, New York.
- Denbigh, K. G.: 1975, *An Inventive Universe*, G. Braziller, New York.
- Dingle, H. and G. R. Martin: 1964, *Chemistry and Beyond, A Selection from the Writings of the Late Professor F. A. Paneth*, Wiley-Interscience, New York.
- Dittus, S. and M. Mayer: 1992, 'Bibliographie Chemie und Geisteswissenschaften', in J. Mittelstrass and G. Stock (eds.), *Chemie und Geisteswissenschaften*, Akademie Verlag, Berlin, pp. 217–334.
- Dobbs, B. J. T.: 1975, *The Foundations of Newton's Alchemy*, Cambridge University Press, Cambridge.
- Dolby, R. G. A.: 1976, 'Debates over the Theory of Solution: A Study of Dissent in Physical Chemistry in the English-Speaking World in the Late Nineteenth and Early Twentieth Centuries', *History Studies of Physical Sciences* **7**, 297–404.
- Donovan, A.: 1975, *Philosophical Chemistry in the Scottish Enlightenment: The Doctrines and Discoveries of William Cullen and Joseph Black*, Edinburgh University Press, Edinburgh.
- Donovan, A.: 1988, 'Lavoisier and the Origins of Modern Chemistry', in A. Donovan (ed.), *Osiris*, ser. 4: 214–231.
- Duhem, P.: 1899, 'Une science nouvelle: La chimie physique', *Revue Philomatique de Bordeaux et du Sud-Ouest*, 205–219, 260–280.
- Duke, B. J.: 1978, 'Stability of Electron Pairs – A Myth', *Education in Chemistry* **15**, 186–8.
- Dumas, J.: 1837, in: M. Bineau (ed.), *Leçons sur la Philosophie Chimique*, Ebrard, Paris.
- Dumas, M.: 1946, *L'Acte chimique. Essai sur l'histoire de la philosophie chimique (L'Humanisme Scientifique)*, Éditions du Sablon, Bruxelles.
- Duncan, A. M.: 1981, 'Styles of Language and Modes of Chemical Thought', *Ambix* **28**, 83–107.
- Early, J. E.: 1992, 'The Nature of Chemical Existence', in P. A. Bogaard and G. Treash (eds.), *Metaphysics as Foundation, Essays in Honour of Ivor Leclerc*, State University of New York Press, New York.
- Early, J. E.: 1981, 'Self-Organisation and Agency: In Chemistry and in Process Philosophy', *Process Studis* **11**, 242–58.
- Eyring, H.: 1976, 'Physical Chemistry: The Past 100 Years', *Chemical & Engineering News* **54**, 88–104.
- Elsasser, W. M.: 1969, 'Can Biology Be Reduced into Chemistry and Physics, and Vice Versa?', *International Journal of Quantum Chemistry*, **IIIS**, 347–348.

- Emerton, N. E.: 1984, *The Scientific Reinterpretation of Form*, Cornell University Press, Ithaca, NY.
- Epiotis, N. D.: 1996, 'Deciphering the Chemical Code', VCH Publishers, New York–Weinheim–Cambridge.
- Farber, E.: 1950, 'Chemical Discoveries by Means of Analogy', *Isis* **41**, 20–26.
- Farber, E.: 1966, 'Dreams and Visions in a Century of Chemistry, in Kekulé Centennial: A Symposium', Washington D.C., American Chemical Society, pp. 129–139.
- Farrar, W. V.: 1965, 'Nineteenth-Century Speculations on the Complexity of the Chemical Elements', *British Journal for the History of Science* **2**, 297–323.
- Fichman, M.: 1971, 'French Stahlism and Chemical Studies of Air', *Ambix* **18**, 94–122.
- Figurovsky, N. A.: 1962, 'General Problems of History of Chemistry', *Quarterly Journal of History of Science and Technology*, **6**, 78–89.
- Fischer, J. L.: 1967, 'Struktur und Prozess', *Wissenschaftliche Zeitschrift der Humboldt-Universität zu Berlin*, Mathematisch-Naturwissenschaftliche Reihe XVI, 957–960.
- Fisher, N. W.: 1974, 'Kekulé and Organic Classification', *Ambix* **21**, 29–52.
- Fisher, N. W.: 1973, 'Organic Classification before Kekulé; Part I and II', *Ambix* **20**, 106–31, 209–33.
- Fleck, G. M.: 1963, 'Atomism in Late Nineteenth Century Physical Chemistry', *Journal for the History of Ideas* **24**, 106–14.
- Fox, R.: 1971, *The Caloric Theory of Gases: From Lavoisier to Regnault*, Oxford University Press, Oxford.
- Friedel, R.: 1993, 'Defining Chemistry: Origins of the Heroic Chemist', in: S. Maukopf (ed.), *Chemical Sciences in the Modern World*, University of Pennsylvania Press, Philadelphia.
- Frike, M.: 1976, 'The Rejection of Avogadro's Hypothesis', in C. Howson, *Method and Appraisal in the Physical Sciences*, Cambridge University Press, Cambridge, pp. 277–308.
- Fritzsche, L.: 1974, 'Qualite-une notion', *Deutsche Zeitschrift für Philosophie* **22**, 75–82.
- Fuchs, G.: 1967, 'Philosophisches zu Strukturproblemen in der Chemie', *Wiss. Zs. Humb. Univ. (Math.-Nat. Reihe)* **16**, 963–967.
- Gascoine, R. M.: 1961, 'Basic Concepts of Modern Chemistry', in G. H. Ayrward (ed.), *Approach to Chemistry*, Sydney University Press, New South Wales, pp. 68–80.
- Gavroglu, K.: 1990, 'The Reaction of the British Physicists and Chemists to van der Waals' Early Work and to the Law of Corresponding States', *Historical Studies in the Physical Sciences* **20**, 199–237.
- Gavroglu, K., Simoes, A.: 1994, 'The Americans, the Germans, and the Beginnings of Quantum Chemistry: The Confluence of Diverging Traditions', *Historical Studies in Physical Sciences* **25**, 47–110.
- Gavroglu, K.: 1995, *Fritz London (1900–1954). A Scientific Biography*, Cambridge University Press, Cambridge.
- Gay, H.: 1976, 'Radicals and Types', *History and Philosophy of Science* **7**, 1–51.
- Gay, H.: 1978, 'The Assymmetric Carbon Atom', *Studies in History and Philosophy of Science* **9**, 207–308.
- Geison, G. L. and J. A. Secord: 1988, 'Pasteur and the Process of Discovery: The Case of Optical Isomerism', *Isis* **79**, 7–36.
- Gieryn, T. F.: 1992, 'The Ballad of Pons and Fleishmann', in E. McMullin (ed.), *The Social Dimensions of Science*, University of Notre Dame, Notre Dame, IN.
- Glas, E.: 1981, *Chemistry and Physiology in Their Historical and Philosophical Relations*, Delft University Press, Delft.

- Goldwhite, H.: 1975, 'Clio and Chemistry: A Divorce Has Been Arranged', *Journal of Chemical Education* **52**, 645–648.
- Goldwhite, H.: 1978, 'Gay Lussac after 200 Years', *Journal of Chemical Education* **55**, 366–8.
- Golinski, J.: 1990, 'Hélène Metzger et l'Interpretation de la chimie du XVIIe siècle', in *Etudes sur Hélène Metzger*, Brill, Leiden.
- Golinski, J.: 1992, *Science and Public Culture: Chemistry and Enlightenment in Britain*, Cambridge University Press, Cambridge.
- Good, R. J.: 1980, 'Surface Chemistry and the Difference between Search and Research', *Chemtech* **10**, 100–9.
- Goodfriend, P. L.: 1966, 'Concepts of Species and State in Chemistry and Molecular Physics', *Journal of Chemical Education* **43**, 95–7.
- Gorman, M.: 1960, 'Philosophical Antecedents of the Modern Atom', *Journal of Chemical Education* **37**, 100–4.
- Gregory, F.: 1984, 'Romantic Kantianism and the end of the Newtonian Dream in Chemistry', *Archives Internationales d'Histoire des Sciences* **34**, 108–23.
- Guerlac, H.: 1959, 'Some French Antecedents of the Chemical Revolution', *Chymia* **5**, 73–112.
- Guerlac, H.: 1961, 'Quantification in Chemistry', *Isis* **52**, 194–214.
- Hall, P. J.: 1986, 'The Pauli Exclusion Principle and the Foundation of Chemistry', *Synthese* **69**, 267–72.
- Hannaway, O.: 1987, 'Chemistry Deconstructed', *Isis* **78**, 82–85.
- Heilbron, J. L., Kuhn, T. S.: 1969, 'The Genesis of the Bohr Atom', *Historical Studies in the Physical Sciences* **1**, 211–90.
- Hein, H. and G. E. Hine: 1966, 'The Chemistry of Noble Gases', *Journal for the History of Ideas* **27**, 417–28.
- Heitler, W.: 1963, 'Life Is Not Chemistry', in K. E. Schaeffer (ed.), *A New Image of Man in Medicine*, Basic Books, New York, pp. 1–10.
- Hess, B.: 1990, 'Order and Chaos in Chemistry and Biology', *Journal Analytical Chemistry* **337**, 459–68.
- Hetling, L.: 'Setting Environmental Standards for Toxic Chemicals', in D. Teichler-Zallen (ed.), *Science and Morality*, Lexington Books, Lexington, MA, pp. 201–204.
- Hettema, H. and T. A. Kuipers: 1988, 'The Periodic Table – Its Formalisation, Status and Relation to Atomic Theory', *Erkenntnis* **28**, 387–408.
- Hiebert, E. N.: 1959, 'The Experimental Basis of Kekulé's Valency Theory', *Journal of Chemical Education* **36**, 320–27.
- Hiebert, E. N.: 1968, 'The Conception of Thermodynamics in the Scientific Thought of Mach and Planck', *Wissenschaftlicher Bericht* **5**.
- Hiebert, E. N.: 1971, 'The Energetics Controversy and the New Thermodynamics', in D. H. D. Roller (ed.), *Perspectives in the History of Science and Technology*, University of Oklahoma Press, Norman, OK, pp. 67–86.
- Hiebert, E. N.: 1978, 'Nernst and Electrochemistry', in: G. Dubpernell and J. H. Westbrook (eds.), *Selected Topics in the History of Electrochemistry*, Electrochemical Society, Princeton, pp. 180–200.
- Hiebert, E. N.: 1982, 'Developments in Physical Chemistry at the Turn of the Century', in C. G. Bernhard, E. Crawford and P. Sorbom (eds.), *Science, Technology and Society in the Time of Alfred Nobel*, Oxford University Press, Oxford, pp. 97–118.

- Hiebert, E. N.: 1983, 'Walther Nernst and the Application of Physics to Chemistry', in R. Aris, H. T. Davis and R. Stuewer (eds.), *Springs of Scientific Creativity*, University of Minnesota Press, Minneapolis, pp. 203–31.
- Hirschfelder, J.: 1983, 'My Adventures in Theoretical Chemistry', *Annual Reviews of Physical Chemistry* **33**, 1–29.
- Hoenen, P.: 1960, *The Philosophy of Inorganic Compounds*, West Baden College, West Baden, IN.
- Hoffman, J. R.: 1990, 'How the Models of Chemistry Vie', *PSA* **1**, 405–19.
- Hoffman, J. R. and Hoffman, P. A.: 1992, 'Darcy's Law and Structural Explanation in Hydrology', *PSA* **1**, 23–35.
- Hoffman, R. and P. Laszlo: 1991, 'Representation in Chemistry', *Angewandte Chemie International Edition in English* **30**, 1–16.
- Hoffman, R.: 1988, 'Nearly Circular Reasoning', *American Scientist* **76**, 182–5.
- Hoffman, R.: 1990, 'Molecular Beauty', *The Journal of Aesthetics and Art Criticisms* **48**, 191–204.
- Hoffman, R.: 1991, 'Creation and Discovery', *American Scientist* **78**, 14–15.
- Hoffman, R. and V. Torrence: 1993, *Chemistry Imagined*, Smithsonian Institution Press, Washington and London.
- Hoffmann, R.: 1995, *The Same and Not the Same*, Columbia University Press, New York.
- Hoffman, R., V. I. Minkin, and B. K. Carpenter: 1996, 'Ockham's Razor and Chemistry', *Bulletin de la Société de Chimie Française* **133**, 117–30.
- Holliday, L.: 1976, 'Chemistry: Science of the Third Order?', *Chemistry and Industry* (May 13), 775–6.
- Holmes, F. L.: 1985, *Lavoisier and the Chemistry of Life*, The University of Wisconsin Press, Madison.
- Holmes, F. L.: 1962, 'From Elective Affinities to Chemical Equilibria: Berthollet's Law of Mass Action', *Chymia* **8**, 105–45.
- Holton, G. et al.: 1968, 'Do Life Processes Transcend Physics and Chemistry?', *Zygon* **3**, 442–72.
- Hooykas, R.: 1958, 'The Concepts of 'Individual' and 'Species' in Chemistry', *Centaurus* **5**, 307–22.
- Hooykas, R.: 1948, 'The Discrimination Between 'Natural' and 'Artificial' Substances and the Development of Corpuscular Theory', *Archives Internationales d'Histoire des Sciences* **4**, 640–51.
- Howson, C.: 1976, *Method and Appraisal in the Physical Sciences*, Cambridge University Press, Cambridge.
- Howson, C. and A. Franklin: 1991, 'Maher, Mendeleev and Bayesianism', *Philosophy of Science* **58**, 574–85.
- Hund, F.: 1977, 'Early History of the Quantum Mechanical Treatment of the Chemical Bond', *Angewandte Chemie, International Edition in English* **16**, 87–91.
- Janich, P.: 1994, 'Protochemie', *Journal for General Philosophy of Science* **25**, 71–87.
- Janich, P. (Hrsg): 1994, *Philosophische Perspektiven der Chemie*, Bibliographisches Institut, Mannheim, Leipzig, Wien, Zurich.
- Janich, P. and N. Psarros (Hrsg): 1996, *Die Sprache der Chemie*, Koningshausen and Neumann, Würzburg.
- Jensen, W. B.: 1995, *Logic, History and the Teaching of Chemistry*, NEACT and Sacred Heart University, Fairfield, CT.
- Jensen, W. B.: 1990, 'Whatever Happened to the Nascent State?', *Bulletin for the History of Chemistry* **5**, 92.

- Jensen, W. B.: 1989, 'Thomas Duché Mitchell and the Chemistry of Principles', *Bulletin of the History of Chemistry* **5**, 42–8.
- Jensen, W. B.: 1986, 'Classification, Symmetry and the Periodic Table', *Computing and Mathematics with Applications* **12B**(1/2), 487–510.
- Jensen, W. B.: 1982, 'The Positions of Lanthanum (Actinium) and Lutetium (Lawrencium) in the Periodic Table', *Journal of Chemical Education* **59**, 634–6.
- Jørgensen, C. K.: 1973, 'The Loose Connection Between Electronic Configurations and the Chemical Behavior of the Heavy Elements (Transuranics)', *Angewandte Chemie (International Edition)* **12**, 12–19.
- Jørgensen, C. K.: 1979, 'The Periodic Table and Induction as Basis of Chemistry', *Journal de Chimie Physique* **76**, 630–35.
- Jungnickel, C.: 1979, 'Teaching and Research in the Physical Sciences and Mathematics in Saxony, 1820–1850', *Historical Studies in the Physical Sciences* **10**, 3–47.
- Kamlah, A.: 1984, 'A Logical Investigation of the Phlogiston Case', in W. Balzer et al. (eds.), *Reduction in Science*, Riedel, Dordrecht, pp. 217–238.
- Kapoor, S. C.: 1969, 'The Origins of Laurent's Organic Classification', *Isis* **60**, 477–527.
- Kapoor, S. C.: 1969, 'Dumas and Organic Classification', *Ambix* **16**, 1–65.
- Kapoor, S. C.: 1965, 'Berthollet, Proust, and Proportions', *Chymia* **10**, 53–110.
- Kargon, R.: 1965, 'Mendeleev's Chemical Ether, Electrons, and the Atomic Theory', *Journal of Chemical Education* **42**, 388–9.
- Kartiel, J. and R. Pauncz: 1977, 'Theoretical Interpretation of Hund's Rule', *Advances in Quantum Chemistry* **10**, 143–85.
- Katriel, J. and C. Jørgensen: 1982, 'Possible Broken Supersymmetry Behind Periodic Table', *Chemical Physics Letters* **87**, 315–8.
- Kendall, J.: 1929, *At Home Among the Atoms: A First Book of Congenial Chemistry*, Bell, London.
- Kim, M. G.: 1995, 'Labor and Mirage: Writing the History of Chemistry', *Studies in History and Philosophy of Science* **26**, 155–65.
- Klapper, M. H.: 1969, 'Truth and Aesthetics in Chemistry', *Chemical Education* **46**, 577–579.
- Klosterman, L. J.: 1985, 'A Research School of Chemistry in the Nineteenth Century: Jean-Baptiste Dumas and his Research Students', *Annals of Science* **42**, 1–8.
- Koertge, N.: 1980, 'Analysis as a Method of Discovery During the Scientific Revolution', in: Th. Nickles (ed.), *Scientific Discovery, Logic, and Rationality*, Reidel, Dordrecht.
- Knight, D.: 1993, 'Chemistry and Metaphors', *Chemistry and Industry* (20th December), 996–9.
- Knight, D.: 1992, *Ideas in Chemistry*, Athlone Press, London.
- Knight, D. M.: 1978, *The Transcendental Part of Chemistry*, Dawson, Folkstone, Kent.
- Kragh, H.: 1977, 'Chemical Aspects of Bohr's 1913 Theory', *Journal of Chemical Education* **54**, 208–10.
- Kragh, H.: 1979, 'Niels Bohr's Second Atomic Theory', *Historical Studies in the Physical Sciences* **10**, 123–86.
- Kragh, H.: 1982, 'Julius Thomsen and 19th-Century Speculations on the Complexity of Atoms', *Annals of Science* **39**, 37–60.
- Kultgen, J. H.: 1958, 'Philosophical Conceptions in Mendeleev's Principles of Chemistry', *Philosophy of Science* **25**, 177–84.
- Kursanov, D. N. et al.: 1952, 'The Present State of Chemical Structural Theory', *Journal of Chemical Education* **29**, 2–3.

- Kuunyanz, I. L.: 1969, 'The Present Status of the Theory of Structure', *Mend. Chem. J.* **14**, 609–617.
- Landsdown, B.: 1950, *The Chemical Background of the Atom* (Workbook of Scientific Thinking, 1), Dalton Book Shop, New York.
- Langmuir, I.: 1932, 'Modern Concepts in Physics and Their Relation to Chemistry', in: Annual Report of the Smithsonian Institute for 1930, Washington, D.C., pp. 219–241.
- LaPorte, J.: 1996, 'Chemical Kind Term Reference and the Discovery of Essence', *Nous* **30**, 112–32.
- Larder, D. F.: 1966, 'The Axiom of Simplicity in the Development of Chemistry', *Journal of Chemical Education* **43**, 490–1.
- Larder, D. F.: 1965, 'Prout's Hypothesis and Nineteenth Century Chemistry', *Education in Chemistry* **2**, 271–6.
- Lauth, B.: 1989, 'Reference Problems in Stoichiometry', *Erkenntnis* **30**, 339–62.
- Leegwater, A.: 1986, 'The Development of Wilhelm Ostwald's Chemical Energetics', *Centaurus* **29**, 314–37.
- Le Grand, H. E.: 1976, 'Berthollet's *Essai de statique chimique* and Acidity', *Isis* **67**, 227–38.
- Le Poidevin, R.: 1994, 'The Chemistry of Space', *Australian Journal of Philosophy* **72**, 77–88.
- Levere, T. H.: 1971, *Affinity and Matter: Elements of Chemical Philosophy*, Clarendon Press, Oxford.
- Levere, T. H.: 1970, 'Affinity or Structure: An Early Problem in Organic Chemistry', *Ambix* **17**, 111–26.
- Lévy, M.: 1979, 'Les Relations Entre Chimie et Physique et le Problème de Réduction', *Epistemologia* **II**, 337–70.
- Liegner, C. M. and G. Del Re: 1987, 'The Relation of Chemistry to Other Fields of Science: Atomism, Reductionism and Inversion of Reduction', *Epistemologia* **X**, 269–84.
- Liegner, Ch. and G. Del Re: 1987, 'Chemistry vs. Physics, the Reduction Myth, and the Unity of Science', *Zeitschrift allg. Wiss. Theorie* **18**, 165–174.
- Lowry, A.: 1974, 'A Note on Emergence', *Mind* **83**, 276–7.
- McEvoy, J. G.: 1983, 'Enlightenment and Dissent in Science: Joseph Priestley and the Limits of Theoretical Reasoning', *Enlightenment and Dissent* **ii**, 47–67.
- McEvoy, J. G.: 1987, 'Causes and Laws, Powers and Principles: The Metaphysical Foundations of Priestley's Concept of Phlogiston', in R. G. W. Anderson and Christopher Lawrence (eds.), *Science, Medicine and Dissent: Joseph Priestley (1733–1804)*, The Wellcome Trust and Science Museum, London, pp. 55–73.
- McEvoy, J. G.: 1988, 'Continuity and Discontinuity in the Chemical Revolution', *Osiris: 2nd series* **4**, 195–213.
- McEvoy, J. G.: 1988, 'The Enlightenment and the Chemical Revolution', in Roger Woolhouse (ed.), *Metaphysics and Philosophy of Science in the Seventeenth and Eighteenth Centuries. Essays in Honour of Gerd Buchdahl*, Kluwer Academic Publishers, Dordrecht, pp. 307–325.
- McEvoy, J. G.: 1992, 'The Chemical Revolution in Context', *The Eighteenth Century: Theory and Interpretation* **xxxiii**, 198–216.
- McEvoy, J. G.: 1997, 'Positivism, Whiggism, and the Chemical Revolution: A Study in the Historiography of Chemistry', *History, Science* **XXXV**, 1–33.
- McKinney, W. J.: 1991, 'Experimenting on and Experimenting with: Polywater and Experimental Realism', *British Journal for the Philosophy of Science* **42**, 295–307.
- Maccoll, A.: 1964, *Space and Time in Chemistry*, Lewis, London.

- MacDonald, D. K. C.: 1960, 'Comments on Caldin's View of Chemistry', *British Journal for the Philosophy of Science* **11**, 222–3.
- Malisoff, W. M.: 1941, 'Chemistry: Emergence Without Mystification', *Philosophy of Science* **8**, 39–52.
- Malissa, H.: 1990, 'Some Philosophical Fundamentals of Analytical Chemistry', *Fresenius Journal of Analytical Chemistry* **337**, 159–160.
- Mandelberg, C. J.: 1963, *Topics in Modern Chemistry*, Cleaver-Hume: London (includes a discussion of the role of models in chemistry).
- March, N. H.: 1983, 'Quantum Mechanics has Accounted for a Large Part of Physics and the Whole of Chemistry, True or False?', *Contemporary Physics* **24**(4), 373–87.
- Margenau, H.: 1981, 'Physics and the Doctrine of Reductionism', in J. Agassi and R. Cohen (eds.), *Scientific Philosophy Today*, Riedel, Dordrecht, pp. 187–199.
- Margenau, H.: 1944, 'The Exclusion Principle and its Philosophical Significance', *Philosophy of Science* **2**, 187–208.
- Mauskopf, S. H. (ed.): 1993, *Chemical Sciences in the Modern World*, University of Pennsylvania Press, Philadelphia.
- Mauskopf, S. H.: 1969, 'Thomson Before Dalton: Thomas Thomson's Considerations of the Issues of Combining Weight Proportions prior to his Acceptance of Dalton's Chemical Atomic Theory', *Ann. Sci.* **25**, 229–42.
- McClelland, C. E.: 1980, *State, Society, and University in Germany, 1700–1914*, Cambridge University Press, Cambridge, UK.
- Melhado, E. M.: 1981, *Jacob Berzelius: The Emergence of His Chemical System*, The University of Wisconsin Press, Madison, WI.
- Mellor, D. H.: 1977, 'Natural Kinds', *British Journal for the Philosophy of Science* **28**, 299–312.
- Metzger, H.: 1948, *Newton, Stahl, Boerhaave et la Doctrine Chimique*, Alcan, Paris.
- Metzger, H.: 1926, *Les Concepts Scientifiques*, Alcan, Paris. (extensive discussion of 17th and 18th century chemistry).
- Meyerson, E.: 1930, *Identity and Reality*, Allen and Unwin, London. (some uses of chemical examples).
- Millikan, R. C.: 1982, 'Why Teach Electronic Configurations of the Elements as We Do?', *Journal of Chemical Education* **59**, 757.
- Mittasch, A.: 1936, 'Über Zanzheit in der Chemie', *Angewandte Chemie International Edition in English* **49**, 417–20.
- Mittasch, A.: 1938, *Katalyse und Determinismus: Ein Beitrag zur Philosophie der Chemie*, Springer, Berlin.
- Mittasch, A.: 1948, *Von der Chemie zu Philosophie*, Ebner, Ulm.
- Morrison, G. S.: 1977, 'Wilhelm Ostwald's 1896 History of Electrochemistry: Failure or Neglected Paragon?', in G. Duppennell and J. H. Westbrook (eds.), *Proceedings of the Symposium on Selected Topics in the History of Electrochemistry*, pp. 213–225.
- Mounin, G.: 1981, 'A Semiology of the Sign System Chemistry', *Diogenes* Spring–Summer, 113–4, 216–28.
- Mulckuyse, J. J.: 1960, *Molecules and Models: Investigations on the Axiomatization of Structure Theory in Chemistry*, University of Amsterdam (Thesis).
- Mulckuyse, J. J.: 1961, 'Molecules and Models, in the Concept and Role of the Model', in *Mathematics and Natural and Social Sciences*, Riedel, Dordrecht.
- Müller, A.: 1994, 'Supramolecular Inorganic Species: An Expedition into a Fascinating, Rather Unknown Land, Mesoscopia, with Interdisciplinary Expectations and Discoveries', *Journal of Molecular Structure* **325**, 13–35.

- Mulliken, R. S.: 1986, 'Spectroscopy, Quantum Chemistry and Molecular Physics', *Physics Today* (April), 52–7.
- Musgrave, A.: 1976, 'Why did Oxygen Supplant Phlogiston?', in C. Howson (ed.), *Research Programmes in the Chemical Revolution, Method and Appraisal in the Physical Sciences*, Cambridge University Press, Cambridge, UK, pp. 181–210.
- Needham, P.: 1993, 'Stuff', *Australasian Journal of Philosophy* **71**, 270–90.
- Nicolacopoulos, P. (ed.): 1990, *Greek Studies in the Philosophy and History of Science*, Kluwer, Dordrecht.
- Niedersen, U.: 1983, 'Chemistry Today' (in German), *Deutsche Zeitschrift für Philosophie* **31**, 363–72.
- Nisio, S.: 1967, 'The Role of Chemical Considerations in the Development of the Bohr Atom Model', *Japanese Studies in the History of Science* **6**, 26–40.
- Novitski, M. E.: 1980, 'Auguste Laurent and the Prehistory of Valence', Ph.D. Dissertation, University of California, Berkeley.
- Nye, M. J.: 1979, 'The Nineteenth-Century Atomic Debates and the Dilemma of an Indifferent Hypothesis', *Studies in History and Philosophy of Science*.
- Nye, M. J.: 1981, 'Berthelot's Anti-Atomism: A "Matter of Taste"?', *Annals of Science* **38**, 585–90.
- Nye, M. J.: 1989, 'Chemical Explanation and Physical Dynamics: Two Research Schools at the First Solvay Conferences, 1922–1928', *Annals of Science* **46**, 461–80.
- Nye, M. J.: 1992, 'Physics and Chemistry: Commensurate or Incommensurate Sciences', in M. J. Nye et al. (eds.), *The Invention the Physical Sciences*, Kluwer, Dordrecht, pp. 205–24.
- Nye, M. J., J. L. Richards, and R. Stuewer (eds.): 1992, 'The Invention of Physical Science: Intersections of Mathematics, Theology and Natural Philosophy Since the Seventeenth Century', *Essays in Honor of Erwin N. Hiebert*, Kluwer Academic Publishers, Dordrecht/Boston.
- Nye, M. J.: 1993, *From Chemical Philosophy to Theoretical Chemistry*, University of California Press, Berkeley, Los Angeles, London.
- Nye, M. J.: 1993, 'Philosophies of Chemistry Since the Eighteenth Century', in S. H. Mauskopf (ed.), *Chemical Sciences in the Modern World*, University of Pennsylvania Press, Philadelphia, pp. 3–24.
- Nyhart, L.: 1986, *Morphology and the German University, 1860–1900*, Ph.D. dissertation, University of Pennsylvania.
- Ogilvie, J. F.: 1994, 'The Nature of the Chemical Bond 1993. There are No Such Things as Orbitals!', in E. S. Kryachko and J. L. Calais (eds.), *Conceptual Trends in Quantum Chemistry*, Kluwer, Dordrecht, pp. 171–198.
- Ogilvie, J. F.: 1990, 'The Nature of the Chemical Bond-1990, There are No Such Things as Orbitals', *Journal of Chemical Education* **67**, 280–9.
- Oldroyd, D.: 1976–77, 'The Doctrine of Property-Conferring Principles in Chemistry: Origins and Antecedents', *Organon* **12–13**, 139–55.
- Ostwald, W.: 1909, *The Fundamental Principles of Chemistry: An Introduction to all Textbooks of Chemistry*, Longmans, London.
- Ostwald, W. : 1907, 'The Modern Theory of Energetics', *The Monist* **17**, 481–515.
- Ostwald, W.: 1904, 'Elements and Compounds', *Journal of the Chemical Society* **35**, 506–40.
- Ostwald, W.: 1896, 'The Failure of Scientific Materialism', *Popular Science Monthly* **00**, 598–601.

- Paneth, F. A.: 1962, 'The Epistemological Status of the Concept of Element', *British Journal for the Philosophy of Science* **13**, 1–14, 144–60.
- Pantin, C. F. A.: 1968, *The Relations Between the Sciences*, Cambridge University Press, Cambridge.
- Paoloni, L.: 1985, 'La Représentation des Molécules en Chimie', *L'Actualité Chimique* (Mai), 47–52.
- Paoloni, L.: 1982, 'Quantum Mechanics and the Logical Structure of Contemporary Chemistry, Current Aspects of Quantum Chemistry', *Studies in Physical and Theoretical Chemistry* **21**, 1–16.
- Paneth, F.: 1965, in: H. Dingle and G. R. Martin (eds.), *Chemistry and Beyond*, Wiley, New York.
- Paneth, H. R.: 1952, 'The Periodic System and the Reduction of Chemistry to Physics', *Science News* **24**, 65–93.
- Partington, J. R.: 1961–1964, *A History of Chemistry*, 4 vols., Macmillan, London.
- Partington, J. R.: 1948, 'The Concept of Substance and Chemical Element', *Chymia* **1**, 109–121.
- Paul, E. R.: 1978, 'Alexander W. Williamson on the Atomic Theory: A Study of Nineteenth-century British Atomism', *Annals of Science* **35**, 17–31.
- Pauling, L.: 1950, 'The Place of Chemistry in the Integration of the Sciences', *Main Currents* **7**, 108–11.
- Pauling, L.: 1992, 'The Value of Rough Quantum Mechanical Calculation', *Foundations of Physics* **22**, 829–38.
- Pauling, L.: 1992, 'The Nature of the Chemical Bond-1992', *Journal of Chemical Education* **69**, 519–21.
- Pauling, L.: 1985, 'Why Modern Chemistry is Quantum Chemistry', *New Scientist* (7th November), 54–5.
- Pauling, L.: 1984, 'G. N. Lewis and the Chemical Bond', *Journal of Chemical Education* **61**, 201–3.
- Pechenkin, A.: 1994, 'The Two-Dimensional View of the History of Chemistry', in K. Gavroglu et al. (eds.), *Trends in the Historiography of Science*, Kluwer, Dordrecht, pp. 369–377.
- Perrin, C. E.: 1988, 'The Chemical Revolution: Shifts in Guiding Assumptions', in: A. Donovan (ed.), *Scrutinizing Science: Empirical Studies of Scientific Change*, Kluwer Academic Publishers, Dordrecht.
- Pierce, N. W.: 1970, *The Chemistry of Matter*, Houghton Mifflin, Boston, Massachusetts.
- Pilar, F. L.: 1981, 'Damn the Permanganate Volcanoes: Full Principles Ahead', *Journal of Chemical Education* **58**, 803.
- Pine, N. W.: 1952, 'Concepts out of Context', *British Journal for the Philosophy of Science* **2**, 269–80.
- Platt, J. R.: 1969, 'Untitled', *Journal of the History of Biology* **2**, 140–7.
- Platt, J. R.: 1961, 'Properties of Large Molecules that Go Beyond the Properties of their Chemical Sub-Groups', *Journal of Theoretical Biology* **1**, 342–58.
- Polanyi, M.: 1992, 'The Value of the Inexact', *Tradition Discovery* **18**, 35–6.
- Post, H. R.: 1968, 'Atomism 1900', *Physics Education* **3**, 225–32, 307–12.
- Prigogine, I.: XXXX, 'Unity of Physical Laws and Levels of Description', in M. Greene (ed.), *Reducability*, University of California, Berkeley.
- Primas, H.: 1988, 'Can We Reduce Chemistry to Physics?', in G. Radnitsky (ed.), *Centripetal Forces in Science*, Pergamon House Press, New York, pp. 119–33.

- Primas, H.: 1985, 'Kann Chemie auf Physik reduziert werden?', *Chemie in Unserer Zeit* **19**, 109–19, 160–6.
- Primas, H.: 1983, *Chemistry, Quantum Mechanics and Reductionism*, Springer, Berlin.
- Primas, H.: 1982, 'Chemistry and Complementarity', *Chimia* **6**, 293–300.
- Psarros, N.: 1993, 'Chemische Theorien und Modelle: Abbilder der Natur oder Systeme von Handlungsanweisungen?', *Wirtschaft & Wissenschaft* **1**, 20–30.
- Psarros N.: 1994, 'Sind die "Gesetze" der konstanten und der multiplen Proportionen empirische Naturgesetze oder Normen?', in N. Psarros and P. Janich, (eds.), *Philosophische Perspektiven der Chemie – 1. Erlenmeyer-Kolloquium der Philosophie der Chemie*, Mannheim, Leipzig, Wien, Zuerich.
- Psarros, N.: 1995, 'The Constructive Approach to the Philosophy of Chemistry', *Epistemologia* **XVIII**, 27–38.
- Psarros, N.: 1996, 'Die chemische Reaktion als Kalkuel', in P. Janich and N. Psarros (eds.), *Die Sprache der Chemie – 2. Erlenmeyer-Kolloquium zur Philosophie der Chemie*, Wuerzburg, pp. 127–138.
- Psarros, N.: 1996, 'Die Chemie als Gegenstand philosophischer Reflexion', in N. Psarros, K. Ruthenberg and J. Schummer (eds.): *Philosophie der Chemie – Bestandsaufnahme und Ausblick*, Wuerzburg, pp. 111–141.
- Psarros, N.: 1996, 'Die Chemie als kulturelle Errungenschaft – Überlegungen zu einer methodischen Chemiegeschichtsschreibung', in D. Hartmann und P. Janich (Hrsg.), *Methodischer Kulturalismus – Zwischen Naturalismus und Postmoderne*, Frankfurt, 1996.
- Psarros, N., K. Ruthenberg, and J. Schummer (Hg.): 1997, *Philosophie der Chemie, Bestandsaufnahme und Ausblick*, Wuerzburg.
- Rabkin, Y. M.: 1993, 'Uses and Images of Instruments', in S. H. Mauskopf (ed.), *Chemical Sciences in the Modern World*, University of Pennsylvania, Philadelphia, pp. 25–42.
- Ramsey, J. L.: 1995, 'Construction by Reduction', *Philosophy of Science* **62**, 1–20.
- Ramsey, J. L.: 1994, 'Ideal Reaction Types and the Reactions of Real Alloys', in D. Hull, M. Forbes and R. Burian (eds.), *PSA* **1**, 149–59, Philosophy of Science Association, East Lansing, MI.
- Ramsey, J. L.: 1993, 'When Reduction Leads to Construction: Design Considerations in Scientific Methodology', *International Studies in Philosophy of Science* **7**, 241–53.
- Ramsey, J. L.: 1990, 'Beyond Numerical and Causal Accuracy', *PSA* **1**, 485–99. Philosophy of Science Association, East Lansing, MI.
- Rancke-Marsden: 1976, 'The Discovery of an Element', *Centaurus* **19**, 299–313.
- Rappaport, R.: 1960, 'G.-F. Rouelle: An Eighteenth-Century Chemist and Teacher', *Chymia* **6**, 68–101.
- Rappaport, R.: 1960, 'Rouelle and Stahl – The Phlogistic Revolution in France', *Chymia* **7**, 73–102.
- Rawson, D. C.: 1974, 'The Process of Discovery: Mendeleev and the Periodic Law', *Annals of Science* **31**, 181–204.
- Reudenberg, K.: 1962, 'The Physical Nature of the Chemical Bond', *Reviews of Modern Physics* **34**, 326–76.
- Rheinberger, H.-J.: 1992, 'Experiment, Difference and Writing: II. The Laboratory Production of Transfer RNA', *Studies in the History and Philosophy of Science* **23**, 389–422.
- Ritchie, A. D.: 1945, 'The Atomic Theory as Metaphysics and as Science', *Proceedings of the Aristotelean Society* **45**, 71–88.
- Ritchie, A. D.: 1958, *Studies in the History and Methods of the Sciences*, Edinburgh University Press, Edinburgh, (especially chapter 7, from alchemy to experimental chemistry).

- Roberts, L.: 1992, 'Condillac, Lavoisier and the Instrumentalization of Science', *Kennis Methode* **16**, 172–90.
- Robisch, G.: 1974, 'Thoughts on the Concept of Chemical Element', *Chemie in der Schule* **21**, 529–31.
- Rocke, A.: 1987, 'Kolbe versus the "Transcendental Chemists": The Emergence of Classical Organic Chemistry', *Ambix* **34**, 156–68.
- Rocke, A.: 1984, *Chemical Atomism in the Nineteenth Century: From Dalton to Cannizzaro*, Ohio State University Press, Columbus.
- Rocke, A.: 1981, 'Kekulé, Butlerov and the Historiography of the Theory of Structure', *British Journal for the Philosophy of Science* **14**, 27–57.
- Rocke, A.: 1979, 'The Reception of Chemical Atomism in Germany', *Isis* **70**, 519–36.
- Rocke, A.: 1978, 'Atoms and Equivalents: The Early Development of the Chemical Atomic Theory', *Historical Studies in the Physical Sciences* **9**, 225–63.
- Rocke, A. J.: 1988, 'Kekulé's Benzene Theory and the Appraisal of Scientific Theories', in: A. Donovan (ed.), *Scrutinizing Science: Empirical Studies of Scientific Change*, Kluwer, Dordrecht.
- Root-Bernstein, R. S.: 1980, 'The Ionists: Founding Physical Chemistry, 1872–1890', Ph.D. dissertation, Princeton University, Princeton, NJ.
- Roque, A. J.: 1985, 'Self Organisation: Kant's Concept of Teleology and Modern Chemistry', *Review of Metaphysics* **39**, 107–35.
- Rothbart, D. and S. W. Slayden: 1994, 'The Epistemology of a Spectrometer', *Philosophy of Science* **61**, 25–38.
- Rouvray, D.: 1994, 'Elementary, my dear Mendeleev', *New Scientist* (12th February), 36–9.
- Rouvray, D.: 1991, 'Making Molecules By Numbers', *New Scientist* (30th March), 22–6.
- Rouvray, D. H.: 1996, 'The Surprising Periodic Table: Ten Remarkable Facts', *Chemical Intelligence*, July, 39–47.
- Ruthenberg, K.: 1992, 'Was kann Timaios erklären?', Wissenschaftstheoretische Anmerkungen zur platonischen Chemie, in K. Doering, G. Woehrle, *Antike Naturwissenschaft und ihre Rezeption* (Hrsg.) Band I/II, Bamberg, pp. 44–58.
- Ruthenberg, K.: 1994, 'Die Schwierigkeiten mit der Definition der Chemie', *Chemie in Labor und Biotechnik* **54**, 303–6.
- Ruthenberg, K.: 1994, 'Die Regelmäßigkeit der allgemeinen Chemie', in P. Janich (Hrsg), *Philosophische Perspektiven der Chemie*, Mannheim, Leipzig, Wien, Zurich, pp. 65–82.
- Sachsse, H.: 1969, 'Philosophie für Chemiker?', *Chem. Uns. Zeit.* **2**, 33–39.
- Sanderson, R. T.: 1964, 'The Principles of Chemical Reaction', *Journal of Chemical Education* **41**, 13–22.
- Sadoun-Goupil, M.: 1977, *Le Chimiste Claude-Louis Berthollet: Sa Vie, Son Oeuvre*, Librairie Philosophique, J. Vrin, Paris.
- Satchell, D. P. N.: 1977, 'Classification of Chemical Reactions', *Naturwissenschaften* **64**, 113–21.
- Schofield, R. E.: 1970, *Mechanism and Materialism: British Natural Philosophy in an Age of Reason*, Princeton University Press, Princeton, N.J.
- Scerri, E. R.: 1986, 'The Tao of Chemistry', *Journal of Chemical Education* **63**(2), 106–7.
- Scerri, E. R.: 1989, 'Transition Metal Configurations and Limitations of the Orbital Approximation', *Journal of Chemical Education* **66**(6), 481–3.
- Scerri, E. R.: 1991, 'Electronic Configurations, Quantum Mechanics and Reduction', *British Journal for the Philosophy of Science* **42**(3), 309–25.

- Scerri, E. R.: 1991, 'Chemistry, Spectroscopy and the Question of Reduction', *Journal of Chemical Education* **68**(2), 122–26.
- Scerri, E. R.: 1992, 'The Relationship Between Periodicity, Quantum Mechanics and the Orbital Model', Ph.D. Thesis, King's College, London University, London.
- Scerri, E. R.: 1992, 'Deducing Answers', *Chemistry in Britain* **28**(11), 986.
- Scerri, E. R.: 1992, 'Quantum Extrapolation', *Chemistry in Britain* **28**(9), 9, 781.
- Scerri, E. R.: 1992, 'The Nature of the Chemical Bond – Once More', *Journal of Chemical Education* **69**(7), 602.
- Scerri, E. R.: 1993, 'Is Chemistry a Reduced Science?', *Education in Chemistry* **30**(4), 112.
- Scerri, E. R.: 1993, 'Correspondence and Reduction in Chemistry', in S. French and H. Kammenga (eds.), *Correspondence, Invariance and Heuristics. Essays in Honour of Heinz Post, Boston Studies in Philosophy of Science 148*, Kluwer, Dordrecht, pp. 45–64.
- Scerri, E. R.: 1993, 'Configurational Energy and Bond Polarity Index', *Journal of Physical Chemistry* **97**, 5786.
- Scerri, E. R.: 1994, 'Has Chemistry Been at Least Approximately Reduced to Quantum Mechanics?', in D. Hull, M. Forbes and R. Burian (eds.), *PSA 1*, pp. 160–170, Philosophy of Science Association, East Lansing, MI.
- Scerri, E. R.: 1994, 'Plus ça Change . . .', *Chemistry in Britain* **30**, 5, 379–381.
- Scerri, E. R.: 1994, 'Prediction of the Nature of Hafnium from Chemistry: Bohr's Theory and Quantum Theory', *Annals of Science* **51**, 137–50.
- Scerri, E. R.: 1995, 'The Exclusion Principle, Chemistry and Hidden Variables', *Synthese* **102**, 165–9.
- Scerri, E. R.: 1996, 'Stephen Brush, The Periodic Table and the Nature of Chemistry', in P. Janich and N. Psarros (eds.), *Die Sprache der Chemie*, Proceedings of the Second Erlennmeyer Colloquium on Philosophy of Chemistry, Königshausen and Neumann, Würzburg, pp. 169–176.
- Scerri, E. R. and L. McIntyre: 1997, 'The Case for Philosophy of Chemistry', *Synthese* **111**, XXX–XXX.
- Scerri, E. R.: 1997, 'Are Chemistry and Philosophy Miscible?', *Chemical Intelligencer* **3**, 44–46.
- Scerri, E. R.: 1997, 'The Evolution of the Periodic System', *Scientific American*, (in press).
- Scerri, E. R.: 1997, 'It All Depends What You Mean By Reduction', in K. Mainzer, A. Müller and W. Saltzer (eds.), *From Simplicity to Complexity, Information, Interaction, Emergence*, Proceedings of the 1994 ZiF Meeting in Bielefeld, Vieweg-Verlag (in press).
- Scerri, E. R.: 1996, 'Reduktion und Erklärung in der Chemie', *Philosophie der Chemie – Bestandsaufnahme und Ausblick*, K. Ruthenberg, N. Psarros and J. Schummer (eds.), pp. 77–93.
- Scott, J. H.: 1959, 'The Nineteenth Century Atom: Undivided or Indivisible', *Journal of Chemical Education* **36**, 64–7.
- Schachparanow, M. I.: 1963, 'Chemie und Philosophie', Technische Hochschule für Chemie C. Schorlemmer Leuna-Mersburg, Institut für Marxismus-Leninismus, Merseburg.
- Schaffner, K. F.: 1969, 'The Crick-Watson Model and Reductionism', *British Journal for the Philosophy of Science* **20**, 325–48.
- Schmieder, L. A.: 1940, 'Some More Casual Notes on the Structure of Inorganic Matter', *New Scholastic* **14**, 33–56.
- Schuffe, J. A.: 1977, 'Provocative Opinion, Some Problems in Philosophy of Science', *Journal of Chemical Education* **54**, 357–8.
- Schummer, J.: Die Rolle des Experiments in der Chemie, in: P. Janich (ed.), *Philosophische Perspektiven der Chemie*, BI-Wissenschaftsverlag, Mannheim, pp. 27–51.

- Schummer, J.: 'Zwischen Wissenschaftstheorie und Didaktik der Chemie: die Genese von den Stoffebegriffen', *Chimica Ditactica* **21**, 85–110.
- Schummer, J.: 1996, 'Zur Semiotik der chemischen Zeinesprache', in: P. Janich and N. Psarros (eds.), *Die Sprache der Chemie*, Königshausen & Neumann, Würzburg, 1996, pp. 113–126.
- Schweber, S. S.: 1990, 'The Young John Clark Slater and the Development of Quantum Chemistry', *Historical Studies in the Physical Sciences* **20**(2), 389–406.
- Servos, J. W.: 1990, *Physical Chemistry from Ostwald to Pauling*, Princeton University Press, Princeton, NJ.
- Shapere, D.: 1974, 'Scientific Theories and their Domains', in F. Suppe (ed.), *The Structure of Scientific Theories*, Illinois University Press, Chicago.
- Sherwood, M.: 1977, *New Worlds in Chemistry*, Faber, London.
- Shim, I. and P. Dahl: 1978, 'A New Interpretation of Hund's First Rule', *Theoretica Chimica Acta* **48**, 165–174.
- Shimony, A.: 1993, 'The Methodology of Synthesis: Parts and Wholes in Low Energy Physics', in *The Search for a Naturalistic World View*, 2 vols. Vol. 1: *Scientific Method and Epistemology*, Cambridge University Press, Cambridge, pp. 191–217.
- Siegfried, R. and B. J. Dobbs: 1968, 'Composition: A Neglected Aspect of the Chemical Revolution', *Annals of Science* **24**, 275–93.
- Simon, R.: 1975, 'Chemie und dielektik', *Deutsche Zeitschrift für Philosophie* **23**, 980–4.
- Slater, J. C.: 1967, 'The Current State of Solid-State and Molecular Theory', *International Journal of Quantum Chemistry* **1**, 37–102.
- Smith, L. A.: 1984, 'The Logic of Concept Formation in Empiricist Philosophy from Locke and Lavoisier to John Stuart Mill', *Dissertation Abstracts International* **45**, 547-A.
- Speakman, J. C.: 1966, *Molecules*, New York: McGraw-Hill.
- Spring, R. J.: 197X, 'Vindicating the Periodic Table', *Education in Chemistry* **12**, 134–8.
- Stranges, A. N.: 1984, 'Reflections on the Electron Theory of the Chemical Bond: 1900–1925', *Journal of Chemical Education* **61**, 185–9.
- Stranks, D. R. et al.: 1965, *Chemistry: A Structural View*, Cambridge University Press, Cambridge.
- Strong, L. E.: 1970, 'Differentiating Physical and Chemical Changes', *Journal of Chemical Education* **47**, 689–690.
- Strong, L. E.: 1962, 'Facts, Students, Ideas', *Journal of Chemical Education* **39**, 126–9.
- Suckling, C. J., K. E. Suckling, and C. W. Suckling: 1978, *Chemistry Through Models*, Cambridge University Press, Cambridge.
- Sutcliffe, B. T.: 1977, 'The Chemical Bond', *Physics Bulletin* (August): 360–3.
- Sutcliffe, B. T.: 1996, 'The Development of the Idea of a Chemical Bond', *International Journal of Quantum Chemistry* **58**, 645–55.
- Tanaka, M., B. Tamamushi, and O. T. Benfey (eds.): 1975, 'How to Understand the Transition of Chemical Theories from Their Classical Theories to the Present Stage', (XIVth International Congress for the History of Science (Proceedings No. 4).
- Thagard, P.: 1990, 'The Conceptual Structure of the Chemical Revolution', *Philosophy of Science* **57**, 183–209.
- Thakray, A. W.: 1970, *Atoms and Powers: An Essay on Newtonian Matter – Theory and the Development of Chemistry*, Harvard University Press, Cambridge, MA.
- Theobald, D. W.: 1964, 'Models and Method', *Philosophy* **39**, 260–67.
- Theobald, D. W.: 1965, 'Alchemy – A Philosophical Reappraisal', *The Technologist* **2**, 135–45.

- Theobald, D. W.: 1976, 'Some Considerations on the Philosophy of Chemistry', *Chemical Society Reviews* **5**, 203–13.
- Theobald, D. W.: 1968, *Introduction to Philosophy of Science*, Methuen, London.
- Theobald, D. W.: 1968, 'On Visualising Chemical Structures', *Education in Chemistry* **5**, 99–100.
- Theobald, D. W.: 1982, 'Gaston Bachelard et la Philosophie de la Chimie', *Archives Philosophiques* **45**, 251–4.
- Timmermans, J.: 1963, *Concept of Species in Chemistry*, Chemical Publishing Company, New York.
- Toulmin, S.: 1957, 'Crucial Experiments: Priestley and Lavoisier', *Journal of the History of Ideas* **xvii**, 205–20.
- Tursman, R.: 1989, 'Phanerochemistry and Semiotics', *Transactions of the Peirce Society* **25** (Fall), 453–468.
- van Brakel, J.: 1993, 'Polywater and Experimental Realism', *British Journal for the Philosophy of Science*, **44**, 775–84.
- van Brakel, J.: 1992, 'Natural Kinds and Theories of Reference', *Dialectica* **46**(3/4), 243–61.
- van Brakel, J.: 1991, 'Chemistry', in *Handbook of Metaphysics and Ontology*, vol. I. Philosophia Verlag, München, pp. 146–7.
- van Brakel, J.: 1990, 'Units of Measurement: Some Kripkean Considerations', *Erkenntnis* **33**, 297–317.
- van Brakel, J.: 1986, 'The Chemistry of Substances and the Philosophy of Mass Terms', *Synthese* **69**, 291–324.
- van Brakel, J. and H. Vermeeren: 1981, 'On the Philosophy of Chemistry', *Philosophy Research Archives* **7**, 1405–56.
- van der Vet, P.: 1987, 'The Aborted Takeover of Chemistry by Physics', Ph.D. thesis, University of Amsterdam.
- van der Vet, P.: 1979, 'Overdetermined Problems and Anomalies', *Studies in History and Philosophy Science* **10**, 259–61.
- van der Vet, P.: 1979, 'The Debate Between F. A. Paneth, G. Von Hevesy and K. Fajans on the Concept of Chemical Identity', *Janus* **66**, 285–303.
- van Hoeve-Brouwer: 1996, 'Teaching Structures in Chemistry', Ph.D. Thesis, University of Utrecht, Netherlands.
- van Spronsen, J. W.: 1969, *The Periodic System of Chemical Elements, A History of the First Hundred Years*, Elsevier, Amsterdam.
- van't Hoff, J. H.: 1912, *Die Chemischen Grundlehren nach Menge, Mass und Zeit*, Braunschweig: Vieweg.
- von Engelhardt, D.: 1986, 'Philosophie und die Theorie der Chemie um 1800', *Philosophia Naturalis* **23**, 223–37.
- von Engelhardt, D.: 1976, *Hegel und die Chemie*, Guido Pressler Verlag, Wiesbaden.
- von Engelhardt, D.: 1969, 'Wissenschaftenliche Chemie um 1800 und Hegel's Philosophie der Chemie', Doctoral Thesis, University of Heidelberg.
- Vermeeren, H.: 1986, 'Controversies and Existence Claims in Chemistry: The Theory of Resonance', *Synthese* **69**, 273–90.
- Virtanen, R.: 1965, *Marcellin Berthelot: A Study of a Scientist's Public Role*, University of Nebraska, n.s. no. 31.
- Vitz, E. W.: 1982, 'Theory and Exemplar', *Journal of Chemical Education* **59**, 298–300.
- Walden, P.: 1952, 'Ancient Natural-Philosophical Ideas in Modern Chemistry', *Journal of Chemical Education* **29**, 386–91.

- Weininger, S. J.: 1984, 'The Molecular Structure Conundrum: Can Classic Chemistry be Reduced to Quantum Chemistry', *Journal of Chemical Education* **61**, 939–44.
- Weyl, H.: 1963, *Philosophy of Mathematics and Natural Science*, Atheneum, New York (Appendix D, Chemical Valence and the Hierarchy of Structure), pp. 266–75.
- Whyte, L. L.: 1968, *An Essay on Atomism from Democritus to 1960*, Wesleyan University Press, Middleton, CN.
- Wightman, W. P. D.: 1961, 'The Language of Chemistry', *Annals of Science* **17**, 259–67.
- Williams, G. F.: 1979, 'Is Popper Relevant?', *Education in Chemistry* **102**.
- Witzemann, E. J.: 1945, 'Chemistry and Evolution', *Philosophy of Science* **12**, 179–89.
- Woodward, R. B.: 1956, 'Synthesis', *Perspective in Organic Chemistry* **00**, 154–181.
- Wooley, R. G.: 1985, 'The Molecular Structure Conundrum', *Journal of Chemical Education* **62**, 1082–5.
- Wooley, R. G.: 1978, 'Must a Molecule Have a Shape?', *Journal of the American Chemical Society* **100**, 1073–8.
- Yakira, E.: 1988, 'Boyle et Spinoza', *Archives de Philosophie* **51** (Jan–Mar), 104–124.
- Zavaleta, D.: 1988, 'Paradigms and Plastic Facts in the History of Valence', *Journal of Chemical Education* **65**, 677–80.
- Zhdanov, Y. A.: forthcoming, 'Problems of the General Definition of Chemistry', *Journal of General Chemistry* **28**, 2643–4.
- Zhdanov, Y. A. (ed.), *Proceedings of a Conference on Philosophical Problems of Chemistry*, Rostov University Press, Rostov-on-Don.
- Zucker, A.: 1988, 'Davy Refuted Lavoisier not Lakatos', *British Journal for the Philosophy of Science* **39**, 537–40.

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