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# Bibliography

- [1] A. M. Weiner and J. P. Heritage. Picosecond and femtosecond Fourier pulse shape synthesis. *Rev. Phys. Appl.*, 22:1619, 1987.
- [2] A. M. Weiner, J. P. Heritage, and E. M. Kirschner. High-resolution femtosecond pulse shaping. *J. Opt. Soc. Am. B*, 5(8):1563–1572, 1988.
- [3] W. S. Warren, H. Rabitz, and M. Dahleh. Coherent Control of Quantum Dynamics: The Dream Is Alive. *Science*, 259(5101):1581, 1993.
- [4] D. Goswami. Optical pulse shaping approaches to coherent control. *Phys. Rep.*, 374(6):385, 2002.
- [5] M. Dantus and V. V. Lozovoy. Experimental coherent laser control of physicochemical processes. *Chem. Rev.*, 104(4):1813–59, 2004.
- [6] V. V. Lozovoy and M. Dantus. Laser control of physicochemical processes; experiments and applications. *Annu. Rep. Prog. Chem., Sect. C: Phys. Chem.*, 102:227–258, 2006.
- [7] R. S. Judson and H. Rabitz. Teaching lasers to control molecules. *Phys. Rev. Lett.*, 68:1500–1503, 1992.
- [8] M. Shapiro and P. Brumer. Laser control of product quantum state populations in unimolecular reactions. *J. Chem. Phys.*, 84(7):4103, 1986.
- [9] D. J. Tannor and S. A. Rice. Control of selectivity of chemical reaction via control of wave packet evolution. *J. Chem. Phys.*, 83:5013, 1985.
- [10] J. Manz. *Ultrafast Reaction Dynamics at Atomic-Scale Resolution*. Imperial College Press, London, 1997.
- [11] Ingo Rechenberg, editor. *Evolutionsstrategie: Optimierung technischer Systeme nach Prinzipien der biologischen Evolution*. Frommann-Holzboog-Verlag, Stuttgart, 1973.
- [12] J. H. Holland. Adaption in natural and artificial systems. *University of Michigan Press*, 1975.
- [13] P. J. Bentley and D. W. Corne. *Creative Evolutionary Systems*. Morgan Kaufmann, 2001.

- [14] D. F. Jones, S. K. Mirrazavi, and M. Tamiz. Multi-objective meta-heuristics: An overview of the current state-of-the-art. *Eur. J. of Operational Research*, 137(1):1–9, 2002.
- [15] E. Brown and H. Rabitz. Some Mathematical and Algorithmic Challenges in the Control of Quantum Dynamics Phenomena. *J. Math. Chem.*, 31(1):17–63, 2002.
- [16] M. M. Wefers and K. A. Nelson. Generation of high-fidelity programmable ultrafast optical waveforms. *Opt. Lett.*, 20(9):1047–1049, 1995.
- [17] T. Brixner and G. Gerber. Femtosecond polarization pulse shaping. *Opt. Lett.*, 26(8):557–559, 2001.
- [18] Y. Silberberg. Ultrafast physics: Quantum control with a twist. *Nature*, 430:624–625, 2004.
- [19] L. Polacheck, D. Oron, and Y. Silberberg. Full control of the spectral polarization of ultrashort pulses. *Opt. Lett.*, 31(5):631–633, 2006.
- [20] M. Plewicki, S. M. Weber, F. Weise, and A. Lindinger. Independent control over the amplitude, phase, and polarization of femtosecond pulses. *Appl. Phys. B*, 86(2):259–263, 2007.
- [21] M. Plewicki, F. Weise, S. M. Weber, and A. Lindinger. Phase, amplitude, and polarization shaping with a pulse shaper in a Mach-Zehnder interferometer. *Appl. Opt.*, 45(32):8354–8359, 2006.
- [22] G. Deerberg, S. Schluter, A. Steiff, W. Witt, L. E. Berg, M. Beutter, and T. Hansson. Femtosecond laser spectroscopy on the vibrational wave packet dynamics of the  $A^1\Sigma^+$  state of NaK. *Chem. Phys. Lett.*, 253(3):327–332, 1996.
- [23] M. P. Comte, D. Bastoul, G. Hebrard, M. Roustan, V. Lazarova, J. Heufelder, H. Ruppe, S. Rutz, E. Schreiber, and L. Wöste. Fractional revivals of vibrational wave packets in the NaK  $A^1\Sigma^+$  state. *Chem. Phys. Lett.*, 269(1):1–8, 1997.
- [24] A. Bartelt, S. Minemoto, C. Lupulescu, Š. Vajda, and L. Wöste. Control of wavepacket dynamics in mixed alkali metal clusters by optimally shaped fs pulses. *Eur. Phys. J. D*, 16(1):127–131, 2001.
- [25] Š. Vajda, A. Bartelt, E. C. Kaposta, T. Leisner, C. Lupulescu, S. Minemoto, P. Rosendo-Francisco, and L. Wöste. Feedback optimization of shaped femtosecond laser pulses for controlling the wavepacket dynamics and reactivity of mixed alkaline clusters. *Chem. Phys.*, 267(1):231–239, 2001.
- [26] A. Bartelt, C. Lupulescu, Š. Vajda, and L. Wöste. *Feedback Control of Alkali Dimers with Sinusoidal Phase Modulated fs-Pulses*. ed. A. Douhal and J. Santamaria, World Scientific Publishing edition, 2002.

- [27] A. Bartelt, A. Lindinger, C. Lupulescu, Š. Vajda, and L. Wöste. One parameter fs-pulse form control on NaK and Na<sub>2</sub>K. *Phys. Chem. Chem. Phys.*, 5:3610–3615, 2003.
- [28] M. Plewicki. *Phase, amplitude, and polarization pulse shaping in order to influence molecular processes*. PhD thesis, FU Berlin, 2006.
- [29] F. Schwabl, editor. *Quantenmechanik*. Springer-Verlag, Berlin-Heidelberg, 1993.
- [30] B. Bareika, R. Danielius, G. Dikchius, R. Gadonas, A. Piskarskas, V. Sirutkaitis, R. L. Fork, C. V. Shank, R. Yen, and C. Hirlimann. Picosecond pulses and applications. *Appl. Phys. B*, 29(3):176–179, 1982.
- [31] J.-C. Diels and W. Rudolph. *Ultrashort Laser Pulse Phenomena*. Academic Pr., 1996.
- [32] D. J. Tannor, J. H. More, and N. D. Spencer. *Interaction of light with matter: A coherent perspective*, volume 1 of *Encyclopedia of Chemical physics and Physical chemistry*. IOP Publishing Ltd, Bristol, 2001.
- [33] M. J. Rosker, M. Dantus, and A. H. Zewail. Femtosecond real-time probing of reactions. I. The technique. *J. Chem. Phys.*, 89:6113, 1988.
- [34] M. Dantus, M. H. M. Janssen, and A. H. Zewail. Femtosecond probing of molecular dynamics by mass-spectrometry in a molecular beam. *Chem. Phys. Lett.*, 181(4):281–287, 1991.
- [35] R. Trebino, K. W. DeLong, D. N. Fittinghoff, J. N. Sweetser, M. A. Krumbügel, B. A. Richman, and D. J. Kane. Measuring ultrashort laser pulses in the time-frequency domain using frequency resolved optical gating. *Rev. Sci. Instrum.*, 68:3277–3295, 1997.
- [36] A. Bartelt. *Steuerung der Wellenpaketzdynamik in kleinen Alkaliclustern mit optimierten Femtosekundenpulsen*. PhD thesis, FU Berlin, 2002.
- [37] A. M. Weiner, D. E. Leaird, J. S. Patel, and J. R. Wullert. Programmable shaping of femtosecond optical pulses by use of 128-element liquid crystal phase modulator. *IEEE J. Quant. Elect.*, 28(4):908–920, 1992.
- [38] Cambridge Research & Instrumentation, Inc. *SLM 640 user manual Rev 1.3 (USB model)*, June 2004.
- [39] C. R. Reeves. *Modern heuristic techniques for combinatorial problems*. John Wiley & Sons, Inc. New York, NY, USA, 1993.
- [40] A. E. Eiben and J. Smith. *Introduction to Evolutionary Computing*. Springer, 2003.
- [41] K. De Jong. *An Analysis of the Behaviour of a Class of Genetic Adaptive Systems*. PhD thesis, University of Michigan, 1975.

- [42] D. E. Goldberg. *Genetic Algorithms in Search, Optimization and Machine Learning*. Addison-Wesley Longman Publishing Co., Inc. Boston, MA, USA, 1989.
- [43] L. J. Fogel. Toward inductive inference automata. *Proceedings of the International Federation for Information Processing Congress*, page 395, 1962.
- [44] J. R. Koza. *Genetic Programming: on the programming of computers by means of natural selection*. Bradford Book, 1992.
- [45] C. Blum and A. Roli. Metaheuristics in combinatorial optimization: Overview and conceptual comparison. *ACM Computing Surveys (CSUR)*, 35(3):268–308, 2003.
- [46] E. Aarts and J. K. Lenstra. *Local Search in Combinatorial Optimization*. John Wiley & Sons, Inc. New York, NY, USA, 1997.
- [47] S. Kirkpatrick, C. D. Gelatt Jr, and M. P. Vecchi. Optimization by Simulated Annealing. *Science*, 220(4598):671, 1983.
- [48] F. W. Glover and M. Laguna. *Tabu Search*. Springer, 1997.
- [49] F. W. Glover. Tabu Search-Part I. *ORSA Journal on Computing*, 1(3):190–206, 1989.
- [50] M. Dorigo and G. Di Caro. The ant colony optimization meta-heuristic. *Mcgraw-Hill'S Advanced Topics In Computer Science Series*, pages 11–32, 1999.
- [51] T. A. Feo and M. G. C. Resende. Greedy Randomized Adaptive Search Procedures. *Journal of Global Optimization*, 6(2):109–133, 1995.
- [52] G. Syswerda. Uniform crossover in genetic algorithms. In *Proceedings of the 3rd International Conference on Genetic Algorithms*, pages 2–9, San Francisco, CA, USA, 1989. Morgan Kaufmann Publishers Inc.
- [53] H. Pauly. *Atom, Molecule, and Cluster Beams I*. Springer Verlag, 2000.
- [54] M. A. Herman and H. Sitter. *Molecular Beam Epitaxy: Fundamentals and Current Status*. Springer-Verlag, 1989.
- [55] C. Lupulescu. *Femtosecond Analysis and Feedback Control of Molecular Processes in Organometallic and Alkaline Systems*. PhD thesis, FU Berlin, 2004.
- [56] S. Rutz. *Femtosekundenspektroskopie zur Wellenpaketdynamik in Alkalidimeren und -trimeren*. PhD thesis, FU Berlin, 1996.
- [57] M. Ulbricht. Hochauflösende Laserspektroskopie an kleinen Alkaliclustern. Master's thesis, FU Berlin, 1991.
- [58] R. de Vivie-Riedle, B. Reischl, S. Rutz, and E. Schreiber. Femtosecond Study of Multiphoton Ionization Processes in K<sub>2</sub> at Moderate Laser Intensities. *J. Phys. Chem.*, 99(46):16829–16834, 1995.

- [59] D. Meshulach and Y. Silberberg. Coherent quantum control of two-photon transitions by a femtosecond laser pulse. *Nature*, 396:239, 1998.
- [60] O. E. Martinez. Matrix formalism for pulse compressors. *Quantum Electronics, IEEE Journal of*, 24(12):2530–2536, 1988.
- [61] D. Leaird and A. Weiner. Femtosecond optical packet generation by a direct space-to-time pulse shaper. *Opt. Lett.*, 24:853–855, 1999.
- [62] J. P. Heritage and A. M. Weiner. Shaping optical pulses by amplitude and phase masking, 1987. US Patent 4,655,547.
- [63] A. M. Weiner, J. P. Heritage, and J. A. Salehi. Encoding and decoding of femtosecond pulses. *Opt. Lett.*, 13(4):300–302, 1988.
- [64] Acousto-optical Modulator, 1971. US Patent 3,572,899.
- [65] C. Hillegas, J. Tull, D. Goswami, D. Strickland, and W. Warren. Femtosecond laser pulse shaping by use of microsecond radio-frequency pulses. *Opt. Lett.*, 19:737, 1994.
- [66] A. M. Weiner. Femtosecond pulse shaping using spatial light modulators. *Rev. Sci. Instrum.*, 71(5):1929, 2000.
- [67] Cambridge Research and Instrumentation, Inc. *SLM-256 Spatial Light Modulator (SLM) User's Manual*, 2004.
- [68] D. E. Leaird and A. M. Weiner. Femtosecond optical packet generation by a direct space-to-time pulse shaper. *Opt. Lett.*, 24(12):855, 1999.
- [69] A. M. Weiner, D. E. Leaird, J. S. Patel, and J. R. Wullert. Programmable shaping of femtosecond optical pulses by use of 128-element liquid crystal phase modulator. *IEEE J. Quant. Elect.*, 28:908–19, 1992.
- [70] M. M. Wefers and K. A. Nelson. Analysis of programmable ultrashort waveform generation using liquid crystal spatial light modulators. *J. Opt. Soc. Am. B*, 12:1343, 1995.
- [71] S. M. Weber. Application of evolution strategies on arbitrary pulse form generation, white light generation and isotope ratio optimization of K<sub>2</sub>. Master's thesis, FU Berlin, 2003.
- [72] S. Linden, H. Giessen, and J. Kuhl. XFROG - a new method for amplitude and phase characterization of weak ultrashort pulses. *Phys. Stat. Sol. (b)*, 206(119):119, 1998.
- [73] J. M. Geremia, W. Zhu, and H. Rabitz. Incorporating physical implementation concerns into closed loop quantum control experiments. *J. Chem. Phys.*, 113(24):10841–10848, 2000.
- [74] D. H. Wolpert and W. G. Macready. No Free Lunch Theorems for optimization. *IEEE Trans. Evol. Computat.*, 1(1):67–82, 1997.

- [75] T. Hornung, R. Meier, and M. Motzkus. Optimal control of molecular states in a learning loop with a parameterization in frequency and time domain. *Chem. Phys. Lett.*, 326:445–453, 2000.
- [76] T. Brixner, B. Kiefer, and G. Gerber. Problem complexity in femtosecond quantum control. *Chem. Phys.*, 267:241, 2001.
- [77] C. Lupulescu, A. Lindinger, M. Plewicki, A. Merli, S. M. Weber, and L. Wöste. Frequency dependent optimization of the ionization process in NaK by means of fs-pulses. *Chem. Phys.*, 296(1):63–69, 2004.
- [78] S. Magnier, M. Aubert-Frecon, and P. Millie. Potential Energies, Permanent and Transition Dipole Moments for Numerous Electronic Excited States of NaK. *J. Mol. Spectr.*, 200(1):96–103, 2000.
- [79] B. Schäfer-Bung, R. Mitric, V. Bonačić-Koutecký, A. Bartelt, C. Lupulescu, A. Lindinger, Š. Vajda, S. M. Weber, and L. Wöste. Optimal control of ionization processes in NaK: Comparison between theory and experiment. *J. Phys. Chem. A*, 108(19):4175–4179, 2004.
- [80] F. Sauer. *Wellenpaketdynamik in Alkali-Dimeren: Untersuchung und Steuerung durch kohärente Anregung mit fs-Pulsen*. PhD thesis, FU Berlin, 2007.
- [81] A. Bartelt, A. Lindinger, C. Lupulescu, Š. Vajda, and L. Wöste. Optimal control of multi-photon dissociation and ionization processes in small  $\text{Na}_m\text{K}_n$  clusters. *Phys. Chem. Chem. Phys.*, 6:1679–1686, 2004.
- [82] K. Deb. *Multi-Objective Optimization Using Evolutionary Algorithms*. John Wiley and Sons, 2001.
- [83] Carlos A. Coello. List of references on evolutionary multiobjective optimization, <http://www.lania.mx/~ccoello/EMOO/EMOObib.html>. last accessed: 4.6.2007.
- [84] O. de Weck. Multiobjective optimization: History and promise. In *The Third China-Japan-Korea Joint Symposium on Optimization of Structural and Mechanical Systems*, Kanazawa, Japan, 2004.
- [85] N. H. Damrauer, C. Dietl, G. Krampert, S. H. Lee, K. H. Jung, and G. Gerber. Control of bond-selective photochemistry in  $\text{CH}_2\text{BrCl}$  using adaptive femtosecond pulse shaping. *Eur. Phys. J. D*, 20:71–76, 2002.
- [86] A. Assion, T. Baumert, M. Bergt, T. Brixner, B. Kiefer, V. Seyfried, M. Strehle, and G. Gerber. Control of chemical reactions by feedback-optimized phase-shaped femtosecond laser pulses. *Science*, 282:919–922, 1998.
- [87] M. Bergt, T. Brixner, B. Kiefer, M. Strehle, and G. Gerber. Controlling the femtochemistry of  $\text{Fe}(\text{CO})_5$ . *J. Phys. Chem. A*, 103(49):10381–10387, 1999.

- [88] T. Brixner, N. H. Damrauer, G. Krampert, P. Niklaus, and G. Gerber. Femtosecond learning control of quantum dynamics in gases and liquids: Technology and applications. *J. Mod. Opt.*, 50(3):539–560, 2003.
- [89] A. Lindinger, C. Lupulescu, M. Plewicki, F. Vetter, A. Merli, S. M. Weber, and L. Wöste. Isotope selective ionization by optimal control using shaped fs-laser pulses. *Phys. Rev. Lett.*, 93:033001, 2004.
- [90] A. Lindinger, S. M. Weber, C. Lupulescu, F. Vetter, M. Plewicki, A. Merli, L. Wöste, A. F. Bartelt, and H. Rabitz. Revealing spectral field features and mechanistic insights by control pulse cleaning. *Phys. Rev. A*, 71(1):013419, 2005.
- [91] K. Sastry, D. D. Johnson, A. L. Thompson, D. E. Goldberg, T. J. Martinez, J. Leiding, and J. Owens. Multiobjective genetic algorithms for multiscaling excited state direct dynamics in photochemistry. *Proceedings of the 8th annual conference on Genetic and evolutionary computation*, pages 1745–1752, 2006.
- [92] A. F. Bartelt, M. Roth, M. Mehendale, and H. Rabitz. Assuring robustness to noise in optimal quantum control experiments. *Phys. Rev. A*, 71(6):063806, 2005.
- [93] B. J. Pearson, J. L. White, T. C. Weinacht, and P. H. Bucksbaum. Coherent control using adaptive learning algorithms. *Phys. Rev. A*, 63(063412), 2001.
- [94] Y. Guevel. Optimized shaped fs pulses by self-adapted evolutionary strategies used in coherent control of wavepacket dynamics in mixed alkali metal clusters. Master’s thesis, Université Pierre et Marie Curie, 2004.
- [95] J. M. Geremia, E. Weiss, and H. Rabitz. Achieving the laboratory control of quantum dynamics phenomena using nonlinear functional maps. *Chem. Phys.*, 267:209–222, 2001.
- [96] V. V. Lozovoy, J. C. Shane, B. Xu, and M. Dantus. Spectral phase optimization of femtosecond laser pulses for narrow-band, low-background nonlinear spectroscopy. *Science*, 303:1998–2001, 2004.
- [97] D. Cardoza, F. Langhofer, C. Trallero-Herrero, O. L. A. Monti, and T. C. Weinacht. Changing pulse-shape basis for molecular learning control. *Phys. Rev. A*, 70(5):053406, 2004.
- [98] J. L. White, B. J. Pearson, and P. H. Bucksbaum. Extracting quantum dynamics from genetic learning algorithms through principal control analysis. *J. Phys. B*, 37:L399–L405, 2004.
- [99] C. Iaconis and I. A. Walmsley. Spectral phase interferometry for direct electric-field reconstruction of ultrashort optical pulses. *Opt. Lett.*, 23(10):792–794, 1998.
- [100] A. M. Weiner. Femtosecond optical pulse shaping and processing. *Prog. Quant. Electr.*, 19:161–237, 1995.

- [101] A. Lindinger, C. Lupulescu, F. Vetter, M. Plewicki, S. M. Weber, A. Merli, and L. Wöste. Learning from the acquired optimized pulse shapes about the isotope selective ionization of potassium dimers. *J. Chem. Phys.*, 122(2):024312, 2005.
- [102] H. London. *Separation of Isotopes*. Newnes, 1961.
- [103] W. H. King. Isotope shifts in atomic spectra. *Physics of Atoms and Molecules*, 1984.
- [104] P. T. Greenland. Laser isotope separation. *Contemporary Physics*, 31:405, 1990.
- [105] I. S. Averbukh, M. J. J. Vrakking, D. M. Villeneuve, and A. Stolow. Wave packet isotope separation. *Phys. Rev. Lett.*, 77:3518, 1996.
- [106] M. Leibscher and I. S. Averbukh. Optimal control of wave-packet isotope separation. *Phys. Rev. A*, 63:043407–1, 2001.
- [107] J. P. Zhang, J. R. Grace, N. Epstein, K. S. Lim, S. Rutz, and E. Schreiber. Fractional revivals of wave packets in the  $A\ ^1\Sigma_u^+$  state of  $K_2$ . A comparison of two different pump and probe cycles by spectrograms. *Chem. Phys. Lett.*, 269(1):9–16, 1997.
- [108] S. Rutz, R. de Vivie-Riedle, and E. Schreiber. Femtosecond wave packet propagation in spin-orbit coupled electronic states of  $^{39,39}K$  and  $^{39,41}K$ . *Phys. Rev. A*, 54:306, 1996.
- [109] A. J. Ross, P. Crozet, C. Effantin, J. d’Incan, and R. F. Barrow. Interactions between the  $A(1)^1\Sigma_u^+$  and  $b(1)^3\Pi_u$  states of  $K_2$ . *J. Phys. B*, 20:6225, 1987.
- [110] B. Schäfer-Bung, V. Bonačić-Koutecky, F. Sauer, S. M. Weber, L. Wöste, and A. Lindinger. Isotope selective photoionization of NaK by optimal control: Theory and experiment. *J. Chem. Phys.*, 125(21):214310, 2006.
- [111] A. Lindinger, A. Merli, M. Plewicki, F. Vetter, S. M. Weber, and L. Wöste. Optimal control of isotope selective fragmentation. *Chem. Phys. Lett.*, 413:315–320, 2005.
- [112] A. Lindinger, F. Vetter, C. Lupulescu, M. Plewicki, S. M. Weber, A. Merli, and L. Wöste. Selective ionization via different electronic pathways by optimal control demonstrated for  $^{23}Na^{39}K/^{23}Na^{41}K$ . *Chem. Phys. Lett.*, 397:123–127, 2004.
- [113] T. Hornung, R. Meier, D. Zeidler, K.-L. Kompa, D. Proch, and M. Motzkus. Optimal control of one- and two-photon transitions with shaped femtosecond pulses and feedback. *Appl. Phys. B*, 71:277, 2000.
- [114] C. J. Bardeen, V. V. Yakovlev, K. R. Wilson, S. D. Carpenter, P. M. Weber, and W. S. Warren. Feedback quantum control of molecular electronic population transfer. *Chem. Phys. Lett.*, 280:151–158, 1997.

- [115] D. Zeidler, S. Frey, K.-L. Kompa, and M. Motzkus. Evolutionary Algorithms and their application to optimal control studies. *Phys. Rev. A*, 64:023420, 2001.
- [116] M. Comstock, V. V. Lozovoy, I. Pastirk, and M. Dantus. Multiphoton intrapulse interference 6; binary phase shaping. *Opt. Exp.*, 12(6):1061–1066, 2004.
- [117] I. Pastirk, M. Kangas, and M. Dantus. Multidimensional analytical method based on binary phase shaping of femtosecond pulses. *J. Phys. Chem. A*, 109(11):2413–2416, 2005.
- [118] J. L. Herek, W. Wohlleben, R. J. Cogdell, D. Zeidler, and M. Motzkus. Quantum control of energy flow in light harvesting. *Nature*, 417(6888):533–535, 2002.
- [119] N. Dudovich, D. Oron, and Y. Silberberg. Single-pulse coherently controlled nonlinear Raman spectroscopy and microscopy. *Nature*, 418(6897):512–514, 2002.
- [120] M. Nisoli, S. Stagira, S. De Silvestri, O. Svelto, S. Sartania, Z. Cheng, G. Tempea, C. Spielmann, and F. Krausz. Toward a terawatt-scale sub-10-fs laser technology. *Selected Topics in Quantum Electronics, IEEE Journal of*, 4(2):414–420, 1998.
- [121] D. Zeidler, S. Frey, W. Wohlleben, M. Motzkus, F. Busch, T. Chen, W. Kiefer, and A. Materny. Optimal control of ground-state dynamics in polymers. *J. Chem. Phys.*, 116(12):5231–5235, 2006.
- [122] J. Konradi, A. K. Singh, A. V. Scaria, and A. Materny. Selective spectral filtering of molecular modes of  $\beta$ -carotene in solution using optimal control in four-wave-mixing spectroscopy. *J. Raman Spec.*, 37(6):697, 2006.
- [123] M. Renard, R. Chaux, B. Lavorel, and O. Faucher. Pulse trains produced by phase-modulation of ultrashort optical pulses: tailoring and characterization. *Opt. Exp.*, 12(3):473–482, 2004.
- [124] G. Vogt, P. Nuernberger, R. Selle, F. Dimler, T. Brixner, and G. Gerber. Analysis of femtosecond quantum control mechanisms with colored double pulses. *Phys. Rev. A*, 74(3):33413, 2006.
- [125] O. M. Shir, C. Siedschlag, T. Bäck, and M. J. J. Vrakking. The complete-basis-functions parameterization in ES and its application to laser pulse shaping. In *GECCO '06: Proceedings of the 8th annual conference on Genetic and evolutionary computation*, pages 1769–1776, New York, 2006. ACM Press.
- [126] M. M. Wefers, H. Kawashima, and K. A. Nelson. Automated multidimensional coherent optical spectroscopy with multiple phase-related femtosecond pulses. *J. Chem. Phys.*, 102(22):9133–9136, 1995.

- [127] A. M. Weiner, S. Oudin, D. E. Leaird, and D. H. Reitze. Shaping of femtosecond pulses using phase-only filters designed by simulated annealing. *J. Opt. Soc. Am. A*, 10(5):1112–1120, 1993.
- [128] D. Meshulach, D. Yelin, and Y. Silberberg. Adaptive real-time femtosecond pulse shaping. *J. Opt. Soc. Am. B*, 15(5):1615–1619, 1997.
- [129] M. Hacker, G. Stobrawa, and T. Feurer. Iterative fourier transform algorithm for phase-only pulse shaping. *Opt. Exp.*, 9(4):191, 2001.
- [130] R. Gerchberg and W. O. Saxton. A practical algorithm for the determination of phase from image and diffraction plane pictures. *Optik*, 35:237, 1971.
- [131] B. Schmidt, M. Hacker, G. Stobrawa, and T. Feurer. Lab2 - A virtual femtosecond laser lab. <http://www.lab2.de>.
- [132] J. A Nelder and R. Mead. The downhill simplex method. *Computer Journal*, 7:308, 1965.
- [133] R. de Vivie-Riedle, K. Kobe, J. Manz, W. Meyer, B. Reischl, S. Rutz, E. Schreiber, and L. Wöste. Femtosecond study of multiphoton ionization processes in K<sub>2</sub>: from pump-probe to control. *J. Phys. Chem.*, 100:7789–7796, 1996.
- [134] F. Vetter, M. Plewicki, A. Lindinger, A. Merli, S. M. Weber, and L. Wöste. Optimized isotope-selective ionization of <sup>23</sup>Na<sup>39</sup>K and <sup>23</sup>Na<sup>41</sup>K by applying evolutionary strategies. *Phys. Chem. Chem. Phys.*, 7(6):1151–1156, 2005.
- [135] K. K. Sharma. *Optics: Principles and applications*. Elsevier, 2006.
- [136] J. W. Goodman. *Introduction to Fourier Optics*. Roberts & Co, 2004.
- [137] D. H. Goldstein and E. Collett. *Polarized Light*. Marcel Dekker, 2003.
- [138] T. Brixner. Poincaré representation of polarization-shaped femtosecond laser pulses. *Appl. Phys. B*, 76(5):531–540, 2003.
- [139] T. Brixner, G. Krampert, T. Pfeifer, R. Selle, G. Gerber, M. Wollenhaupt, O. Graefe, C. Horn, D. Liese, and T. Baumert. Quantum Control by Ultrafast Polarization Shaping. *Phys. Rev. Lett.*, 92(20):208301, 2004.
- [140] T. Suzuki, S. Minemoto, T. Kanai, and H. Sakai. Optimal Control of Multiphoton Ionization Processes in Aligned I<sub>2</sub> Molecules with Time-Dependent Polarization Pulses. *Phys. Rev. Lett.*, 92(13):133005, 2004.
- [141] N. Dudovich, D. Oron, and Y. Silberberg. Quantum control of the angular momentum distribution in multiphoton absorption processes. *Phys. Rev. Lett.*, 92(10):103003, 2004.
- [142] M. Aeschlimann, M. Bauer, D. Bayer, T. Brixner, F. J. Garcia de Abajo, W. Pfeiffer, M. Rohmer, C. Spindler, and F. Steeb. Adaptive subwavelength control of nano-optical fields. *Nature*, 446(7133):301–4, 2007.

- [143] S. C. Barden, J. A. Arns, and W. S. Colburn. Volume-phase holographic gratings and their potential for astronomical applications. *Proc. SPIE*, 3355:866–876, 1998.
- [144] S. C. Barden, J. A. Arns, W. S. Colburn, and J. B. Williams. Volume-Phase Holographic Gratings and the Efficiency of Three Simple Volume-Phase Holographic Gratings. *Publications of the Astronomical Society of the Pacific*, 112(772):809–820, 2000.
- [145] Z. Zhuang, S.W. Suh, and JS Patel. Polarization controller using nematic liquid crystals. *Opt. Lett.*, 24(10):694–696, 1999.
- [146] M. Akbulut, R. Nelson, A. M. Weiner, P. Cronin, and P. J. Miller. Broadband polarization correction with programmable liquid-crystal modulator arrays. *Opt. Lett.*, 29(10):1129–1131, 2004.
- [147] F. Weise. Entwicklung der Pulsformung in Phase, Amplitude und Polarisierung sowie kohärente Kontrolle in der MOT. Master's thesis, FU Berlin, 2006.
- [148] T. Brixner, G. Krampert, P. Niklaus, and G. Gerber. Generation and characterization of polarization-shaped femtosecond laser pulses. *Appl. Phys. B*, 74:133–144, 2002.
- [149] T. Suzuki, S. Minemoto, and H. Sakai. Nontrivial Polarization Shaping of Femtosecond Pulses by Reference to the Results of Dual-Channel Spectral Interferometry. *Appl. Opt.*, 43(32):6047–6050, 2004.
- [150] T. Brixner, N. H. Damrauer, G. Krampert, P. Niklaus, and G. Gerber. Adaptive shaping of femtosecond polarization profiles. *J. Opt. Soc. Am. B*, 20(5):878–881, 2003.
- [151] G. E. Jellison Jr and D. H. Lowndes. Time-resolved ellipsometry measurements of the optical properties of silicon during pulsed excimer laser irradiation. *Appl. Phys. Lett.*, 47(7):718–721, 2006.
- [152] A. C. Albrecht. Polarizations and assignments of transitions: The method of photoselection. *J. Mol. Spec.*, 6:84–108, 1961.
- [153] A. Pe'er, B. Dayan, Y. Silberberg, and A. A. Friesem. Optical Code-Division Multiple Access Using Broad-Band Parametrically Generated Light. *J. Lightwave Technology*, 22(6):1463, 2004.
- [154] J. J. Larsen, K. Hald, N. Bjerre, H. Stapelfeldt, and T. Seideman. Three Dimensional Alignment of Molecules Using Elliptically Polarized Laser Fields. *Phys. Rev. Lett.*, 85(12):2470–2473, 2000.
- [155] A. Ulman. Formation and structure of self-assembled monolayers. *Chem. Rev.*, 96(4):1533–1554, 1996.
- [156] M. Shapiro and P. Brumer. Controlled photon induced symmetry breaking: Chiral molecular products from achiral precursors. *J. Chem. Phys.*, 95:8658–8661, 1991.

- [157] Y. Fujimura, L. González, K. Hoki, J. Manz, and Y. Ohtsuki. Selective preparation of enantiomers by laser pulses: quantum model simulation for H<sub>2</sub>POSH. *J. Chem. Phys.*, 306(1):1–8, 1999.
- [158] L. González, D. Kröner, and I. R. Sola. Separation of enantiomers by ultraviolet laser pulses in H<sub>2</sub>POSH:  $\pi$  pulses versus adiabatic transitions. *J. Chem. Phys.*, 115(6):2519–2529, 2001.
- [159] D. Oron, Y. Silberberg, N. Dudovich, and D. M. Villeneuve. Efficient polarization gating of high-order harmonic generation by polarization-shaped ultrashort pulses. *Phys. Rev. A*, 72(063816), 2005.
- [160] W. J. Walecki, D. N. Fittinghoff, A. L. Smirl, and R. Trebino. Characterization of the polarization state of weak ultrashort coherent signals by dual-channel spectral interferometry. *Opt. Lett.*, 22(2):81–83, 1997.
- [161] N. Srinivas and K. Deb. Multiobjective optimization using nondominated sorting in genetic algorithms. *Evol. Computation*, 2(3):221–248, 1994.
- [162] R. S. Rosenberg. *Simulation of genetic populations with biochemical properties*. PhD thesis, Ann Harbor, Michigan, 1967.
- [163] V. H. Chankong and Y. Yacov. *Multiobjective Decision Making*. North Holland, New York / Amsterdam / Oxford, 1983.
- [164] J. D. Schaffer. *Some Experiments in Machine Learning Using Vector Evaluated Genetic Algorithms*. PhD thesis, Vanderbilt Univ., Nashville, TN (USA), 1984.
- [165] K. Deb, S. Agrawal, A. Pratab, and T. Meyarivan. A fast elitist non-dominated sorting genetic algorithm for multi-objective optimization: NSGA-II. Technical report, Indian Institute of Technology, Kanpur, India, 2000. KanGAL report 200001.
- [166] E. Zitzler, M. Laumanns, and L. Thiele. SPEA2: Improving the Strength Pareto Evolutionary Algorithm. *EUROGEN*, pages 95–100, 2001.
- [167] B. Sareni and L. Krahenbuhl. Fitness sharing and niching methods revisited. *IEEE Trans. on Ev. Computation*, 2(3):97–106, 1998.
- [168] K. Deb and R. B. Agrawal. Simulated binary crossover for continuous search space. *Complex Systems*, 9(2):115–148, 1995.
- [169] K. Deb. *Multi-objective optimization using evolutionary algorithms*. Wiley, Chichester, UK, 2001.
- [170] K. Deb. Evolutionary algorithms for multi-criterion optimization in engineering design. *Evolutionary Algorithms in Engineering and Computer Science*, pages 135–161, 1999.
- [171] K. Deb. Multi-objective genetic algorithms: Problem difficulties and construction of test problems. *Evol. Computation*, 7(3):205, 1999.

- [172] S. Cahon, N. Melab, and E. G. Talbi. ParadisEO: A Framework for the Reusable Design of Parallel and Distributed Metaheuristics. *J. Heuristics*, 10(3):357–380, 2004.
- [173] S. Cahon, N. Melab, and E. G. Talbi. Building with ParadisEO reusable parallel and distributed evolutionary algorithms. *Parallel Computing*, 30(5–6):677–697, 2004.
- [174] M. Keijzer, J. J. Merelo, G. Romero, and M. Schoenauer. Evolving objects: a general purpose evolutionary computation library. *Proceedings of Evolution Artificielle*, 1:231–244, 2001.
- [175] M. H. Hennessy, A. M. Kelley, and S. Matter. Using real-valued multi-objective genetic algorithms to model molecular absorption spectra and Raman excitation profiles in solution. *Phys. Chem. Chem. Phys.*, 6:1085–1095, 2004.
- [176] J. C. Vaughan, T. Feurer, and K. A. Nelson. Automated two-dimensional femtosecond pulse shaping. *J. Opt. Soc. Am. B*, 19(10):2489–2495, 2002.
- [177] T. Feurer, J. C. Vaughan, and K. A. Nelson. Spatiotemporal coherent control of lattice vibrational waves. *Science*, 299(5605):374–7, 2003.
- [178] G. Vogt, G. Krampert, P. Niklaus, P. Nuernberger, and G. Gerber. Optimal Control of Photoisomerization. *Phys. Rev. Lett.*, 94(6):68305, 2005.
- [179] M. Shapiro and P. Brumer. Coherent control of molecular dynamics. *Reports on Progress in Physics*, 66(6):859–942, 2003.
- [180] M. Ivanov, P. B. Corkum, T. Zuo, and A. Bandrauk. Routes to control of intense-field atomic polarizability. *Phys. Rev. Lett.*, 74(15):2933–2936, Apr 1995.
- [181] J. L. Krause, D. H. Reitze, G. D. Sanders, A. V. Kuznetsov, and C. J. Stanton. Quantum control in quantum wells. *Phys. Rev. B*, 57(15):9024–9034, 1998.
- [182] I. Barth, J. Manz, Y. Shigeta, and K. Yagi. Unidirectional electronic ring current driven by a few cycle circularly polarized laser pulse: Quantum model simulations for Mg-porphyrin. *J. Am. Chem. Soc.*, 128(21):7043–7049, 2006.

