Appendix 3: References

Items marked with an asterisk (*) were not viewed directly by the compiler of this list, but are known and incorporated from other peoples' work.

*Abraham, M.R., Grzybowski, E.B., Renner, L.W., and Marek, E.A. (1992). Understandings and misunderstandings of eighth graders of five chemistry concepts found in textbooks, *Journal of Research in Science Teaching* 29, 105-120. (Reported in Meltzer (2001).)

Ahtee, M. and Varjola, I. (1998). Students' Understanding of Chemical Reactions, *International Journal of Science Education* 20 (3) 305-316.

*Andersson, B. (1984). Chemical reactions. Report: Elevperspektiv number 12, Göteborg: University of Göteborg. (In Kind (2004), p.33.)

*Andersson, B. (1986a). Pupils' explanations of some aspects of chemical reactions, (Age 12-16), *Science Education* 70, 549-563.

Andersson, B. (1986b). The experimental gestalt of causation: a common core to pupils' preconceptions in science. *European Journal of Science Education*, 8(2), 155-171.

*Andersson, B. (1990). Pupils' conceptions of matter and its transformations (age 12-16), *Studies in Science Education* 18, 53-85.

Arons, Arnold (1997). *Teaching Introductory Physics, 2nd Ed.*, John Wiley and Sons, New York. (Cf. Part I: chapter 5 section 5-10, chapter 6 section 12, chapter 7 sections 1-4, and chapter 8, section 1, chapter 10, sections 1 and 7 and chapter 11 sections 1-4.)

*Barker, V. (1994). An investigation of 16-18 year old students' understanding of basic chemical ideas. In P. L. Lijnse (Ed.), *European research in Science Education - Proceedings of the first Ph. D. Summerschool* (pp. 175-183). Utrecht: CDß Press, Centrum voor ß-Didactiek.

*Barker, Vanessa (1995). *A longitudinal study of 16-18 year olds' understanding of basic chemical ideas*, unpublished Ph.D. thesis, Department of Educational Studies, University of York. (In Kind (2004). Vanessa Barker is now Vanessa Kind.)

*Barker, Vanessa and Millar, R. (1999), Students' reasoning about chemical reactions: what changes occur during a context-based post-16 chemistry course, *International Journal of Science Education* 21 (6), 645-665. (In Kind (2004), p.43)

*Barral, F.L., and Fernandez, E.G.-F. (1992). Secondary Students' Interpretations of the Process occurring in an Electrochemical Cell, *Journal of Chemical Education* 69, 635-657.

Basili, P.A., & Sanford, J.P. (1991). Conceptual change strategies and cooperative group work in chemistry, *Journal of Research in Science Teaching* 28, 293-304. (Reported in Meltzer (2001).)

Beall, Herbert (1994). Probing Student Misconceptions in Thermodynamics with In-Class Writing, *Journal of Chemical Education* 71 (12), 1056-1057.

*Benson, D.L., Wittrock, M.C. and Baur, M.E. (1993). Students' preconceptions of the nature of gasses, *Journal of Research in Science Teaching* 30 (6), 587-597. (In Kind (2004).)

*Ben-Zvi, R.; Eylon, B.; and Silbestein, J. (1986). Is an atom of copper malleable? *Journal of Chemical Education* 63(1), 64-66. (Referred to in Nakhleh (1992).)

*Ben-Zvi, R.; Eylon, B; and Silberstein, J. (1987). Students' visualization of a chemical reaction, *Education in Chemistry* 24, 117-120.

*Ben-Zvi, R.; Eylon, B.; and Silberstein, J. (1988). Theories, principles and laws, *Journal of Chemical Education* 65 (25), 89-92.

Birk, James P. and Kurtz, Martha J. (1999). Effects of Experience on Retention and Elimination of Misconceptions about Molecular Structure and Bonding, *Journal of Chemical Education* 76 (1), 124-128.

Bodner, George M. (1991). I have found you an argument: the conceptual knowledge of beginning chemistry graduate students, *Journal of Chemical Education* 68 (5), 385-388.

*Bodner, B. M. (1992) Why Changing the Curriculum May Not Be Enough, *Journal of Chemical Education* 69 (3), 186-190.

*Bodner, George M. (1992). [Change of state], *Journal of Chemical Education* 69 (3), 191-196.

Boo, H.K. (1998). Student Understandings of Chemical Bonds and the Energetics of Chemical Reactions, *Journal of Research in Science Teaching* 35 (5), 569-581.

*BouJaoude, S.B. (1991). A study of the nature of students' understandings about the concept of burning, *Journal of Research in Science Teaching* 28 (8), 689-704. (In Kind (2004) p.40.)

BouJaoude, S.B. (1992). The relationship between students' learning strategies and techniques in their understandings during a high school chemistry course, *Journal of Research in Science Teaching* 29, 687-699.

*BouJaoude, S.B. and Barakat, H. (2000), Secondary school students' difficulties with stoichiometry, *School Science Review* 81 (296), 91-98. (In Kind (2004) p.49-50.)

*Briggs, H. and Holding, B. (1986). "Aspects of Secondary Students' understanding of elementary ideas in chemistry: Full Report", Children's Learning in Science Project, Leeds: University of Leeds. (Reported in Kind (2004).)

*Brook, A., Briggs, H., and Driver, R. (1984). *Aspects of Secondary Students' understanding of*

elementary ideas of chemistry: Full Report. Children's Learning in Science Project, Leeds: University of Leeds. (Reported in Kind (2004).)

*Broznan, T. (1992). *Explanation of Charge, Technical Paper #3*. London: University of London, London Mental Models Group, Working Group 6237: Children's and Teachers' Explanations.

*Butts, B., and Smith, R. (1987), HSC Chemistry students' understanding of the structure and properties of molecular and ionic compounds, *Research in Science Education* 17: 192-201. (In Kind (2004) p.57.)

*Cachapuz, A.F., and Martins, I.P. (1987). High School Students' Ideas about Energy of Chemical Reactions. In Novak, J., and Helm, H., (Eds.) *Proceedings of the International Seminar on Misconceptions in Science and Mechanics,* Vol. 3, 60-68. (Reported in Boo (1998).)

* Cachapuz, A. F., Maskill, R. (1989). Using word association in formative classroom tests: following the learning of Le Chatelier's principle. *International Journal of Science Education,* 11 (2), 235-246. (In Kind (2004) p.70)

Camp, Charles W., and Clement, John J. (1994). *Preconceptions in Mechanics: Lessons Dealing with Students' Conceptual Difficulties,* Kendall/Hunt, Dubuque Iowa. Scientific Reasoning Research Institute, University of Massachusetts - Amherst.

Clement, J. (1982). Students' Preconceptions in Introductory Mechanics, *American Journal of Physics* 50, 66-71.

*Clough, E., and Driver, R. (1985). Secondary Students' Conceptions of the Conduction of Heat: bringing together scientific and personal views, *Physics Education* 20, 176-182.

Cohen, R., Eylon, B., and Ganiel, U. (1983). Potential difference and current in simple electric circuits: A study in students' concepts, *American Journal of Physics* 51 (5).

*Cros, D., Mauvan, M., Chastrette, M., Leher, J., and Fayol, M. (1986). Conceptions of first-year university students of the constituents of matter and the notions of acids and bases, *European Journal of Science Education* 8 (3), 305-313. (In Kind (2004) p.47)

deVos, Wobbe and Verdonk, Adri H. (1987). A New Road to Reactions, Part 4. The Substance and its Molecules, *Journal of Chemical Education* 64 (8), 692-694.

deVos, Wobbe, van Berkel, B., and Verdonk, Adri H. (1994). A Coherent Conceptual Structure of the Chemistry Curriculum, *Journal of Chemical Education* 71 (9), 743-746.

*deVos, W. and Verdonk, A. (1986). A New Road to Reactions, Part 3: Teaching the Heat Effect of the Reaction, *Journal of Chemical Education* 63, 972-974.

*Denbigh, G.K. and Denbigh, U.J.S., *Entropy in Relation to Incomplete Knowledge*, Cambridge

University Press, New York, pp. 43-44. (Reported in Lambert (2002).)

*diSessa, Andrea A. (1983). Phenomenology and the evolution of intuition. In E. Gentner and A. Stevens (eds), *Mental Models* (Erlbaum, Hillsdale, NJ), 15-33. (Reported in diSessa (1998).)

*diSessa, Andrea A. (1993). Toward an epistemology of physics. *Cognition and Instruction,* 10 (2) 105-225 and 10 (3) 261-280. (Reported in diSessa (1998).)

diSessa, Andrea A. and Sherin, Bruce L. (1998). What changes in conceptual change? *International Journal of Science Education* 20 (10), 1151-1191.

diSessa, Andrea A. (2004). Metarepresentation: Native Competence and Targets for Instruction, *Cognition and Instruction* 22 (3), 293-331.

*Driver, R., Guesnes, E. & Tiberghien, A. (1985). Some Features of Children's Ideas and their Implications for Teaching. In R. Driver, E. Guesnes, & A. Tiberghien (Eds.), *Children's' Ideas in Science* (pp.193-201). Milton Keynes: Open University Press. (Reported in Viennot (1998), Kind (2004) p.33, 38)

Driver, Rosalind, and Bell, Beverly (1986). Students' thinking and the learning of science: a constructivist view, *School Science Review* 67 (March), 443-456.

*Duit, Reinders (1984). Learning the energy concept in school – empirical results from The Philippines and West Germany, *Physics Education* 19, 59-66.

*Engels, E. (1982). *The development of understanding of selected aspects of pressure, heat and evolution in pupils aged between 12-16 years.* Unpublished Ph.D. thesis, University of Leeds, Leeds. (Reported in Viennot (1998).)

*Erickson, G. (1980). Children's viewpoints of heat: A second look, *Science Education*, 64 (3), 323-336. (Reported in Viennot (1998).)

Erickson, G. (1985). "Heat and Temperature, part A." In R. Driver, E. Guesnes & A. Tiberghien (Eds.), *Children's Ideas in Science* (pp.52-84). Milton Keynes: Open University Press. (Reported in Viennot (1998).)

*Finegold, M., and Trumper, Ricardo (1989). Categorizing Pupils' Explanatory Frameworks in Energy as a Means to the Development of a Teaching Approach, *Research in Science Teaching* 19, 97-110. (In Kind (2004) p.65.)

*Finley, F.N., Stewart, J., and Yarroch, W.L. (1982). Teachers' perceptions of important and difficult science content, *Science Education* 66(4), pp. 531-538. (Quoted in Hackling (1985).)

Francis, Gregory E. (1998), They stay fixed! *The Physics Teacher* 36, p. 488ff.

FurioMas, C.J., Perez, J.H., & Harris, H.H. (1987). Parallels between adolescents' conceptions of

gasses and the history of chemistry, *Journal of Chemical Education* 63, 616-618.

Gabel, D.L., Samuel, K.V., & Hunn, D.F. (1987). Understanding the particulate nature of matter, *Journal of Chemical Education* 64 (8), 695-697.

Gabel, Dorothy (1999). Improving Teaching and Learning through Chemistry Education Research, a Look to the Future, *Journal of Chemical Education* 76(4), 548-554.

*Gayford, C.G. (1986). Some aspects of the problems of teaching about energy in school biology, *European Journal of Science Education* 8, 443-450.

Garnett, Paula S. and Treagust, D. (1992). Conceptual Difficulties Experienced by Senior High School Students of Electrochemistry, Electric Circuits and Oxidation-Reduction Reactions, *Journal of Research in Science Teaching* 29(2), 121-142.

*Gensler, W. (1970). Physical versus chemical change. *Journal of Chemical Education* 47 (2), 154-155. (Reported in Kind (2004) p.25.)

*Gorodetsky, M. and Gussarsky, E. (1986). Misconceptions of the chemical equilibrium concept as revealed by different evaluation methods, *European Journal of Science Education* 8 (4), 427-441. (In Kind (2004) p.70.)

Granville, Mark F. (1985). Student Misconceptions in Thermodynamics, *Journal of Chemical Education* 62(10), 847-848.

*Grayson, D. J., Anderson, T. R. & Crossley, L. (2001). A four-level framework for identifying and classifying students' conceptual and reasoning difficulties, *International Journal of Science Education*, 23, 611-622. (Cited and quoted on the CARD website (Appendix 1): < http://www.card.unp.ac.za >

Greenbowe, Thomas J., and Meltzer, David. E. (2003). Student Learning of Thermochemical Concepts in the Context of Solution Calorimetry, *International Journal of Science Education* 25, 779-800. At http://www.physics.iastate.edu/per/.
Related publications are at http://www.chem.iastate.edu/group/Greenbowe/.

*Griffiths, A.K., and Preston, K.R. (1989). [Models of molecules and atoms], Paper presented at National Association for Research in Science Teaching. (Referred to by Nakhleh (1992).)

*Griffiths, A.K., and Preston, K.R. (1992). Conceptual difficulties experienced by senior high school students in electrochemustry: electrochemical (galvanic) and electrolytic cells, *Journal of Research in Science Teaching* 29, 1079-1099. (Reported in Kind (2004).)

*Gutiérrez, R. & Ogborn, J. (1992). A causal framework for analyzing alternative conceptions, *International Journal of Science Education* 14 (2), 201-220. (Reported in Viennot (1998).)

Hackling, Mark W. and Garnett, Patrick J. (1985). Misconceptions of Chemical Equilibrium, *European Journal of Science Education* 7 (2), 205-214.

Hayes, P. (1979). The naïve physics manifesto. In Michele, D., ed.: *Expert Systems in the Microelectronic Age*, Edinburgh University Press, Edinburgh. (Reported in Kind (2004).)

Halloun, Ibrahim and Hestenes, David (1985a). The initial knowledge state of college physics students, *American Journal of Physics* 53 (11), 1043-1055. Available at http://modeling.asu.edu/R&E/Research.html .

Halloun, Ibrahim and Hestenes, David (1985b). Common sense concepts about motion, *American Journal of Physics* 53 (11), 1056-1065. Available at http://modeling.asu.edu/R&E/Research.html .

Hammer, David (1996). Misconceptions or P-Prisms: How May Alternative Perspectives of Cognitive Structure Influence Instructional Perceptions and Intentions? *The Journal of the Learning Sciences* 5 (2), 17-127.`

Hand, B.M. and Treagust, D.F. (1988). Application of a conceptual conflict strategy to enhance student learning of acids and bases, *Research in Science Education* (18), 53-63. (Reported in Kind (2004).)

Harrison, Alan G. and Treagust, D. (1996). Secondary Students' Mental Models of Atoms and Molecules: Implications for Teaching Chemistry, *Science Education* 80(5), 509-534.

Hestenes, David, Wells, Malcolm and Swackhamer, Gregg (1992). Force Concept Inventory, *The Physics Teacher* 30: 141-158. Available at http://modeling.asu.edu/R&E/Research.html

Hestenes, David (1995). What do graduate oral exams tell us? *American Journal of Physics* 63 (12), 1069.

Hesse and Anderson (1992). Students' Conceptions of Chemical Change, *Journal of Research in Science Teaching* 29, 277-99.

Huddle, P.A., and Pillay, A.E. (1996). An in-depth study of misconceptions in stoichiometry and chemical equilibrium at a South African university, *Journal of Research in Science Teaching* 33, 75-77.

*Iona, M. (1979). *The Physics Teacher* 79 (5), 299. (Quoted in Cohen (1983).)

*Johnson, P. (1996). "What is a Substance", *Education in Chemistry*, March, p.41-45. (In Kind (2004) p.27.)

Johnstone, A.H., MacDonald, J.J., and Webb, G. (1977). Misconceptions in school thermodynamics, *Physics Education*, May 1977, 248-251.

Kesidou, S. and Duit, R. (1993). Students' Conceptions of the Second Law of Thermodynamics, an Interpretive Study, *Journal of Research in Science Teaching* 30(1), 85-106.

*Kesidou, S., Duit, R. & Glynn, S.M. (1995). Conceptual Development in Physics: Students' Understanding of Heat; In S.M. Glynn and R. Duit (Eds), *Learning Science in the Schools,* (pp. 179-198). Mahwah NJ: Lawrence-Erlbaum. (Reported in Viennot (1998).)

Kind, Vanessa (2004). *Beyond Appearances: Students' misconceptions about basic chemical ideas*, *2nd Edition*, School of Education, Durham University, UK. Self-published; available at < http://www.chemsoc.org/pdf/LearnNet/rsc/miscon.pdf > (Vanessa Kind was formerly Vanessa Barker.)

Kokotas, Panagiotas, Vlachos, I, and Koudiadis, V. (1998). Teaching the Topic of the Particulate Nature of Matter, *International Journal of Science Education* 20(3) 291-303.

*Krajcik, J.S. (1989). Paper presented at American Anthropological Association, Washington, D.C. (Referred to by Nakhleh (1992).)

Krnel, D., Watson, R. and Glazar, S.A. (1998). Survey of Research Related to the Development of the Concept of Matter, *International Journal of Science Education* 20 (3) 257-289.

*Kruger, C. (1990). Some primary teachers' ideas about energy, *Physics Education* 25, 86-91. (Reported in Swackhamer (2001).)

*Lambert, F.L. (1999). Shuffled cards, messy desks, and disorderly dorm room - examples of entropy increase? Nonsense! *Journal of Chemical Education* 76, 1385-1387. (Reported in Lambert (2002).)

Lambert, F.L. (2002). Disorder – a Cracked Crutch for Supporting Entropy Discussions, *Journal of Chemical Education* 79 (2), 187-192.

*Lee, O., Eichinger, D.C., Anderson, C. W., Berkeimer, G.D. and Blakeslee, T.D. (1989). Changing middle school students' conceptions of matter and molecules; paper presented to the A.E.R.A. meeting, San Francisco. (Quoted in Rozier (1991).)

*Lee, O., Eichinger, D.C., Anderson, C. W., Berkeimer, G.D. and Blakeslee, T.D. (1993). Changing middle school students' conceptions of matter and molecules, *Journal of Chemical Education* 67, 248-252. (Reported in Mulford (1996).)

Lehmann, Kevin, "Bad Chemistry" website.
http://faculty.virginia.edu/lehmannlab/badchemistry.html

Lewis, Eileen, and Linn, Marcia (1994). Heat, Energy and Temperature Concepts of Adolescents, Adults and Experts: Implications for Curriculum Development, *Journal of Research in Science Teaching* 31(6), 657-77.

Linn, Marcia, and Songer, Nancy, Teaching Thermodynamics to Middle School Students: What are Appropriate Cognitive Demands? *Journal of Research in Science Teaching* 28 (10), 885-918.

*Lipman, F. (1941), Metabolic generation and utilization of phosphate bond energy," *Advances in Enzymology,* 1, 99-162. (In Gayford, C.G. (1986).)

*Lythcott, J. (1990), Problem Solving and the requisite knowledge of chemistry, *Journal of Chemical Education* 67, 248-252. (Reported in Boo (1998), Mulford (1996).)

*Martins, I.P., and Cachapuz, A. (1993). "Making the invisible visible: A constructivist approach to the experimental teaching of energy changes in chemical systems." In J. Novak (Ed.) *Proceedings of the 3rd International Seminar in Misconceptions and Educational Strategies in Science and Mathematics* (Ithaca, N.Y.: Misconceptions Trust). (Quoted by Greenbowe (2001).)

*Maskill, R. and Cachapuz, A.F.C. (1989). Learning about the chemistry topic of equilibrium: the use of word association tests to detect developing conceptualizations, *International Journal of Science Education* 11 (1), 57-69. (In Kind (2004) p.69.)

McCloskey, M. (1983). Intuitive Physics, *Scientific American* 248 (4), 122-130.

McDermott, Lillian C. and Shaffer, Peter S. (1992). Research as a guide for curriculum development: An example from introductory electricity. Part I: Investigation of student understanding, *American Journal of Physics* 60(11), pp. 994-1003.

*Méheut, M. and Chomat, A. (1990), "The bounds of children's atomism: an attempt to make children build up a particle model of matter", in: P.L. Linjse, P. Licht, W. de Vos and A.J. Waaro (eds), *Relating Macroscopic Phenomena to Microscopic Particles: A Central Problem in Science Education,* Utrecht: Centre for Science and Mathematics Education, University of Utrecht. (In Kind (2004), p.41.)

*Méheut, M. (1997). Designing a learning sequence about a prequantitative kinetic model of gases: the parts played by questions and by a computer simulation, *International Journal of Science Education* 19 (6), 647-660. (Reported in Viennot (1998).)

Meltzer, David E. (2001). Student Reasoning regarding work, heat and the first law of thermodynamics in an introductory physics course, *Proceedings of the Physics Education Research Center*, Rochester, NY, June 25-26.

Mulford, Douglas R. (1996). *An Inventory for Measuring College Students' Level of Misconceptions in First Semester Chemistry.* Ph.D. Dissertation, Purdue University.

Mulford, Douglas R., and Robinson, William R. (2002), An Inventory for Alternate Conceptions among First-Semester General Chemistry Students, *Journal of Chemical Education* 79 (6), 739-744.

Nakhleh, Mary (1992). Why Some Students Don't Learn Chemistry, *Journal of Chemical Education* 69(3) 191-196.

Novick, S. and Nussbaum, J. (1978). Junior high school pupils' understanding of the particulate nature of matter, an interview study, *Science Education* 62, 273-281.

*Novick, S. and Nussbaum, J. (1981). Pupils' understanding of the particulate nature of matter: A cross-age study, *Science Education* 65 (2), 187-196. (Reported in Kind (2004).)

Nurenbern, S.C. and Pickering, M. (1987). Concept learning vs. problem solving: is there a difference? *Journal of Chemical Education* 64, 508-510.

Olenick, Richard P., "Comprehensive Conceptual Curriculum for Physics." (C3P Project) Department of Physics, University of Dallas, olenick@udallas.edu. Site at: http://phys.udallas.edu/C3P/Preconceptions.pdf.

Osborne, Roger J. and Cosgrove, M.M. (1983). Childrens' conceptions of the changes of state in water, *Journal of Research in Science Teaching* 20, 825-838.

Osborne, Roger J., and Freyberg, Peter (1985). Children's Science, in *Learning in Science, the Implications of Children's Science Learning in Science, the Implications of Children's Science*, Heinemann, Aukland.

*Peterson, R.F. and Treagust, D.F. (1989a). Grade-12 students' misconceptions of covalent bonding, *Journal of Chemical Education* 66, 459-460. (Reported in Kind (2004), p.56.)

Peterson, R F, Treagust, D F & Garnett, P J (1989). Development and Application of a Diagnostic Instrument to Evaluate Grade 11 and 12 Students' Concepts of Covalent Bonding and Structure following a Course of Instruction, *Journal of Research in Science Teaching* 26, 301-314.

*Peterson, R.F. (1993). Tertiary students understanding of covalent bonding and structure concepts, *Australian Journal of Chemical Education*, July, p.11-15. (In Kind (2004) p. 61.)

*Pfundt, H., and Duit, P., (1994). *Students' alternative frameworks and science education. (4th edition),* Institut fur die pedagogik der Naturwissenschaften an der Univeritet, Kiel: IPN Reports in Brief

*Piaget, J. and Inhelder, B. (1974). *The child's construction of quantities.* Routledge and Kegan Paul, London. (Reported in Kind (2004).)

*Prieto, T., Blanco, A. and Rodriguez, A. (1989). The ideas of 11 to 14 year old students about the nature of solutions. *International Journal of Science Education* 11 (4) 451-463. (Reported in Kind (2004) p.8.)

*Quilez-Pardo, J., Solaz-Portolez, J. J. (1995). Students' and teachers' misapplication of Le Chatelier's principle: Implications for the teaching of chemical equilibrium. *Journal of Research in Science Teaching,* 32 (9), 939-957.

*Ross, K. (1993). There is no energy in food and fuels - but they do have fuel value, *School Science Review* 75, 39-47.

Rozier, S. and Viennot, L. (1991). Students' reasonings in thermodynamics, *International Journal of Science Education* 13 (2), 159-197.

*Russell, T., and Watt, D. (1990), "Evaporation and Condensation", A primary SPACE research report: University of Liverpool Press. (In Kind (2004))

*Russell, T., Harlen, W. and Watt, D. (1989), "Children's ideas about evaporation", *International Journal of Science Education* 11, Special Issue, 566-576. (In Kind (2004))

Sanger, M., and Greenbowe, T. (1999). Analysis of College Chemistry Textbooks as Sources of Misconceptions and Errors in Electrochemistry, *Journal of Chemical Education* 76 (6), 853-60.

Schmidt, Hans-Jurgen (1997). Students' Misconceptions - Looking for a Pattern, *Science Education* 81 (2), 123-135.

*Schollum, B. (1981). Chemical change: A working paper of the Learning in Science Project (no. 27), University of Waikato, Hamilton, New Zealand. (Summarized in Kind (2004) p.35)

*Schollum, B. (1982). "Reactions: A working paper of the Learning in Science Project (no. 37), University of Waikato, Hamilton, New Zealand. (In Kind (2004) p.24, 35)

*Séré, M.G. (1985). The gaseous state. In R. Driver, E. Guesnes & A. Tiberghien (Eds.), *Childrens' Ideas in Science*, Milton Keynes: Open University Press, p.105-123. (Reported in Viennot (1998).)

*Séré, M.G. (1986). Children's conceptions of the gaseous state, prior to teaching, *European Journal of Science Education* 8(4), 413-425. (In Kind (2004))

Smith, John, P., diSessa, Andrea A., and Roschelle, Jeremy (1993), Misconceptions Reconceived: a Constructivist Analysis of Knowledge in Transition, *The Journal of the Learning Sciences* 3 (2), p. 115-163.

*Solomon, J. (1985). Teaching the Conservation of Energy, *Physics Education* 20, 165-170. (In

Swackhamer (2001).)

*Stavy, R. and Stachel, D. (1985) Children's ideas about 'solid' and 'liquid', *European Journal of Science Education* 7 (4), 407-421.

*Stavy, R. (1988). Children's conception of gas, *International Journal of Science Education* 10, 553-60.

*Stavy, R. (1990). Children's conceptions of changes in the state of matter: From liquid (or solid) to gas, *Journal of Research in Science Teaching* 27 (3), 247-266. (In Kind (2004))

Steinberg, Melvin S. (1995). *Electricity Visualized, the Castle Project; Capacitor-Aided System for Teaching and Learning Electricity (CASTLE),* PASCO Scientific, Roseville, CA. The extensive teachers'guide section holds many insights on student alternative conceptions and strategies to address them.

*Strong, L.E. (1970). Differentiating Physical and Chemical Changes, *Journal of Chemical Education* 47 (10), 689-690. (In Kind (2004) p.26.)

Swackhamer, Gregg (2001). "Bibliography for Energy Concept Inventory", unpublished, Modeling Instruction Program, Department of Physics, Arizona State University, Tempe. Available from pswackhamer@glenbrook.k12.il.us.

*Taber, K.S. (1996). The secret life of the chemical bond: students' anthropomorphic and animistic references to bonding, *International Journal of Science Education* 18 (5), 557-568. (In Kind (2004) p.55.)

Taber, K.S. (1997). Student Understanding of Ionic Bonding: Molecular versus Electrostatic Framework? *School Science Review* 78, 85-95.

Taber, K. S. (1998a). An Alternative Conceptual Framework From Chemistry Education. *International Journal of Science Education* 20 (5), 597-608.

Taber, K.S. (1998 b). The sharing out of nuclear attraction, or 'I can't think about physics in chemistry', *International Journal of Science Education* 20 (8), 1001-1014.

*Thomaz, Marilia, Maliquias, I. M., Valente, M. C. and Aritanes, M.J. (1993). An attempt to overcome alternative conceptions related to heat and temperature, In Novak, J. (Ed.), *Proceedings of the Third International Seminar on Misconceptions and Educational Strategies in Science and Mathematics*. Ithaca, New York: Cornell University (distributed electronically). (In Swackhamer (2001).)

*Thomaz, Marilia; Valente, M.C., Maliquias, I. M. and Aritanes, M. (1995). An attempt to overcome alternative conceptions related to heat and temperature, *Physics Education* 30 (1), 19-36..

Thomas, P.L. and Schwenz, R.W. (1998). College Physical Chemistry Students' Conceptions of Equilibrium and Fundamental Thermodynamics, *Journal of Research in Science Teaching* 35 (10), 1151-60.

*Tiberghien, A. (1984). Critical review on the research aimed at elucidating the sense that the notion of temperature and heat have for students aged 10 to 16 years. In *Research on Physics Education, Proceedings of an International Workshop*, la Londes les Maures, .CNRS, Paris, 75-90

*Tiberghien, A. (1985). Heat and Temperature, part B. In R. Driver, E. Guesnes and A. Tiberghien (Eds.), *Childrens' Ideas in Science* (pp. 52-84). Milton Keynes: Open University Press. (Reported in Viennot (1998).)

*Tibergihian, A. (1985). Heat and temperature, Part 3. In R. Driver, E. Guesnes and A. Tibergihian, eds., *Children's Ideas in Science*, (52-84). Milton Keynes: Open University Press. (Reported in Viennot (1998).)

*Trumper, Ricardo (1990). Being Constructive: an alternative approach to the teaching of the energy concept – part one, *International Journal of Science Education* 12, 343-354. (In Swackhamer (2001).)

*Trumper, Ricardo (1993). Children's energy concepts: a cross-age study, *International Journal of Science Education* 15, 139-48. (In Swackhamer (2001).)

*Trumper, Ricardo (1997a). A survey of the conceptions of energy in Israeli pre-service high school biology teachers, *International Journal of Science Education* 19, 31-46. (In Swackhamer (2001).)

Tyson, Louise, and Treagust, David (1999). Complexity of Teaching and Learning Chemical Equilibrium, *Journal of Chemical Education* 76 (4), 554-558.

van Driel, J., deVos, W., van der Loop, N. and Dekkers, H. (1998). Developing secondary students' conceptions of chemical reactions: the introduction of chemical equilibrium, *International Journal of Science Education* 20 (4), 379-392..

*van Huis, Cor, van den Berg, Eds. (1993). Teaching Energy, a systems approach, *Physics Education* 28, 146-153.

*Viennot, Lawrence (1997). "Experimental Facts and Ways of Reasoning in Thermodynamics: Learners' Common Approach," in *Connecting Research in Physics Education with Teacher Education,* Tiberghian, Andree, Jossem, E. Leonard, Barojas, Jorge, eds., http://www.physics.ohio-state.edu/~jossem/ICPE/C3.html, (The International Commission on Physics Education, 1997-98.)

Wells, M., Hestenes, D. and Swackhamer, G. (1995). A modeling method for high school

physics instruction, *American Journal of Physics* **63**: 606-619. Available at http://modeling.asu.edu/R&E/Research.html.

Wheeler, A. and Kass, H. (1978). Student Misconceptions in Chemical Equilibrium, *Science Education* 62 (2), 223-232.

Yarroch, W.L. (1985). Student understanding of chemical equation balancing, *Journal of Research in Science Teaching* 22, 449-459.

Yeo, Shelley, and Zadnik, Marjan (2001). Introductory thermal concept evaluation: assessing student understanding, *The Physics Teacher* 39(8), 496-504. Available from S.Yeo@curtin.edu.au.

This paper was printed (without Appendix 2 and with abridged References) in the ***California Journal of Science Education,*** Volume VII, Issue 2 – Spring, 2007, and is available on their website at http://www.cascience.org/altchemconceptions.doc. It is also posted at the website http://hellevator.daisley.net with links to several concept evaluation instruments - one for pre-chemistry, the "Matter Concept Inventory", and one to evaluate the effectiveness of chemistry curricula, the "Chemistry Concept Inventory" (not to be confused by Mulford's 1996 CCI, but informed by it). The concept tests are password protected.
Contact PatrickD@spokaneschools.org for access.

Communications about this paper and contributions to it:

Christopher Horton
40 Boyd St.
Worcester, MA, USA 01606
chrisahorton@yahoo.com

Assumption College
500 Salisbury St.
Worcester, MA, USA 01609