

Bibliography

- Abramowitz, M. and I. A. Stegun. *Handbook of Mathematical Functions*. Dover, New York, NY, 1965.
- Adler, R., D. Coppersmith, and M. Hassner. Algorithms for sliding block codes – an application of symbolic dynamics to information theory. *IEEE Transactions on Information Theory*, 29(1):5–22, 1983.
- Agazzi, O. E., M. R. Hueda, H. S. Carrer, and D. E. Crivelli. Maximum-likelihood sequence estimation in dispersive optical channels. *Journal of Lightwave Technology*, 23(2):749–63, 2005.
- Agrawal, G. P. *Semiconductor Lasers*. Van Nostrand Reinhold, New York, NY, 1993.
- Agrawal, G. P. *Nonlinear Fiber Optics*. Academic Press, San Diego, CA, 2008.
- Agrawal, G. S. *Quantum Optics*. Cambridge University Press, Cambridge, 2013.
- Agrell, E. and M. Karlsson. Power-efficient modulation formats in coherent transmission systems. *Journal of Lightwave Technology*, 27(22):5115–26, 2009.
- Agrell, E., A. Alvarado, and F. R. Kschischang. Implications of information theory in optical fibre communications. *Philosophical Transactions of the Royal Society of London A: Mathematical, Physical and Engineering Sciences*, 374(2062):20140438, 2016.
- Ahmed, S., T. Ratnarajah, M. Sellathurai, and N. Cowan. Reduced-complexity iterative equalization for severe time-dispersive MIMO channels. *IEEE Transactions on Vehicular Technology*, 57(1):594–600, 2008.
- Al-Dhahir, N. and A. H. Sayed. The finite-length multi-input multi-output MMSE-DFE. *IEEE Transactions on Signal Processing*, 48(10):2921–36, 2000.
- Alferov, Zh. I., V. M. Andreev, E. L. Portnoi, and M. K. Turkan. AlAs–GaAs heterojunction injection lasers with a low room-temperature threshold. *Soviet Physics Semiconductors*, 3:460–3, 1970.
- Alić, N., G. C. Papen, R. E. Saperstein, L. B. Milstein, and Y. Fainman. Signal statistics and maximum likelihood sequence estimation in intensity modulated fiber optic links containing a single optical preamplifier. *Optics Express*, 13(12):4568–79, 2005.
- Arikan, E. A method for constructing capacity-achieving codes for symmetric binary-input memoryless channels. *IEEE Transactions on Information Theory*, 55(7):3051–3073, 2009.
- Arimoto, S. An algorithm for computing the capacity of arbitrary discrete memoryless channels. *IEEE Transactions on Information Theory*, 18(1):14–20, 1972.
- Austin, M. E. Decision-feedback equalization for digital communications over dispersive channels. Technical Report 437, MIT Lincoln Laboratories, 1967.
- Azana, J. and M. A. Muriel. Real-time optical spectrum analysis based on the time-space duality in chirped fiber gratings. *IEEE Journal of Quantum Electronics*, 36(5):517–26, 2000.
- Bahl, L., J. Cocke, F. Jelinek, and J. Raviv. Optimal decoding of linear codes for minimizing symbol error rate. *IEEE Transactions on Information Theory*, 20(2):284–7, 1974.

- Baker, K. R. On the WMC density as an inverse Gaussian probability density. *IEEE Transactions on Communications*, 44(1):15–17, 1996.
- Ballato, J. and P. Dragic. Materials development for next generation optical fiber. *Materials*, 7(6):4411–30, 2014.
- Ban, M., K. Kurokawa, R. Momose, and O. Hirota. Optimum measurements for discrimination among symmetric quantum states and parameter estimation. *International Journal of Theoretical Physics*, 36(6):1269–88, 1997.
- Barry, J. R. and E. A. Lee. Performance of coherent optical receivers. *Proceedings of the IEEE*, 78(8):1369–94, 1990.
- Becerra, F. E., J. Fan, G. Baumgartner, S. V. Polyakov, J. Goldhar, J. T. Kosloski, and A. Migdall. *M*-ary-state phase-shift-keying discrimination below the homodyne limit. *Physical Review A*, 84:062324, 2011.
- Becerra, F. E., J. Fan, G. Baumgartner, J. Goldhar, J. T. Kosloski, and A. Migdall. Experimental demonstration of a receiver beating the standard quantum limit for multiple nonorthogonal state discrimination. *Nature Photonics*, 7(2):147–52, 2013.
- Becker, P. C., N. A. Olsson, and J. R. Simpson. *Erbium-Doped Fiber Amplifiers*. Academic Press, San Diego, CA, 1999.
- Beling, A. and J. C. Campbell. InP-based high-speed photodetectors. *Journal of Lightwave Technology*, 27(1–4):343–55, 2009.
- Bell, A. G. On the production and reproduction of speech by light. *American Journal of Science*, 20(118):305–24, 1880.
- Bellanger, M. A simple comparison of constant modulus and Wiener criteria for equalization with complex signals. *Digital Signal Processing*, 14(5):429–37, 2004.
- Benedetto, S. and E. Biglieri. *Principles of Digital Transmission: With Wireless Applications*. Kluwer Academic/Plenum Press, New York, NY, 1999.
- Berdague, S. and P. Facq. Mode-division multiplexing in optical fibers. *Applied Optics*, 21:1950–5, 1982.
- Berger, T. and D. W. Tufts. Optimal pulse amplitude modulation part I: Transmitter–receiver design and bounds from information theory. *IEEE Transactions on Information Theory*, 13(4):196–208, 1967.
- Berrou, C. Error-correction coding method with at least two systematic convolutional codings in parallel, corresponding iterative decoding method, decoding module and decoder, August 29, 1995. URL www.google.com/patents/US5446747. US Patent 5,446,747.
- Berrou, C., A. Glavieux, and P. Thitimajshima. Near Shannon limit error-correcting coding and decoding: Turbo-codes. 1. In *Conference Record, IEEE International Conference on Communications, 1993. ICC 93. Geneva. Technical Program*, volume 2, pages 1064–70, 1993.
- Betti, S., G. De Marchis, and E. Iannone. *Coherent Optical Communications Systems*. Wiley-Interscience, New York, NY, 1995.
- Beygi, L., E. Agrell, J. M. Kahn, and M. Karlsson. Rate-adaptive coded modulation for fiber-optic communications. *Journal of Lightwave Technology*, 32(2):333–43, 2013.
- Blachman, N. M. A comparison of the informational capacities of amplitude- and phase-modulation communication systems. *Proceedings of the Institute of Radio Engineers*, 41(6):748–59, 1953.
- Blahut, R. E. Computation of channel capacity and rate-distortion functions. *IEEE Transactions on Information Theory*, 18(4):460–73, 1972.
- Blahut, R. E. *Principles and Practice of Information Theory*. Addison-Wesley, Reading, MA, 1988.

- Blahut, R. E. *Digital Transmission of Information*. Addison-Wesley, Reading, MA, 1990.
- Blahut, R. E. *Algebraic Codes for Data Transmission*. Cambridge University Press, Cambridge, 2003.
- Blahut, R. E. *Modem Theory: An Introduction to Telecommunications*. Cambridge University Press, Cambridge, 2010.
- Blahut, R. E. *Principles of Information Theory*. Cambridge University Press, Cambridge, 2019.
- Blow, K. J. and D. Wood. Theoretical description of transient stimulated raman scattering in optical fibers. *IEEE Journal of Quantum Electronics*, 25(12):2665–73, 1989.
- Bode, H. W. *Network Analysis and Feedback Amplifier Design*. The Bell Telephone Laboratories series. Van Nostrand Reinhold, New York, NY, 1950.
- Bondurant, R. S. Near-quantum optimum receivers for the phase-quadrature coherent-state channel. *Optics Letters*, 18(22):1896–8, 1993.
- Born, M. and E. Wolf. *Principles of Optics: Electromagnetic Theory of Propagation, Interference and Diffraction of Light*. Pergamon Press, Oxford, 1980.
- Bosco, G., P. Poggiolini, and M. Visintin. Performance analysis of MLSE receivers based on the square-root metric. *Journal of Lightwave Technology*, 26(14):2098–109, 2008.
- Bowen, J. On the capacity of a noiseless photon channel. *IEEE Transactions on Information Theory*, 13(2):230–6, 1967.
- Boyd, R. W. *Nonlinear Optics*. Elsevier Science, Amsterdam, 2013.
- Brandwood, D. H. A complex gradient operator and its application in adaptive array theory. *Microwaves, Optics and Antennas, IEE Proceedings H*, 130(1):11–16, 1983.
- Braunstein, S. L. Homodyne statistics. *Physical Review A*, 42(1):474–81, 1990.
- Breiling, M. A logarithmic upper bound on the minimum distance of turbo codes. *IEEE Transactions on Information Theory*, 50(8):1692–710, 2004.
- Bromage, J. Raman amplification for fiber communications systems. *Journal of Lightwave Technology*, 22(1):79–93, 2004.
- Butler, B. K. and P. H. Siegel. Bounds on the minimum distance of punctured quasi-cyclic LDPC codes. *IEEE Transactions on Information Theory*, 59(7):4584–97, 2013.
- Butler, B. K. and P. H. Siegel. Error floor approximation for LDPC codes in the awgn channel. *IEEE Transactions on Information Theory*, 60(12):7416–41, 2014.
- Bužek, V. and P. L. Knight. Quantum interference, superposition states of light, and nonclassical effects. In E. Wolf, editor, *Progress in Optics*, volume 34, pages 1–158. Elsevier, Amsterdam, 1995.
- Campbell, J. C. Advances in photodetectors. In I. P. Kaminow, T. Li, and A. E. Willner, editors, *Optical Fiber Telecommunications V A: Components and Subsystems*, pages 221–68. Elsevier, Amsterdam, 2008.
- Campbell, J. C. Recent advances in avalanche photodiodes. *Journal of Lightwave Technology*, 34(2):278–85, 2016.
- Campbell, J. C., S. Demiguel, F. Ma, A. Beck, X. Guo, S. Wang, X. Zheng, X. Li, J. D. Beck, M. A. Kinch, A. Huntington, L. A. Coldren, J. Decobert, and N. Tschertpner. Recent advances in avalanche photodiodes. *IEEE Journal of Selected Topics in Quantum Electronics*, 10(4):777–87, 2004.
- Campbell, N. The study of discontinuous phenomena. *Proceedings of the Cambridge Philosophical Society*, 15:117–36, 1909a.
- Campbell, N. Discontinuities in light emission. *Proceedings of the Cambridge Philosophical Society*, 15:310–28, 1909b.

- Carena, A., V. Curri, G. Bosco, P. Poggiolini, and F. Forghieri. Modeling of the impact of non-linear propagation effects in uncompensated optical coherent transmission links. *Journal of Lightwave Technology*, 30:1524–39, 2012.
- Carlson, A. P., P. B. Crilly, and J. C. Rutledge. *Communication Systems: An Introduction to Signals and Noise in Electrical Communication*. McGraw-Hill, Dubuque, IA, 2001.
- Carson, J. R., S. P. Mead, and S. A. Schelkunoff. Hyper-frequency wave guides – mathematical theory. *Bell System Technical Journal*, 15:310–33, 1936.
- Caves, C. M. Quantum limits on noise in linear amplifiers. *Physical Review D*, 26(8):1817–39, 1982.
- Caves, C. M. and P. D. Drummond. Quantum limits on bosonic communication rates. *Reviews of Modern Physics*, 66:481–537, 1994.
- Chen, J., J. L. Habif, Z. Dutton, R. Lazarus, and S. Guha. Optical codeword demodulation with error rates below the standard quantum limit using a conditional nulling receiver. *Nature Photonics*, 6:374–9, 2012.
- Chew, W. C. *Waves and Fields in Inhomogeneous Media*. Van Nostrand Reinhold, New York, NY, 1990.
- Chiang, T.-K., N. Kagi, T. K. Fong, M. E. Marhic, and L. G. Kazovsky. Cross-phase modulation in dispersive fibers: Theoretical and experimental investigation of the impact of modulation frequency. *IEEE Photonics Technology Letters*, 6:733–6, 1994.
- Chraplyvy, A. R. Limitations on lightwave communications imposed by optical-fiber nonlinearities. *Journal of Lightwave Technology*, 8:1548–57, 1990.
- Chraplyvy, A. R., R. W. Tkach, and K. L. Walker. Optical fiber for wavelength division multiplexing, August 29, 1995. URL www.google.com/patents/US5327516. US Patent 5,327,516.
- Chraplyvy, A. R., D. Marcuse, and P. S. Henry. Carrier-induced phase noise in angle-modulated optical-fiber systems. *Journal of Lightwave Technology*, 2:6–10, 1984.
- Chuang, S. L. *Physics of Photonic Devices*. Wiley, New York, NY, 2012.
- Coleman, J. J. The development of the semiconductor laser diode after the first demonstration in 1962. *Semiconductor Science and Technology*, 27(9):090207, 2012.
- Conradi, J. The distribution of gains in uniformly multiplying avalanche photodiodes: Experimental. *Transactions on Electron Devices*, 19(6):713–18, 1972.
- Costello, D. J. An introduction to low-density parity check codes. Presented at the IEEE Information Theory Society Summer School, Northwestern University, August 2009.
- Cover, T. M. and J. A. Thomas. *Elements of Information Theory*. John Wiley & Sons, New York, NY, 1991, 2006.
- Dar, R., M. Shtaif, and M. Feder. New bounds on the capacity of the nonlinear fiber-optic channel. *Optics Letters*, 39(2):398–401, 2014.
- Darrigol, O. *A History of Optics from Greek Antiquity to the Nineteenth Century*. Oxford University Press, Oxford, 2012.
- Davies, E. B. and J. T. Lewis. An operational approach to quantum probability. *Communications in Mathematical Physics*, 17(3):239–60, 1970.
- Desset, C., B. Macq, and L. Vandendorpe. Computing the word-, symbol-, and bit-error rates for block error-correcting codes. *IEEE Transactions on Communications*, 52(6):910–21, 2004.
- Desurvire, E., J. R. Simpson, and P. C. Becker. High-gain erbium-doped traveling-wave fiber amplifier. *Optics Letters*, 12(11):888–90, 1987.
- Diamant, P. *Wave Transmission and Fiber Optics*. Macmillan, New York, NY, 1990.
- Dirac, P. A. M. *The Principles of Quantum Mechanics*. Clarendon Press, Oxford, 1981.

- Djordjevic, I., W. Ryan, and B. Vasic. *Coding for Optical Channels*. Springer, New York, NY, 2010.
- Dolinar, S. J. An optimum receiver for the binary coherent state quantum channel. *MIT Research Laboratory of Electronics Quarterly Progress Report*, 111:115–20, 1973.
- Einarsson, G. *Principles of Lightwave Communications*. John Wiley and Sons, New York, NY, 1996.
- Eiselt, M. Limits on WDM systems due to four-wave mixing: A statistical approach. *Journal of Lightwave Technology*, 17(11):2261–7, 1999.
- Eldar, Y. C. von Neumann measurement is optimal for detecting linearly independent mixed quantum states. *Physical Review A*, 68:52303, 2003.
- Eldar, Y. C. and G. D. Forney. On quantum detection and the square-root measurement. *IEEE Transactions on Information Theory*, 47(3):858–72, 2001.
- Eldar, Y. C., A. Megretski, and G. C. Verghese. Designing optimal quantum detectors via semidefinite programming. *IEEE Transactions on Information Theory*, 49(4):1007–12, 2003.
- Epworth, R. E. The phenomenon of modal noise in analog and digital optical fiber systems. In *Proceedings of the Fourth European Conference on Optical Communication, 1978*, page 492, 1978.
- Falconer, D. and J. Salz. Optimal reception of digital data over the Gaussian channel with unknown delay and phase jitter. *IEEE Transactions on Information Theory*, 23(1):117–26, 1977.
- Fehenberger, T., A. Alvarado, G. Böcherer, and N. Hanik. On probabilistic shaping of quadrature amplitude modulation for the nonlinear fiber channel. *Journal of Lightwave Technology*, 34(21):5063–73, 2016.
- Fock, V. Konfigurationsraum und zweite Quantelung. *Zeitschrift für Physik*, 75(9):622–47, 1932.
- Forestieri, E. and G. Prati. Exact analytical evaluation of second-order PMD impact on the outage probability for a compensated system. *Journal of Lightwave Technology*, 22(4):988–96, 2004.
- Forghieri, R. W. and A. R. Chraplyvy. Fiber nonlinearities and their impact on transmission systems. In I. P. Kaminow and T. L. Koch, editors, *Optical Fiber Telecommunications IIIA*. Academic Press, San Diego, CA, 1997.
- Forney, G., R. Gallager, G. Lang, F. Longstaff, and S. Qureshi. Efficient modulation for band-limited channels. *IEEE Journal on Selected Areas in Communications*, 2(5):632–47, 1984.
- Forney, G. D. The concepts of state and entropy in quantum mechanics. Master's thesis, Massachusetts Institute of Technology, 1963.
- Forney, G. D. *Concatenated Codes*. MIT University Press, Cambridge, MA, 1966.
- Forney, G. D. Maximum-likelihood sequence estimation of digital sequences in the presence of intersymbol interference. *IEEE Transactions on Information Theory*, 18(3):363–78, 1972.
- Forney, G. D. Viterbi algorithm. *Proceedings of the IEEE*, 61(3):268–78, 1973.
- Forney, G. D. and D. J. Costello. Channel coding: The road to channel capacity. *Proceedings of the IEEE*, 95:1150–77, 2007.
- Forney, G. D. and G. Ungerboeck. Modulation and coding for linear Gaussian channels. *IEEE Transactions on Information Theory*, 44(6):2384–415, 1998.
- Foschini, G. J. and C. D. Poole. Statistical-theory of polarization dispersion in single-mode fibers. *IEEE Journal of Lightwave Technology*, 9(11):1439–56, 1991.
- Franceschetti, M. Quantum limits on the entropy of bandlimited radiation. *Journal of Statistical Physics*, 169(2):374–94, 2017.
- Friedman, B. *Principles and Techniques of Applied Mathematics*. Wiley, New York, NY, 1956.

- Gabor, D. Communication theory and physics. *Transactions of the IRE Professional Group on Information Theory*, 1(1):48–59, 1953.
- Gagliardi, R. M. and S. Karp. *Optical Communications*. Wiley, New York, NY, 1976.
- Gallager, R. G. Low-density parity-check codes. *IRE Transactions on Information Theory*, 8(1):21–8, 1962.
- Gallager, R. G. *Stochastic Processes: Theory for Applications*. Cambridge University Press, Cambridge, 2013.
- Garello, R., P. Pierleoni, and S. Benedetto. Computing the free distance of turbo codes and serially concatenated codes with interleavers: Algorithms and applications. *IEEE Journal on Selected Areas in Communications*, 19(5):800–12, 2001.
- Geist, J. M. Capacity and cutoff rate for dense M -ary PSK constellations. In *Military Communications Conference, 1990*, volume 2, pages 768–70, 1990.
- George, D. Matched filters for interfering signals. *IEEE Transactions on Information Theory*, 11(1):153–4, 1965.
- Gibbs, J. W. *Elementary Principles in Statistical Mechanics: Developed with Especial Reference to the Rational Foundation of Thermodynamics*. Yale University Press, New Haven, CT, 1914.
- Giles, C. R., E. Desurvire, and J. R. Simpson. Transient gain and cross talk in erbium-doped fiber amplifiers. *Optics Letters*, 14(16):880–2, 1989.
- Giovannetti, V., S. Guha, S. Lloyd, L. Maccone, J. H. Shapiro, and H. P. Yuen. Classical capacity of the lossy bosonic channel: The exact solution. *Physical Review Letters*, 92(2):027902, 2004.
- Giovannetti, V., R. García-Patrón Sánchez, N. J. Cerf, and A. S. Holevo. Ultimate classical communication rates of quantum optical channels. *Nature Photonics*, 8(10):796–800, 2014.
- Glauber, R. J. Coherent and incoherent states of the radiation field. *Physical Review A*, 131(6):2766–88, 1963.
- Gloge, D. Weakly guiding fibers. *Applied Optics*, 10(10):2252–8, 1971a.
- Gloge, D. Dispersion in weakly guiding fibers. *Applied Optics*, 10(11):2442–5, 1971b.
- Gloge, D. and E. A. J. Marcatili. Multimode theory of graded-core fibers. *Bell System Technical Journal*, 52(9):1563–78, 1973.
- Gnauck, A. H. and P. J. Winzer. Optical phase-shift-keyed transmission. *Journal of Lightwave Technology*, 23(1): 115–30, 2005.
- Godard, D. Self-recovering equalization and carrier tracking in two-dimensional data communication systems. *IEEE Transactions on Communications*, 28(11):1867–75, 1980.
- Goldfarb, G., G. Li, and M. G. Taylor. Orthogonal wavelength-division multiplexing using coherent detection. *IEEE Photonics Technology Letters*, 19(24):2015–17, 2007.
- Goodman, J. W. *Speckle Phenomena in Optics: Theory and Applications*. Roberts and Company, Greenwood Village, CO, 2007.
- Goodman, J. W. *Statistical Optics*. Wiley, New York, NY, second edition, 2015.
- Gordon, B. E. and L. P. Bolgiano. Information capacity of a photoelectric detector. *Proceedings of the IEEE*, 53(11):1745–46, 1965.
- Gordon, J. P. Quantum effects in communication systems. *Proceedings of the Institute of Radio Engineers*, 50(9):1898–908, 1962.
- Gordon, J. P. Noise at optical frequencies; information theory. In P. A. Miles, editor, *Proceedings of the International School of Physics “Enrico Fermi”, Course XXXI*, pages 156–81. Academic Press, New York, NY, 1964.
- Gordon, J. P. and H. Kogelnik. PMD fundamentals: Polarization mode dispersion in optical fibers. *Proceedings of the National Academy of Sciences of the United States of America*, 97:4541–50, 2000.

- Gordon, J. P. and W. H. Louisell. Simultaneous measurement of noncommuting observables. In P. L. Kelley, B. Lax, and P. E. Tannewald, editors, *Physics of Quantum Electronics*, page 43. McGraw Hill, New York, NY, 1966.
- Gordon, J. P. and L. F. Mollenauer. Phase noise in photonic communications systems using linear amplifiers. *Optics Letters*, 15(23):1351–53, 1990.
- Gowan, B. Ciena 20: The founding of Ciena, 2012. URL www.ciena.com/insights/articles/Ciena-20-The-Founding-of-Ciena_prx.html.
- Gowar, J. *Optical Communication Systems*. Prentice Hall International, Englewood Cliffs, NJ, 1984.
- Griffiths, R. B. *Consistent Quantum Theory*. Cambridge University Press, Cambridge, 2002.
- Gursoy, M. C. On the low-SNR capacity of phase-shift keying with hard-decision detection. In *IEEE International Symposium on Information Theory, 2007. ISIT 2007*. pages 166–70. IEEE, 2007.
- Hagfors, T. Information capacity and quantum effects in propagation circuits. Technical Report 344, MIT Lincoln Laboratories, 1964.
- Hajek, B. *Random Processes for Engineers*. Cambridge University Press, Cambridge, 2015.
- Hall, M. J. W. Gaussian noise and quantum-optical communication. *Physical Review A*, 50(4):3295–303, 1994.
- Hall, R. N., G. E. Fenner, J. D. Kingsley, T. J. Soltys, and R. O. Carlson. Coherent light emission from Ga-As junctions. *Physics Review Letters*, 9(9):366–8, 1962.
- Hamkins, J. Performance of low-density parity-check coded modulation. Technical Report IPN Progress Report 42-184, Jet Propulsion Laboratory, 2011.
- Han, Y. and G. Li. Coherent optical communication using polarization multiple-input-multiple-output. *Optics Express*, 13:7527–34, 2005.
- Harrington, R. F. *Time-Harmonic Electromagnetic Fields*. McGraw-Hill, New York, NY, 1961.
- Hasegawa, A. and T. Nyu. Eigenvalue communication. *Journal of Lightwave Technology*, 11(3):395–9, 1993.
- Haus, H. A. Noise figure definition valid from RF to optical frequencies. *IEEE Journal of Selected Topics in Quantum Electronics*, 6(2):240–7, 2000a.
- Haus, H. A. *Electromagnetic Noise and Quantum Optical Measurements*. Springer-Verlag, Berlin, 2000b.
- Haus, H. A., C. H. Townes, and B. M. Oliver. Comments on “Noise in photoelectric mixing”. *Proceedings of the Institute of Radio Engineers*, 50(6):1544–6, 1962.
- Hausladen, P., R. Jozsa, B. Schumacher, M. Westmoreland, and W. K. Wootters. Classical information capacity of a quantum channel. *Physical Review A*, 54(3):1869–76, 1996.
- Hayashi, T., T. Taru, O. Shimakawa, T. Sasaki, and E. Sasaoka. Design and fabrication of ultra-low crosstalk and low-loss multi-core fiber. *Optics Express*, 19(17):16576–92, 2011.
- Haykin, S. *Adaptive Filter Theory*. Prentice Hall, Englewood Cliffs, NJ, 1996.
- Haykin, S. *Communication Systems*. Wiley, New York, NY, 2001.
- Hecht, J. *City of Light: The Story of Fiber Optics*. Oxford University Press, Oxford, 2004.
- Helstrom, C. W. *Statistical Theory of Signal Detection*. Pergamon Press, Oxford, 1968.
- Helstrom, C. W. *Quantum Detection and Estimation Theory*. Academic Press, New York, NY, 1976.
- Helstrom, C. W. *Probability and Stochastic Processes for Engineers*. Maxwell Macmillan International, New York, NY, 1991.
- Henry, C. H. Phase noise in semiconductor lasers. *Journal of Lightwave Technology*, 4(3):298–311, 1986.

- Henry, C. H. and R. F. Kazarinov. Quantum noise in photonics. *Reviews of Modern Physics*, 68(3):801–53, 1996.
- Hepp, K. The classical limit for quantum mechanical correlation functions. *Communications in Mathematical Physics*, 35(4):265–77, 1974.
- Hill, K. O., D. C. Johnson, B. S. Kawasaki, and R. I. MacDonald. CW three-wave mixing in single-mode optical fibers. *Journal of Applied Physics*, 49(10):5098–106, 1978.
- Ho, K. P. *Phase-Modulated Optical Communication Systems*. Springer, New York, NY, 2005.
- Ho, K. P. and J. M. Kahn. Channel capacity of WDM systems using constant-intensity modulation formats. In *Optical Fiber Communications Conference. (OFC). Postconference Technical Digest*, pages 731–3. Optical Society of America, 2002.
- Ho, K. P. and J. M. Kahn. Statistics of group delays in multimode fiber with strong mode coupling. *Journal of Lightwave Technology*, 29:3119–28, 2011.
- Holevo, A. S. Statistical problems in quantum physics. In *Proceedings Soviet–Japanese Symposium on Probability and Statistics*, volume 1, pages 22–40, 1968.
- Holevo, A. S. Some estimates of the information transmitted by quantum communication channel. *Problems in Information Transmission*, 9(3):177–83, 1973.
- Holevo, A. S. *Probabilistic and Statistical Aspects of Quantum Theory*. North-Holland, Amsterdam, 1982.
- Holevo, A. S. The capacity of the quantum channel with general signal states. *IEEE Transactions on Information Theory*, 44(1):269–73, 1998a.
- Holevo, A. S. Quantum coding theorems. *Russian Mathematical Surveys*, 53(6):1295–331, 1998b.
- Holevo, A. S. *Probabilistic and Statistical Aspects of Quantum Theory*. Edizioni della Normale Basel, second edition, 2011.
- Holevo, A. S. and R. F. Werner. Evaluating capacities of bosonic Gaussian channels. *Physical Review A*, 63:032312, 2001.
- Holevo, A. S., M. Sohma, and O. Hirota. Capacity of quantum gaussian channels. *Physical Review A*, 59:1820–8, 1999.
- Holonyak, N. and S. F. Bevacqua. Coherent (visible) light emission from $\text{Ga}(\text{As}_{1-x}\text{P}_x)$ junctions. *Applied Physics Letters*, 1(4):82–3, 1962.
- Horn, R. A. and C. R. Johnson. *Topics in Matrix Analysis*. Cambridge University Press, Cambridge, 1994.
- Horodecki, R., P. Horodecki, M. Horodecki, and K. Horodecki. Quantum entanglement. *Reviews of Modern Physics*, 81:865–942, 2009.
- Hranilovic, S. and F. R. Kschischang. Capacity bounds for power- and band-limited optical intensity channels corrupted by Gaussian noise. *IEEE Transactions on Information Theory*, 50(5):784–95, 2004.
- Hueda, M. R., D. E. Crivelli, H. S. Carrer, and O. E. Agazzi. Parametric estimation of IM/DD optical channels using new closed-form approximations of the signal PDF. *Journal of Lightwave Technology*, 25(3):957–75, 2007.
- Hui, R., K. R. Demarest, and C. T. Allen. Cross-phase modulation in multispan WDM optical fiber systems. *Journal of Lightwave Technology*, 17(6):1018, 1999.
- Humblet, P. A. Design of optical matched filters. In *Global Telecommunications Conference, 1991*, volume 2, pages 1246–50, 1991.
- Humblet, P. A. and M. Azizoglu. On the bit error rate of lightwave systems with optical amplifiers. *Journal of Lightwave Technology*, 9(11):1576–82, 1991.
- Husimi, K. Some formal properties of the density matrix. *Proceedings of the Physico-Mathematical Society of Japan*, 22:264–314, 1940.

- Huttner, B., C. Geiser, and N. Gisin. Polarization-induced distortions in optical fiber networks with polarization-mode dispersion and polarization-dependent losses. *IEEE Journal of Selected Topics in Quantum Electronics*, 6(2):317–29, 2000.
- Immink, K. A. S. Runlength-limited sequences. *Proceedings of the IEEE*, 78(11):1745–59, 1990.
- Inoue, K. Suppression technique for fiber four-wave mixing using optical multi-/demultiplexers and a delay line. *Journal of Lightwave Technology*, 11(3):455–61, 1993.
- Inoue, K. and N. Shibata. Theoretical evaluation of intermodulation distortion due to 4-wave mixing in optical fibers for coherent phase-shift-keying frequency-division-multiplexing transmission. *Optics Letters*, 14(11):584–6, 1989.
- Ip, E. and J. M. Kahn. Digital equalization of chromatic dispersion and polarization mode dispersion. *Journal of Lightwave Technology*, 25(8):2033–43, 2007.
- Ip, E. and J. M. Kahn. Compensation of dispersion and nonlinear impairments using digital backpropagation. *Journal of Lightwave Technology*, 26(20):3416–25, 2008.
- Ippen, E. P. and R. H. Stolen. Stimulated Brillouin-scattering in optical fibers. *Applied Physics Letters*, 21(11):539–41, 1972.
- Jacobs, I. and E. Berlekamp. A lower bound to the distribution of computation for sequential decoding. *IEEE Transactions on Information Theory*, 13(2):167–74, 1967.
- Jacobsen, G. *Noise in Digital Optical Transmission Systems*. Artech House, Boston, MA, 1994.
- Jaynes, E. T. Information theory and statistical mechanics. *Physical Review*, 106(4):620–30, 1957a.
- Jaynes, E. T. Information theory and statistical mechanics 2. *Physical Review*, 108(2):171–90, 1957b.
- Jelonek, Z. A comparison of transmission systems. In W. Jackson, editor, *Communication Theory*, page 43. Academic Press Inc., New York, NY, 1953.
- Jinguji, K., N. Takato, A. Sugita, and M. Kawachi. Mach-Zehnder interferometer type optical waveguide coupler with wavelength-flattened coupling ratio. *Electronics Letters*, 26:1326–7, 1990.
- Johnson, C. R., P. Schniter, T. J. Endres, J. D. Behm, D. R. Brown, and R. A. Casas. Blind equalization using the constant modulus criterion: A review. *Proceedings of The IEEE*, 86(10):1927–50, 1998.
- Johnson, N. L., A. W. Kemp, and S. Kotz. *Univariate Discrete Distributions*. Wiley, New York, NY, 2005.
- Kabal, P. and S. Pasupathy. Partial-response signaling. *IEEE Transactions on Communications*, 23(9):921–34, 1975.
- Kahn, J. M. and K. P. Ho. Spectral efficiency limits and modulation/detection techniques for DWDM systems. *IEEE Journal of Selected Topics in Quantum Electronics*, 10(2):259–72, 2004.
- Kailath, T. *Linear Least-Squares Estimation*. Dowden, Hutchinson & Ross, Stroudsburg, PN, 1977.
- Kanwal, R. P. *Generalized Functions: Theory and Applications*. Birkhäuser, Boston, MA, 2004.
- Kao, K. C. and G. A. Hockham. Dielectric-fibre surface waveguides for optical frequencies. *Proceedings of the IEE*, 113(7):1151–8, 1966.
- Kapron, F. P., D. B. Keck, and R. D. Mauer. Radiation losses in glass optical waveguides. *Applied Physics Letters*, 17:423–5, 1970.
- Karlsson, M. Probability density functions of the differential group delay in optical fiber communication systems. *Journal of Lightwave Technology*, 19(3):324–31, 2001.

- Karlsson, M. and H. Sunnerud. Effects of nonlinearities on PMD-induced system impairments. *Journal of Lightwave Technology*, 24(11):4127–37, 2006.
- Karp, S., R. M. Gagliardi, S. E. Moran, and L. B. Stotts. *Optical Channels: Fibers, Clouds, Water, and the Atmosphere*. Springer, New York, NY, 2013.
- Katz, M. and S. Shamai. On the capacity-achieving distribution of the discrete-time noncoherent and partially coherent AWGN channels. *IEEE Transactions on Information Theory*, 50(10):2257–70, 2004.
- Kawakami, S. and J. Nishizawa. Propagation loss in a distributed beam waveguide. *Proceedings of the IEEE*, 53:2148–9, 1965.
- Kay, S. M. *Fundamentals of Statistical Signal Processing: Estimation Theory*. Prentice Hall, Upper Saddle River, NJ, 1993.
- Kazovsky, L. G., S. Benedetto, and A. E. Willner. *Optical Fiber Communication Systems*. Artech House, Boston, MA, 1996.
- Kennedy, R. S. A near-optimum receiver for the binary coherent state quantum channel. Technical report, MIT Research Laboratory of Electronics Quarterly Progress Report, 1973a.
- Kennedy, R. S. On the optimum quantum receiver for the M -ary linearly independent pure state problem. Technical report, MIT Research Laboratory of Electronics Quarterly Progress Report, 1973b.
- Kikuchi, K. Polarization-demultiplexing algorithm in the digital coherent receiver. In *Digest of the LEOS Summer Topical Meetings, 2008*, page MC2.2, 2008.
- Killey, R. Dispersion and nonlinearity compensation using electronic predistortion techniques. In *The IEE Seminar on Optical Fibre Communications and Electronic Signal Processing, 2005*, pages 2/1–2/6, 2005.
- Klauder, J. R. and E.C.G. Sudarshan. *Fundamentals of Quantum Optics*. Benjamin, New York, NY, 1968.
- Klotzkin, D. J. *Introduction to Semiconductor Lasers for Optical Communications: An Applied Approach*. Springer, New York, NY, 2013.
- Koetter, R., A. C. Singer, and M. Tüchler. Turbo equalization. *IEEE Signal Processing Magazine*, 21(1):67–80, 2004.
- Kogelnik, H. Theory of dielectric waveguides. In *Integrated Optics*, pages 13–81. Springer, Berlin, 1975.
- Kolmogorov, A. N. Sur l'interpolation et extrapolation des suites stationnaires. *Comptes rendus de l'Académie des Sciences*, 208:2043–5, 1939. English translation in Kailath (1977).
- Kong, J. A. *Electromagnetic Wave Theory*. Wiley, New York, NY, 1990.
- Kramer, G., A. Ashikhmin, A. J. van Wijngaarden, and W. Xing. Spectral efficiency of coded phase-shift keying for fiber-optic communication. *Journal of Lightwave Technology*, 21(10):2438–45, 2003.
- Kramer, G., M. I. Yousefi, and F. R. Kschischang. Upper bound on the capacity of a cascade of nonlinear and noisy channels. In *2015 IEEE Information Theory Workshop (ITW)*, 2015.
- Kretzmer, E. Generalization of a technique for binary data communication. *IEEE Transactions on Communication Technology*, 14(1):67–8, 1966.
- Kreutz-Delgado, K. The complex gradient operator and the $\mathbb{C}\mathbb{R}$ -calculus, 2009. URL <https://arxiv.org/pdf/0906.4835.pdf>.
- Kschischang, F. R. and S. Pasupathy. Optimal nonuniform signaling for Gaussian channels. *IEEE Transactions on Information Theory*, 39(3):913–29, 1993.
- Kudeki, E. and D. C. Munson. *Analog Signals and Systems*. Pearson Prentice-Hall, Upper Saddle River, NJ, 2009.

- Kwiat, P. G. and L. Hardy. The mystery of the quantum cakes. *American Journal of Physics*, 68(1):33–6, 2000.
- Lachs, G. Theoretical aspects of mixtures of thermal and coherent radiation. *Physical Review*, 138(4B):B1012, 1965.
- Lai, Y. and H. A. Haus. Characteristic functions and quantum measurements of optical observables. *Quantum Optics*, 1(2):99–115, 1989.
- Landau, L. D., E. M. Lifshitz, and L. P. Pitaevskiĭ. *Electrodynamics of Continuous Media*. Pergamon, Oxford, 1984.
- Lapidoth, A. On phase noise channels at high SNR. In *Proceedings of 2002 IEEE Information Theory Workshop*, pages 1–4. IEEE, 2002.
- Lax, M. Classical noise. V. Noise in self-sustained oscillators. *Physical Review*, 160(2):290–307, 1967.
- Lebedev, D. S. and L. B. Levitin. Information transmission by electromagnetic field. *Information and Control*, 9(1):1–22, 1966.
- Lee, H. W. Theory and application of the quantum phase-space distribution functions. *Physics Reports*, 259(3):147–211, 1995.
- Lender, A. The duobinary technique for high-speed data transmission. *Transactions of the American Institute of Electrical Engineers, Part I: Communication and Electronics*, 82(2):214–18, 1963.
- Lender, A. Correlative digital communication techniques. *IEEE Transactions on Communication Technology*, 12(4):128–35, 1964.
- Lenz, G., B. J. Eggleton, C. R. Giles, C. K. Madsen, and R. E. Slusher. Dispersive properties of optical filters for WDM systems. *IEEE Journal of Quantum Electronics*, 34(8):1390–402, 1998.
- Leonhardt, U. A. *Essential Quantum Optics*. Cambridge University Press, Cambridge, 2010.
- Leonhardt, U. A. and H. Paul. Measuring the quantum state of light. *Progress in Quantum Electronics*, 19(2):89–130, 1995.
- Lin, S. and D. J. Costello. *Error Control Coding: Fundamentals and Applications*. Pearson Prentice-Hall, Upper Saddle River, NJ, 2004.
- Lindsey, W. C. and M. K. Simon. *Telecommunication Systems Engineering*. Prentice-Hall, Englewood Cliffs, NJ, 1973.
- Liu, J. M. *Photonic Devices*. Cambridge University Press, Cambridge, 2005.
- Liu, X., X. Wei, R. E. Slusher, and C. J. McKinstrie. Improving transmission performance in differential phase-shift-keyed systems by use of lumped nonlinear phase-shift compensation. *Optics Letters*, 27(18):1616–18, 2002.
- Loudon, R. *The Quantum Theory of Light*. Oxford University Press, Oxford, 2000.
- Lucky, R. W. Automatic equalization for digital communication. *The Bell System Technical Journal*, 44(4):547–88, 1965.
- MacKay, D. J. C. and R. M. Neal. Near Shannon limit performance of low density parity check codes. *Electronics Letters*, 32:1645–6, 1996.
- Mandel, L. Fluctuation of photon beams and their correlations. *Proceedings of the Physical Society*, 71:1037–48, 1958.
- Mandel, L. Fluctuations of photon beams: The distribution of the photo-electrons. *Proceedings of the Physical Society*, 74(3):233–43, 1959.
- Mandel, L. and E. Wolf. Photon statistics and classical fields. *Physical Review*, 149:1033–7, 1966.
- Mandel, L. and E. Wolf. *Optical Coherence and Quantum Optics*. Cambridge University Press, Cambridge, 1995.

- Marcuse, D. *Light Transmission Optics*. Van Nostrand Reinhold, New York, NY, 1972.
- Marcuse, D. *Theory of Dielectric Optical Waveguides*. Academic Press, New York, NY, 1974.
- Marcuse, D. Pulse distortion in single-mode fibers. *Applied Optics*, 19(10):1653–60, 1980.
- Marcuse, D. RMS width of pulses in nonlinear dispersive fibers. *Journal of Lightwave Technology*, 10(1):17–21, 1992.
- Marcuse, D., A. R. Chraplyvy, and R. W. Tkach. Dependence of cross-phase modulation on channel number in fiber WDM systems. *Journal of Lightwave Technology*, 12(5):885–90, 1994.
- Martinez, A. Spectral efficiency of optical direct detection. *Journal of the Optical Society of America B*, 24(4):739–49, 2007.
- McCusker, K. T. and P. G. Kwiat. Efficient optical quantum state engineering. *Physical Review Letters*, 103:163602, 2009.
- McIntyre, R. J. Multiplication noise in uniform avalanche diodes. *IEEE Transactions on Electron Devices*, 13(1):164–8, 1966.
- McIntyre, R. J. The distribution of gains in uniformly multiplying avalanche photodiodes: Theory. *IEEE Transactions on Electron Devices*, 19(6):702–13, 1972.
- Mears, R. J., L. Reekie, I. M. Jauncey, and D. N. Payne. Low-noise erbium-doped fibre amplifier operating at 1.54 μm . *Electronics Letters*, 23(19):1026–8, 1987.
- Mecozzi, A. Probability density functions of the nonlinear phase noise. *Optics Letters*, 29(7):673–5, 1994a.
- Mecozzi, A. Limits to long-haul coherent transmission set by the Kerr nonlinearity and noise of the in-line amplifiers. *Journal of Lightwave Technology*, 12(11):1993–2000, 1994b.
- Mecozzi, A. and M. Shtaif. On the capacity of intensity modulated systems using optical amplifiers. *IEEE Photonics Technology Letters*, 13(9):1029–31, 2001.
- Mecozzi, A., C. Antonelli, and M. Shtaif. Nonlinear propagation in multi-mode fibers in the strong coupling regime. *Optics Express*, 20(11):11673–8, 2012.
- Menyuk, C. R. Application of multiple-length-scale methods to the study of optical fiber transmission. *Journal of Engineering Mathematics*, 36(1–2):113–36, 1999.
- Menyuk, C. R. and B. S. Marks. Interaction of polarization mode dispersion and nonlinearity in optical fiber transmission systems. *Journal of Lightwave Technology*, 24(7):2806–26, 2006.
- Messerschmitt, D. G. Minimum MSE equalization of digital fiber optic systems. *IEEE Transactions on Communications*, 26(7):1110–18, 1978.
- Milonni, P. W. *Lasers*. Wiley, New York, NY, 1988.
- Milonni, P. W. *The Quantum Vacuum: An Introduction to Quantum Electrodynamics*. Academic Press, New York, NY, 1994.
- Mitra, P. P. and J. B. Stark. Nonlinear limits to the information capacity of optical fibre communications. *Nature*, 411(6841):1027–30, 2001.
- Monsen, P. Feedback equalization for fading dispersive channels. *IEEE Transactions on Information Theory*, 17(1):56–64, 1971.
- Nathan, M., W. Dumke, G. Burns, F. Dill, and G. Lasher. Stimulated emission of radiation from GaAs P–N junctions. *Applied Physics Letters*, 1(3):62–4, 1962.
- Newton, I. and W. Innys. *Opticks: Or, A Treatise of the Reflections, Refractions, Inflections and Colours of Light*. William Innys at the West-End of St. Paul's, London, 1730.
- Nielsen, M. A. and I. L. Chuang. *Quantum Computation and Quantum Information*. Cambridge University Press, Cambridge, 2000.
- North, D. O. An analysis of the factors which determine signal/noise discrimination in pulsed carrier systems. Technical Report PTR-6C, Radio Corporation of America, 1943.

- Nuemark, M. A. On the representation of additive operator set functions. *Comptes Rendus (Doklady) Acad. Sci. URSS*, 41(1):359–61, 1943.
- Nyquist, H. Certain topics in telegraph transmission theory. *Transactions of the American Institute of Electrical Engineers*, 47(2):617–44, 1928.
- Okamoto, K. *Fundamentals of Optical Waveguides*. Academic Press, Burlington, MA, 2006.
- Okoshi, T. *Optical Fibers*. Academic Press, New York, NY, 1982.
- Oliver, B. M. Signal-to-noise ratios in photoelectric mixing. *Proceedings of the Institute of Radio Engineers*, 49(12):1960–1, 1961.
- Oliver, B. M. Thermal and quantum noise. *Proceedings of the IEEE*, 53(5):436–54, 1965.
- Oppenheim, A. V. and A. S. Willsky. *Signals and Systems*. Pearson Education, London, 2013.
- Osaki, M., M. Ban, and O. Hirota. Derivation and physical interpretation of the optimum detection operators for coherent-state signals. *Physical Review A*, 54(2):1691–701, 1996.
- Ourjoumtsev, A., R. Tualle-Brouiri, J. Laurat, and P. Grangier. Generating optical Schrödinger kittens for quantum information processing. *Science*, 312(5770):83–6, 2006.
- Papen, G. C. and R. E. Blahut. The channel capacity from particles to waves. *IEEE Transactions on Information Theory*, to be published, 2019.
- Payne, D. N. and W. A. Gambling. Zero material dispersion in optical fibres. *Electronics Letters*, 11(8):176–8, 1975.
- Pearl, J. Reverend Bayes on inference engines: A distributed hierarchical approach. In *Proceedings of the Second National Conference on Artificial Intelligence, 1983*, pages 133–63, 1982.
- Personick, S. D. An image band interpretation of optical heterodyne noise. *Bell System Technical Journal*, 50:213–16, 1971.
- Personick, S. D. Receiver design for digital fibre optic communication systems. I. *Bell System Technical Journal*, 52(6):843–74, 1973a.
- Personick, S. D. Baseband linearity and equalization in fiber optic digital communication systems. *Bell System Technical Journal*, 52(7):1175–94, 1973b.
- Personick, S. D., P. Balaban, J. H. Bobsin, and P. R. Kumar. A detailed comparison of four approaches to the calculation of the sensitivity of optical fiber system receivers. *IEEE Transactions on Communications*, 25(5):541–8, 1977.
- Peřina, J. *Quantum Statistics of Linear and Nonlinear Optical Phenomena*. Springer Netherlands, Amsterdam, 2012.
- Petermann, K. *Laser Diode Modulation and Noise*. Kluwer, Dordrecht, 1988.
- Poggiolini, P. The GN model of non-linear propagation in uncompensated coherent optical systems. *Journal of Lightwave Technology*, 30(24):3857–79, 2012.
- Poggiolini, P., G. Bosco, Y. Benlachtar, S. J. Savory, P. Bayvel, R. I. Killey, and J. Prat. Long-haul 10 Gbit/s linear and non-linear IMDD transmission over uncompensated standard fiber using a sqrt-metric MLSE receiver. *Optics Express*, 16(17):12919–36, 2008.
- Polyanskiy, Y., H. V. Poor, and S. Verdu. Channel coding rate in the finite blocklength regime. *IEEE Transactions on Information Theory*, 56(5):2307–59, 2010.
- Poole, C. D. and R. E. Wagner. Phenomenological approach to polarisation dispersion in long single-mode fibres. *Electronics Letters*, 22(19):1029–30, 1986.
- Poole, S. B., D. N. Payne, and M. E. Fermann. Fabrication of low-loss optical fibers containing rare-earth ions. *Electronics Letters*, 21(17):737–8, 1985.
- Potasek, M. J. and G. P. Agrawal. Self-amplitude-modulation of optical pulses in nonlinear dispersive fibers. *Physical Review A*, 36:3862–7, 1987.

- Prabhu, V. K. Error rate considerations for digital phase-modulation systems. *IEEE Transactions on Communication Technology*, 17(1):33–42, 1969.
- Prasad, S., M. O. Scully, and W. Martienssen. A quantum description of the beam splitter. *Optics Communications*, 62:139–45, 1987.
- Price, E. Claude E. Shannon, an oral history. IEEE History Center at Stevens Institute of Technology, Castle Point on Hudson, Hoboken, NJ, 1982.
- Prilepsky, J. E., S. A. Derevyanko, and S. K. Turitsyn. Nonlinear spectral management: Linearization of the lossless fiber channel. *Optics Express*, 21(20):24344–67, 2013.
- Proakis, J. G. *Digital Communications*. McGraw-Hill, Boston, MA, 2001.
- Proakis, J. G. and M. Salehi. *Digital Communications*. McGraw-Hill, Boston, MA, 2007.
- Quist, T. M., R. H. Rediker, R. J. Keyes, W. E. Krag, B. Lax, A. L. McWhorter, and H. J. Zeigler. Semiconductor maser of GaAs. *Applied Physics Letters*, 1(4):91–2, 1962.
- Randel, S., R. Ryf, A. Sierra, P. J. Winzer, A. H. Gnauck, C. A. Bolle, R.-J. Essiambre, D. W. Peckham, A. McCurdy, and R. Lingle. 6×56 -Gb/s mode-division multiplexed transmission over 33-km few-mode fiber enabled by 6×6 MIMO equalization. *Optics Express*, 19(17):16697–707, 2011.
- Rashleigh, S. C. and R. Ulrich. Polarization mode dispersion in single-mode fibers. *Optics Letters*, 3(2):60–2, 1978.
- Reed, I. On a moment theorem for complex Gaussian processes. *IRE Transactions on Information Theory*, 8(3):194–5, 1962.
- Reed, I. S. and G. Solomon. Polynomial codes over certain finite fields. *Journal of The Society for Industrial and Applied Mathematics*, 8(2):300–4, 1960.
- Rice, S. O. Mathematical analysis of random noise – parts I and II. *Bell System Technical Journal*, 23:282–32, 1944.
- Rice, S. O. Mathematical analysis of random noise – part III. *Bell System Technical Journal*, 24:46–108, 1945.
- Richardson, D. J., J. M. Fini, and L. E. Nelson. Space-division multiplexing in optical fibres. *Nature Photonics*, 7(5):354–62, 2013.
- Richardson, T. Error-floors of LDPC codes. In *Proceedings of the 41st Annual Allerton Conference, Monticello, IL, 2003*, pages 1426–35, 2003.
- Richardson, T. and R. Urbanke. *Modern Coding Theory*. Cambridge University Press, Cambridge, 2008.
- Risken, H. Statistical properties of laser light. In E. Wolf, editor, *Progress in Optics Volume VIII*, pages 241–94. North-Holland, Amsterdam, 1970.
- Ross, M. *Laser Receivers: Devices, Techniques, Systems*. Wiley, New York, NY, 1966.
- Roudas, I., A. Vgenis, C. S. Petrou, D. Toumpakaris, J. Hurley, M. Sauer, J. Downie, Y. Mauro, and S. Raghavan. Optimal polarization demultiplexing for coherent optical communications systems. *Journal of Lightwave Technology*, 28(7):1121–34, 2010.
- Ryan, W. E. and S. Lin. *Channel Codes: Classical and Modern*. Cambridge University Press, Cambridge, 2009.
- Ryf, R., S. Randel, A. H. Gnauck, C. Bolle, A. Sierra, S. Mumtaz, M. Esmaelpour, E. C. Burrows, R. J. Essiambre, P. J. Winzer, D. W. Peckham, A. H. McCurdy, and R. Lingle. Mode-division multiplexing over 96 km of few-mode fiber using coherent 6×6 MIMO processing. *Journal of Lightwave Technology*, 30(4):521–31, 2012.
- Sakurai, J. J. and J. Napolitano. *Modern Quantum Mechanics*. Addison-Wesley, New York, NY, 2011.

- Saleh, B. E. A. *Photoelectron Statistics, with Applications to Spectroscopy and Optical Communication*, volume 6. Springer-Verlag, Berlin, 1978.
- Saleh, B. E. A. and M. I. Irshid. Coherence and intersymbol interference in digital fiber optic communication-systems. *IEEE Journal of Quantum Electronics*, 18(6):944–51, 1982a.
- Saleh, B. E. A. and M. I. Irshid. Collett–Wolf equivalence theorem and propagation of a pulse in a single-mode optical fiber. *Optics Letters*, 7(7):342–3, 1982b.
- Saleh, B. E. A. and M. C. Teich. *Fundamentals of Photonics*. Wiley, New York, NY, 1991.
- Salz, J. Coherent lightwave communications. *AT&T Technical Journal*, 64(10):2153–209, 1985.
- Sasaki, M., K. Kato, M. Izutsu, and O. Hirota. A demonstration of superadditivity in the classical capacity of a quantum channel. *Physics Letters A*, 236(1–2):1–4, 1997.
- Sasaki, M., K. Kato, M. Izutsu, and O. Hirota. Quantum channels showing superadditivity in classical capacity. *Physical Review A*, 58(1):146–58, 1998.
- Sato, Y. A method of self-recovering equalization for multilevel amplitude-modulation systems. *IEEE Transactions on Communications*, 23(6):679–82, 1975.
- Sayed, A. H. *Adaptive Filters*. Wiley Interscience, Hoboken, NJ, 2008.
- Schrödinger, E. Die gegenwärtige Situation in der Quantenmechanik. *Naturwissenschaften*, 23(48):807–12, 1935.
- Schumacher, B. and M. D. Westmoreland. Sending classical information via noisy quantum channels. *Physical Review A*, 56(1):131–8, 1997.
- Schumacher, B. and M. D. Westmoreland. *Quantum Processes, Systems, and Information*. Cambridge University Press, Cambridge, 2010.
- Schwartz, L. *Théorie des Distributions*. Hermann et Cie, Paris, 1950.
- Seimetz, M. *High-Order Modulation for Optical Fiber Transmission*. Springer-Verlag, Berlin, 2009.
- Shannon, C. E. The mathematical theory of communication. *The Bell System Technical Journal*, 27:379–423 and 623–56, 1948.
- Shannon, C. E. and W. Weaver. *The Mathematical Theory of Communication*. University of Illinois Press, Urbana, IL, 1949.
- Shannon, C. E. and W. Weaver. *The Mathematical Theory of Communication*. Reprinted with corrections by R. Blahut and B. Hayak. University of Illinois Press, Urbana, IL, 1998.
- Shapiro, J. and S. Wagner. Phase and amplitude uncertainties in heterodyne detection. *IEEE Journal of Quantum Electronics*, 20(7):803–13, 1984.
- Shapiro, J. H. Classical capacities of bosonic channels. In L. Cohen, H. V. Poor, and M. O. Scully, editors, *Classical, Semi-classical and Quantum Noise*, pages 157–68. Springer, 2012.
- Shen, Y. R. *The Principles of Nonlinear Optics*. Wiley-Interscience, New York, NY, 2002.
- Shibata, N., R. Braun, and R. Waarts. Phase-mismatch dependence of efficiency of wave generation through four-wave mixing in a single-mode optical fiber. *IEEE Journal of Quantum Electronics*, 23(7):1205–10, 1987.
- Shimada, S. *Coherent Lightwave Communications Technology*, volume 1. Chapman and Hall, London, 1995.
- Shtaif, M. Analytical description of cross-phase modulation in dispersive optical fibers. *Optics Letters*, 23:1191–3, 1998.
- Shurcliff, W. A. *Polarized Light: Production and Use*. Harvard University Press, Cambridge, MA, 1962.
- Simon, M. K. *Probability Distributions Involving Gaussian Random Variables: A Handbook for Engineers and Scientists*. Springer, New York, NY, 2007.
- Slepian, D. On bandwidth. *Proceedings of the IEEE*, 64(3):292–300, 1976.

- Slepian, D. and H. O. Pollak. Prolate spheroidal wave functions, Fourier analysis and uncertainty. I. *Bell System Technical Journal*, 40:43–64, 1961.
- Slusher, R. E., L. W. Hollberg, B. Yurke, J. C. Mertz, and J. F. Valley. Observation of squeezed states generated by four-wave mixing in an optical cavity. *Physical Review Letters*, 55:2409–12, 1985.
- Snyder, A. W. Coupled-mode theory for optical fibers. *Journal of the Optical Society of America*, 62:1267–77, 1972.
- Snyder, A. W. and J. D. Love. *Optical Waveguide Theory*. Chapman and Hall, London, 1983.
- Snyder, D. L. *Random Point Processes*. Wiley Interscience, New York, NY, 1975.
- Snyder, D. L. and M. I. Miller. *Random Point Processes in Time and Space*. Springer, New York, NY, 2012.
- Splett, A., Ch. Kurtzke, and K. Petermann. Ultimate transmission capacity of amplified optical fiber communication systems taking into account fiber nonlinearities. In *19th European Conference on Optical Communication ECOC '93, Montreux, Switzerland*, volume 2, pages 41–4, 1993.
- Stark, H. and J. W. Woods. *Probability, Random Processes, and Estimation Theory for Engineers*. Prentice-Hall, Englewood Cliffs, NJ, 1994.
- Stark, J. B., P. Mitra, and A. Sengupta. Information capacity of nonlinear wavelength division multiplexing fiber optic transmission line. *Optical Fiber Technology: Materials, Devices and Systems*, 7(4):275–88, 2001.
- Stern, T. E. Some quantum effects in information channels. *IRE Transactions on Information Theory*, 6(9):435–40, 1960.
- Stolen, R. H. Nonlinear properties of optical fibers. In S. E. Miller and A. G. Chynoweth, editors, *Optical Fiber Communications*, page 130. Academic Press Inc., New York, NY, 1979.
- Stolen, R. H. and C. Lin. Self-phase-modulation in silica optical fibers. *Physical Review A*, 17:1448–53, 1978.
- Strichartz, R. S. *A Guide to Distribution Theory and Fourier Transforms*. World Scientific, Singapore, 2003.
- Stuart, H. R. Dispersive multiplexing in multimode optical fiber. *Science*, 289:281–3, 2000.
- Sudarshan, E. C. G. Equivalence of semiclassical and quantum mechanical descriptions of statistical light beams. *Physical Review Letters*, 10:277–9, 1963.
- Sun, H., K.-T. Wu, and K. Roberts. Real-time measurements of a 40 Gb/s coherent system. *Optics Express*, 16(2):873–9, 2008.
- Swindell, W. *Polarized Light*. Dowden, Hutchinson & Ross, Stroudsburg, PN, 1975.
- Taghavi, M. H., G. C. Papen, and P. H. Siegel. On the multiuser capacity of WDM in a nonlinear optical fiber: Coherent communication. *IEEE Transactions on Information Theory*, 52(11):5008–22, 2006.
- Takahasi, H. *Information Theory of Quantum-Mechanical Channels*, pages 227–310. Academic Press, New York, NY, 1965.
- Takeoka, M. and M. Sasaki. Discrimination of the binary coherent signal: Gaussian-operation limit and simple nongaussian near-optimal receivers. *Physical Review A*, 78(2):022320, 2008.
- Tang, J. T. K. and K. B. Letaief. The use of WMC distribution for performance evaluation of APD optical communication systems. *IEEE Transactions on Communications*, 46(2):279–85, 1998.
- Tanner, R. M. A recursive approach to low complexity codes. *IEEE Transactions on Information Theory*, 27(5):533–47, 1981.
- Teich, M. C. and B. E. A. Saleh. Squeezed state of light. *Quantum Optics*, 1:153–91, 1989.

- Temprana, E., E. Myslivets, B. P. P. Kuo, L. Liu, V. Ataie, N. Alić, and S. Radić. Overcoming Kerr-induced capacity limit in optical fiber transmission. *Science*, 348(6242):1445–8, 2015.
- Tikhonov, V. I. Phase-lock automatic frequency control application in the presence of noise. *Automatika i Telemekhanika*, 21(3):209–14, 1960.
- Tonguz, O. K. and L. G. Kazovsky. Theory of direct-detection lightwave receivers using optical amplifiers. *Journal of Lightwave Technology*, 9(2):174–81, 1991.
- Treichler, J. and M. Larimore. New processing techniques based on the constant modulus adaptive algorithm. *IEEE Transactions on Acoustics, Speech, and Signal Processing*, 33(2):420–31, 1985.
- Treichler, J. R and B. G. Agee. A new approach to multipath correction of constant modulus signals. *IEEE Transactions on Acoustics, Speech and Signal Processing*, 31:459–72, 1983.
- Tse, D. and P. Viswanath. *Fundamentals of Wireless Communication*. Cambridge University Press, Cambridge, 2005.
- Tufts, D. W. Nyquist's problem; the joint optimization of transmitter and receiver in pulse amplitude modulation. *Proceedings of the IEEE*, 53(3):248–59, 1965.
- Turitsyn, K. S., S. A. Derevyanko, I. V. Yurkevich, and S. K. Turitsyn. Information capacity of optical fiber channels with zero average dispersion. *Physical Review Letters*, 91(20):203901, 2003.
- Turitsyna, E. G. and S. K. Turitsyn. Digital signal processing based on inverse scattering transform. *Optics Letters*, 38(20):4186–8, 2013.
- Ungerboeck, G. Nonlinear equalization of binary signals in Gaussian noise. *IEEE Transactions on Communication Technology*, 19(6):1128–1137, 1971.
- Ungerboeck, G. Channel coding with multilevel/phase signals. *IEEE Transactions on Information Theory*, 28(1):55–67, 1982.
- Urkowitz, H. Energy detection of unknown deterministic signals. *Proceedings of the IEEE*, 55(4):523–31, 1967.
- van der Pol, B. LXXXVIII. On “relaxation-oscillations”. *The London, Edinburgh, and Dublin Philosophical Magazine and Journal of Science*, 2(11):978–92, 1926.
- Venghaus, H. and N. Grote. *Fibre Optic Communication: Key Devices*. Springer International Publishing, New York, NY, 2017.
- Verdeyen, J. T. *Laser Electronics*. Prentice Hall, Englewood Cliffs, NJ, 1995.
- Verdu, S. Spectral efficiency in the wideband regime. *IEEE Transactions on Information Theory*, 48(6):1319–43, 2002.
- Verdu, S. and T.-S. Han. A general formula for channel capacity. *IEEE Transactions on Information Theory*, 40(4):1147–57, 1994.
- Viterbi, A. J. *Principles of Coherent Communication*. McGraw-Hill, New York, NY, 1966.
- Viterbi, A. J. Error bounds for convolutional codes and an asymptotically optimum decoding algorithm. *IEEE Transactions on Information Theory*, 13(2):260–9, 1967.
- Vlatko, V. *Introduction to Quantum Information Science*. Oxford University Press, Oxford, 2006.
- von Neumann, J. *Mathematische Grundlagen der Quantenmechanik [Mathematical Foundations of Quantum Mechanics]*. Springer, Berlin, 1932. An English translation by Robert T. Beyer was published in 1955 by Princeton University Press and reprinted in 1996.
- Waarts, R. G. and R. P. Braun. System limitations due to 4-wave-mixing in single-mode optical fibers. *Electronics Letters*, 22(16):873–5, 1986.
- Waks, E., E. Diamanti, and Y. Yamamoto. Generation of photon number states. *New Journal of Physics*, 8(1):4, 2006.

- Webb, P. P., R. J. McIntyre, and J. Conradi. Properties of avalanche photodiodes. *RCA Review*, 35(2):234–78, 1974.
- Weedbrook, C., S. Pirandola, R. García-Patrón, N. J. Cerf, T. C. Ralph, J. H. Shapiro, and S. Lloyd. Gaussian quantum information. *Review of Modern Physics*, 84:621–69, May 2012.
- Wehrl, A. General properties of entropy. *Reviews of Modern Physics*, 50(2):221–60, 1978.
- Werts, A. Propagation de la lumière cohérente dans les fibres optiques. *L'Onde Electrique*, 46:967–80, 1966.
- Widmer, A. X. and P. A. Franaszek. A DC-balanced, partitioned-block, 8B/10B transmission code. *IBM Journal of Research and Development*, 27(5):440–51, 1983.
- Widrow, B. and M. E. Hoff. Adaptive switching circuits. In *1960 IRE WESCON Convention Record*, pages 96–104, 1960.
- Wiener, N. *Extrapolation, Interpolation, and Smoothing of Stationary Time Series, with Engineering Applications*. MIT Press, Cambridge, MA, 1949. Originally issued as a classified National Defense Research Report in February 1942.
- Wiener, N. and E. Hopf. Über eine Klasse singulärer Integralgleichungen [On a class of singular integral equations]. *Berichte der Preußischen Akademie der Wissenschaften*, 31:696–706, 1931.
- Wigner, E. On the quantum correction for thermodynamic equilibrium. *Physical Review*, 40:749–59, 1932.
- Wilson, S. G. *Digital Modulation and Coding*. Prentice-Hall, Upper Saddle River, NJ, 1996.
- Winter, M., C.-A. Bunge, D. Setti, and K. Petermann. A statistical treatment of cross-polarization modulation in DWDM systems. *Journal of Lightwave Technology*, 27(17):3739–51, 2009.
- Winter, M., D. Setti, and K. Petermann. Cross-polarization modulation in polarization-division multiplex transmission. *IEEE Photonics Technology Letters*, 22(8):538–40, 2010.
- Winters, J. H. and S. Kasturia. Constrained maximum-likelihood detection for high-speed fiber-optic systems. In *IEEE Global Telecommunications Conference. GLOBECOM '91*, pages 1574–9, 1991.
- Winzer, P. J. and R. J. Essiambre. Advanced modulation formats for high-capacity optical transport networks. *Journal of Lightwave Technology*, 24(12):4711–28, 2006.
- Winzer, P. J., A. H. Gnauck, C. R. Doerr, M. Magarini, and L. L. Buhl. Spectrally efficient long-haul optical networking using 112-Gb/s polarization-multiplexed 16-QAM. *Journal of Lightwave Technology*, 28(4):547–56, 2010.
- Wittmann, C., U. L. Andersen, M. Takeoka, D. Sych, and G. Leuchs. Demonstration of coherent-state discrimination using a displacement-controlled photon-number-resolving detector. *Physical Review Letters*, 104(10):100505, 2010.
- Wolf, E. and C. L. Mehta. Determination of the statistical properties of light from photoelectric measurements. *Physical Review Letters*, 13:705–7, 1964.
- Woodward, P. Theory of radar information. *Transactions of the IRE Professional Group on Information Theory*, 1(1):108–13, 1953.
- Wozencraft, J. M. and I. M. Jacobs. *Principles of Communication Engineering*. Waveland, Prospect Heights, IL, 1965.
- Wyner, A. D. Bounds on communication with polyphase coding. *Bell System Technical Journal*, 45(4):423–560, 1966.
- Yamamoto, Y. and H. A. Haus. Preparation, measurement and information capacity of optical quantum states. *Reviews of Modern Physics*, 58(4):1001–20, 1986.
- Yariv, A. *Quantum Electronics*. Wiley, New York, NY, third edition, 1989.
- Yonenaga, K. and S. Kuwano. Dispersion-tolerant optical transmission system using duobinary transmitter and binary receiver. *Journal of Lightwave Technology*, 15(8):1530–7, 1997.

- Yoshitani, R. On the detectability limit of coherent optical signals in thermal radiation. *Journal of Statistical Physics*, 2(4):347–78, 1970.
- Yousefi, M. I. and F. R. Kschischang. Information transmission using the nonlinear Fourier transform, part I: Mathematical tools. *IEEE Transactions on Information Theory*, 60(7):4312–28, 2014a.
- Yousefi, M. I. and F. R. Kschischang. Information transmission using the nonlinear Fourier transform, part II: Numerical methods. *IEEE Transactions on Information Theory*, 60(7):4329–45, 2014b.
- Yousefi, M. I. and F. R. Kschischang. Information transmission using the nonlinear Fourier transform, part III: Spectrum modulation. *IEEE Transactions on Information Theory*, 60(7):4346–69, 2014c.
- Yu, T., W. M. Reimer, V. S. Grigoryan, and C. R. Menyuk. A mean field approach for simulating wavelength-division multiplexed systems. *IEEE Photonics Technology Letters*, 12:443–5, 2000.
- Yuen, H. P. and M. Ozawa. Ultimate information carrying limit of quantum systems. *Physical Review Letters*, 70:363–6, 1993.
- Yuen, H. P. and J. H. Shapiro. Generation and detection of two-photon coherent states in degenerate four-wave mixing. *Optics Letters*, 4(10):334–6, 1979.
- Yuen, H. P., R. S. Kennedy, and M. Lax. Optimum testing of multiple hypotheses in quantum detection theory. *IEEE Transactions on Information Theory*, 21(2):125–34, 1975.
- Yuen, H. P. and V. W. S. Chan. Noise in homodyne and heterodyne detection. *Optics Letters*, 8(3):177–9, 1983.
- Zador, R. S. Bell Telephone Laboratories technical memorandum, 1965.
- Zehavi, E. and J. Wolf. On the performance evaluation of trellis codes. *IEEE Transactions on Information Theory*, 33(2):196–202, 1987.
- Zeng, H. H., L. Tong, and C. R. Johnson. Relationships between the constant modulus and Wiener receivers. *IEEE Transactions on Information Theory*, 44(4):1523–38, 1998.
- Zheng, L. and D. N. C. Tse. Diversity and multiplexing: A fundamental tradeoff in multiple-antenna channels. *IEEE Transactions on Information Theory*, 49:1073–96, 2003.
- Ziemer, R. E. and W. H. Tranter. *Principles of Communications: Systems, Modulation, and Noise*. John Wiley, New York, NY, 2015.
- Zurek, W., editor. *Complexity, Entropy, and the Physics of Information*. Addison-Wesley, Redwood City, CA, 1980.
- Zweck, J. and C. R. Menyuk. Validity of the additive white Gaussian noise model for quasi-linear long-haul return-to-zero optical fiber communications systems. *Journal of Lightwave Technology*, 27(16):3324–35, 2009.
- Zyskind, J. L., J. A. Nagel, and H. D. Kidorf. Erbium-doped fiber amplifiers for optical communications. In T. L. Koch, editor, *Optical Fiber Telecommunications IIIB*, pages 13–68. Academic Press, San Diego, CA, 1997.