

Greg Kochanski

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- EXPERIENCE
- ◇ **Bell Laboratories**, 1998-present Murray Hill, NJ
Physiological/mechanical modeling of speech and intonation, in the context of speech synthesizers. We have the best models of tone languages (*e.g.*, Chinese) and the only models that allow emphasis and the beginnings of emotional expression in tone languages. Computational linguistics and signal processing research. Microphone arrays for improved speech data acquisition. Signal processing for speech measurements.
 - ◇ **Montclair State University**, Summer 2002 Montclair NJ
Teaching a new graduate course in the Linguistics department: “Mathematical models of language phenomena.”
 - ◇ **Bell Laboratories**, 1996-1998 Murray Hill, NJ
Use of speech recognition for security. Statistical classification and summarization of messages; merging thesaurus information with problem-specific information. Design of integrated voice-mail/e-mail messaging system. Analyzed network transport protocol.
 - ◇ **1994-1999** Observational astrophysics, using strong gravitational lensing as a probe of the mass distribution in clusters of galaxies. I produced maps of the mass distribution in a cluster of galaxies that have an order of magnitude more information content than previous results. These measurements overturned some details of theoretical models of dark matter in galaxy clusters.
 - ◇ **1995-1996** Developed techniques for automatic fruit and vegetable identification, and classification based on multiscale measurement of texture. Human interface studies: optimal keyboard designs for 2-way pagers.
 - ◇ **1993-2000** Flat-panel display development and studies of field-emission from diamond and carbon nanotubes. Led team of 2-6 researchers. Achieved record current densities for diamond emitters, and patented high performance carbon nanotube emitters. Also investigations of conductivity in doped buckyballs (C_{60}): chemistry of C_{60} -metal compounds.
 - ◇ **1987-1993** Scanning tunneling microscope (STM) studies of Si and Al surfaces, including atomic and electronic structure. Calculations and measurements of interactions between steps on the surface. Design and construction of STM with highly interactive computer/hardware interfaces.
- EDUCATION
- ◇ **Massachusetts Institute of Technology**, 1982-1987 Cambridge, MA
Ph.D. thesis: “Magnetic Trapping and Cooling of Atomic Hydrogen.” Modeling and measurement of spatial, momentum, and spin distributions, along with chemical reaction rates. Built and modeled a novel low-temperature hydrogen maser.
 - ◇ **1978-1982** S.B. Physics. Courses included Mechanical and Electrical Engineering. Research included X-ray and neutron spectroscopy, and laser optics. Designed and built 200 kW power supplies for fusion experiments.
- OTHER SKILLS
- Many computer languages, circuit design, nonlinear optimization, statistical analysis, multithreaded/multiprocessor programming, image processing, network protocols. Teaching experience: 5 summer students, one graduate class. Managed technicians.

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RECENT
CONFERENCE
PROCEED-
INGS

(My favorite papers are marked with asterisks.)

“Comparison of Declarative and Interrogative Intonation in Chinese,” Yuan, Jiahong, Shih, Chilin and Kochanski, Greg P., *Proceedings of the Speech Prosody 2002 Conference*, Aix-en-Provence, Laboratoire Parole et Langage, 11-13 April 2002, pp. 711-714. Bel, B. and Marlien, I., eds. ISBN 2-9518233-0-4.

“Implications of Prosody Modeling for Prosody Recognition,” Chilin Shih, Greg Kochanski, Eric Fosler-Lussier, Melody Chan, Jia-Hong Yuan, in Bacchiani, M. and Hirschberg, J. and Litman D. and Ostendorf M. (eds.), *Proceedings of the ISCA Tutorial and Research Workshop on Prosody in Speech Recognition and Understanding*, Red Bank, NJ, October 2001, pp. 133-138. (International Speech Communication Association).

*“*Synthesis of prosodic styles*,” Shih, Chilin and Kochanski, G. P., in *Proceedings of the 4th ISCA Tutorial and Research Workshop on Speech Synthesis, Perthshire, Scotland, August 2001*.

*“*Hierarchical structure and word strength prediction of Mandarin prosody*,” Kochanski, G. P. and Shih, Chilin, and Jing, Hongyan, in *Proceedings of the 4th ISCA Tutorial and Research Workshop on Speech Synthesis, Perthshire, Scotland, August 2001*.

“*Automated modeling of Chinese intonation in continuous speech*,” Kochanski, G. P. and Shih, Chilin, in *Proceedings of seventh European conference on speech communication and technology (Eurospeech)*, pp. 669-672, Aalborg, Denmark, September 2001.

“*Prosody control for speaking and singing styles*,” Shih, Chilin and Kochanski, G. P., in *Proceedings of seventh European conference on speech communication and technology (Eurospeech)*, Aalborg, Denmark, September 2001.

“*Stem-ML: Language-Independent Prosody Description*,” Kochanski, G. P., and Shih, Chilin, in *Proceedings of the sixth International Conference on Spoken Language Processing, Beijing, China, October 2001*.

“*Chinese Tone Modeling with Stem-ML*,” Shih, Chilin, and Kochanski, G. P., in *Proceedings of the sixth International Conference on Spoken Language Processing, Beijing, China, October 2001*.

REFEREED
PUBLICA-
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“Hierarchical Structure and Word Strength Prediction of Mandarin Prosody,” Kochanski, G. P., Shih, C., Jing, H. accepted by *International J. Speech Technology*, 2002.

*“Quantitative Measurement of Prosodic Strength in Mandarin,” Kochanski, G. P., Shih, C., Jing, H. submitted to *Speech Communication*, 2001.

“Prosody Modeling with Soft Templates,” Kochanski, G. P., Shih, C., to be published in *Speech Commnication*, 2002.

“A Quasi-Glottogram signal for voicing and power estimation,” Kochanski, G. P. and Shih, Chilin, submitted to *J. Acoustic. Soc. Amer.* 2001.

“Mechanisms of efficient field emission from carbon nanotubes,” W. Zhu, C. Bower, O. Zhou, G. Kochanski, S. Jin, *Materials Research Society symposium proceedings on materials issues in vacuum microelectronics #2*, 1999.

“Large current density from carbon nanotube field emitters,” W. Zhu, C. Bower, O. Zhou, G. Kochanski, S. Jin, *Applied Physics Letters* **75(6)**, August 1999, p. 873-875.

“Low Field Electron Emission from Undoped Nanostructured Diamond,” W. Zhu, G. P. Kochanski, and S. Jin, *Science* **282**, 20 November 1998, pp. 1471-1473.

“Low-field electron emission from undoped nanostructured diamond”, W. Zhu, G. Kochanski, S. Jin; Nov 20, 1998 *Science* **282(5393)** 1471.

*“A detailed mass map of CL0024+1654 from strong lensing,” J. A. Tyson, G. Kochanski, I. Dell’Antonio; 1998 *Astrophysical Journal* **498(2)** L107.

“Manifestation of twofold anisotropic domain growth kinetics on fourfold substrates,” G. G. Bishop, A. P. Graham, K. Mihanic, J. K. Wendel, B. J. Hinch, and G. Kochanski; 1997 *Phys. Rev. Lett.* **79(L7)** 1409.

“Morphology of gravitationally lensed galaxies,” J. A. Tyson, G. Kochanski, I. Dell’Antonio; *The UV Universe at Low and High Redshift*, October 1997, AIP press.

- *“Faint flickering galaxies: few and far between;” G. P. Kochanski, J. A. Tyson, P. Fischer, 1996 *Astronomical Journal* **111**, 1444-1455.
- “Electron field emission characteristics of chemical vapor deposited diamond;” W. Zhu, G. P. Kochanski, S. Jin, L. Seibles, 1996 *Proc. Electrochemical Soc.* 95-4 p. 531. In “Diamond Materials #4” , K. V. Ravi and J. P. Dismukes, ed. Pennington, NJ.
- “Electron field emission from chemical vapor deposited diamond;” W. Zhu, G. P. Kochanski, S. Jin, L. A. Seibles, 1996 *J. Vac. Sci. Tech.*
- “Defect-enhanced electron field emission from chemical vapor deposited diamond;” W. Zhu, G. P. Kochanski, S. Jin, L. Seibles, 1995 *Journal of Applied Physics* **78**, 2707-2711.
- “Electron field emission from ion-implanted diamond;” W. Zhu, G. P. Kochanski, S. Jin, L. Seibles, D. C. Jacobsen, M. McCormack, and A. E. White, 1995 *Applied Physics Letters* **67**, 1157-1159.
- “Erratum: Surface barrier resonances on a simple metal (Phys. Rev. Lett.70, 849 (1993));” S. Yang, R. A. Bartynski, G. P. Kochanski, S. Papadia, T. Fonden, M. Persson, 1995 *Physical Review Letters* **75**, 1424-1424.
- *“Optimal addition of images for detection and photometry;” P. Fischer and G. Kochanski, 1994 *Astronomical Journal* **107**, 802-810.
- “Two-dimensional silicide 5x3 structure on Cu(001) as seen by scanning tunneling microscopy and helium-atom scattering;” A. P. Graham, B. J. Hinch, G. P. Kochanski, E. M. McCash, and W. Allison, 1994 *Physical Review B* **50**, 15304-15315.
- “Electrical resistivity and stoichiometry of K_xC_{60} , Rb_xC_{60} , and Cs_xC_{60} films;” R. C. Haddon, A. S. Perel, R. C. Morriss. H. Chang, A. T. Fiory A. F. Hebard, T. T. M. Palstra, and G. P. Kochanski, 1994 *Chemical Physics Letters* **218**, 100-106.
- “Enhanced cohesion of photo-oxygenated fullerene films: a new opportunity for lithography;” A. F. Hebard, C. B. Eom, R. M. Fleming, Y. J. Chabal, A. J. Muller, S. H. Glarum, G. J. Pietsch, R. C. Haddon, A. M. Muijsce, M. A. Paczkowski, G. P. Kochanski, 1993 *Applied Physics A* **57**, 299-303.
- “Electrical resistivity and stoichiometry of Ba_kC_{60} films;” R. C. Haddon, G. P. Kochanski, A. F. Hebard, A. T. Fiory, R. C. Morris, A. S. Perel, 1993 *Chemical physics letters* **203**, 433-437.
- “Surface barrier resonances on a simple metal;” S. Yang, R. A. Bartynski, G. P. Kochanski, S. Papadia, T. Fonden, M. Persson, 1993 *Physical review letters* **70**, 849-852.
- “Electrical resistivity and stoichiometry of Ca_xC_{60} and Sr_xC_{60} films;” R. C. Haddon, G. P. Kochanski, A. F. Hebard, A. T. Fiory, R. C. Morris, 1992 *Science* **258**, 1636-1638.
- *“STM measurements of photovoltage on Si(111) and Si(111):Ge;” G. P. Kochanski and R. F. Bell, 1992 *Surface Science* **273**, L435-L440.
- “Scanning probe metrology;” D. Griggs, J. Griffith, G. Kochanski and M. Vasile, *Proceedings of the (SPIE) International Society for Optical Engineering*, 1992.
- *“Electrical resistivity and stoichiometry of K_xC_{60} films;” G. P. Kochanski, A. F. Hebard, R. C. Haddon, and A. T. Fiory, 1991 *Science* **255**, 184-186.
- *“A Ginzberg-Landau model of dimers on the Si(100) surface;” G. P. Kochanski and J. E. Griffith, 1991 *Surface Science Letters*, **249**, L293-L299.
- “Optical interactions in the junction of a scanning tunneling microscope;” Y. Kuk, R. S. Becker, P. J. Silverman, G. P. Kochanski, 1990 *Physical review letters* **65**, 456-459.
- *“Step-step interactions due to anisotropic surface stress;” Greg P. Kochanski, 1990 *Phys. Rev.* **B41**, 12334.
- “The atomic structure of Vicinal Si(001) and Ge(001);” J. E. Griffith and G. P. Kochanski, 1990 *Critical Reviews in Solid State and Material Sciences*, **16**(4), 255.

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*“Momentum noise in vacuum tunneling transducers;” B. Yurke, G. P. Kochanski, 1990 *Phys. Rev.* **B41**, 8184-8194.

“Nonlinear alternating-current tunneling microscopy;” G. P. Kochanski, 1989 *Phys. Rev. Lett.* **62**, 2285-2288.

“Evaporative cooling of spin-polarized atomic hydrogen;” N. Masuhara, J. M. Doyle, J. C. Sandberg, D. Kleppner, T. J. Greytak, H. F. Hess, G. P. Kochanski, 1988 *Phys. Rev. Lett.* **61**, 935-938.

*“Magnetic Trapping of Spin-Polarized Atomic Hydrogen;” H. F. Hess, G. P. Kochanski, J. M. Doyle, N. Masuhara, D. Kleppner, and T. J. Greytak, 1987 *Phys. Rev. Lett.* **59**, 672-675.

*“Spin-Polarized Hydrogen Maser;” H. F. Hess, G. P. Kochanski, J. M. Doyle, T. J. Greytak, and D. Kleppner, 1986 *Phys. Rev.* **A34**, 1602-1604.

“Relaxation and recombination in spin-polarized atomic hydrogen;” D. A. Bell, H. F. Hess, G. P. Kochanski, S. Buchman, L. Pollack, Y. M. Xiao, D. Kleppner, T. J. Greytak, 1986 *Phys. Rev.* **B34**, 7670-7697.

“Direct observation of a two-dimensional gas of spin-polarized atomic hydrogen;” L. Pollack, S. Buchman, Y. M. Xiao, H. F. Hess, G. P. Kochanski, T. J. Greytak, 1986 *Phys. Rev.* **B34**, 461-463.

“Temperature and magnetic field dependence of three-body recombination in spin-polarized hydrogen;” H. F. Hess, D. A. Bell, G. P. Kochanski, D. A. Kleppner, T. J. Greytak, 1984 *Phys. Rev. Lett.* **52**, 1520-1523

“Observation of three-body recombination in spin-polarized hydrogen;” H. F. Hess, D. A. Bell, G. P. Kochanski, R. W. Cline, D. A. Kleppner, T. J. Greytak, 1983 *Phys. Rev. Lett.* **51**, 483-486.

“Studies of neutron emission during the start-up phase of the Alcator C tokamak;” D. S. Pappas, R. J. Furnstahl, G. P. Kochanski, F. J. Wysocki, 1983 *Nuclear Fusion* **23**, 1285-1291.

INVITED
TALKS

The Hotspot Transform; Princeton Graphics Seminar Series, 12/6/1999.

High resolution mass maps from gravitational lensing; CCNY 3/4/1998.

Science for fun and profit at Bell Labs, Rutgers University Scientists in Industry series, 2/7/97.

Scanning probe microscopy on dielectrics: what are the limits? Gordon Research Conference on Dielectric Materials, July 1994.

What don't we know about Si(100)? Rutgers University Surface Science Series, October 1991.

Microwave and optical rectification in an STM; APS, Anaheim, CA, March 12-16, 1990.

OTHER

Kochanski, G. P., Zhu, Wei, Goren, Yehuda, “Technological Overview,” Chapter 2, in *Vacuum Microelectronics*, ed. Wei Zhu, John Wiley & Sons, Inc. 2001. ISBN 0-471-32244-X.

New York Times, 12/29/1998, front page of the Science section: article about gravitational lensing research at Bell Laboratories.

Styx speed over wide area networks, G. P. Kochanski; BL0011339-980612-02TM. Analysis of network protocol performance.

“Well of darkness”, editorial, A. E. Evrard, 1998 *Nature* **394**, 9 July, pp. 122-123. As the first reliable experiment, our 1998 gravitational lensing paper has prompted theorists to rethink their assumptions and modeling of the dynamics of clusters of galaxies.

PATENTS

U.S. patent 6,363,606: *Process for forming integrated structures using three dimensional printing techniques*; Johnson, D. W., Kochanski, G. P., Lanzerotti, L. J., Pribble, C. M., and Thomson, D. J. This shows how to build solid objects under computer control that are made from multiple materials and even include enclosed components.

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U.S. patent 6,310,952: *Telephone Access to Overly Popular Services*; Baldwin, M., Jin, S.-H., Kochanski, G. P. Techniques for auctioning access to telephone services, for instance public golf course reservations.

U.S. patent 6,297,952: *Microwave Vacuum Tube Device Employing Grid-Modulated Cold Cathode Source having Nanotube Emitters*; Goren, Y., Jin, S.-H., Kochanski, G. P., Zhu, W. Without a hot cathode and the resulting thermal expansion and diffusion, one can build vacuum tubes with much smaller interelectrode spacing, and therefore dramatically better frequency response. At high power levels, these can perform substantially better than semiconductor designs.

U.S. patent 6,219,438: *Produce Identifier using Barcode Scanner and Wavelet Image Processing and having Compensation for Dirt Accumulated on the Viewing Window*; Giordano, D. A., Kochanski, G. P. How can one automatically tell an apple from an orange? Look at the texture.

U.S. patent 6,014,124: *Display Means and Methods*. Dickinson, A. G., Kochanski, G. P., Wong, Apollo. Novel excitation scheme for liquid crystal displays.

*U. S. patent 6,097,195: *Methods and Apparatus for Increasing Metal Density in an Integrated Circuit while also Reducing parasitic Capacitance*; Ackland, B. D., Inglis, D. A., Kochanski, G. P. Circuit design for a CMOS fingerprint sensor with general applicability to IC amplifiers. Actively driven guard electrodes.

U. S. patent 5,854,661: *System and Method for Subtracting Reflection Images from a Display Screen*; Kochanski, G. P. Modeling and removing glare from displays by image processing.

*U.S. patent 5,838,118: *Display Apparatus with Coated Phosphor and Method for Making Same*; Kochanski, G. P., Murray, C. A., Steigerwald, M. L., Wiltzius, Pierre, van Blaaderen, Alfons. Improving the phosphor lifetime in CRT displays and fluorescent lights by protecting the surface of the phosphor particles.

*U. S. patent 5,283,500: *Flat Panel Field Emission Display Apparatus*; G. P. Kochanski It is currently one of only two known techniques for eliminating the extreme nonuniformity that field emitters suffer from, and by far the more manufacturable.

*U.S. patent 5,483,235: *Stylus-Based Keyboard Arrangement*; G. Kochanski, K. J. Hanson. The sensible way to arrange a keyboard - put common pairs and triplets of letters together, with adjustments for syllable boundaries. We used simulated annealing techniques to optimize the keyboard layout for common messages.

*U.S. patent 5,512,934: *System and Method for Transmission of Programming on Demand*; G. Kochanski. Describes techniques for distributing video on demand more efficiently. Hardware and spectrum is shared between users by running some users slightly faster, and some slightly slower until their data streams merge.

*U.S. patent 5,596,634: *Telecommunications system for dynamically selecting conversation topics having an automatic call-back feature*; G. P. Kochanski. This patent allows internet-style chat services to be supported over the telephone network. It has a novel call-back feature that makes it possible to have chat lines on esoteric topics with small communities of interest. One could have chat on town politics or growing Begonias, rather than just topics of universal interest like money. In short, the patent allows the system to call you back, if some one wants to talk about your favorite topic.

U.S. patents 5,561,340; 5,598,056; 5,616,368; 5,637,950; 5,623,180; 5,648,699; 5,681,196; 5,690,530; 5,698,934; 5,704,820; 5,709,577; 5,717,292; 5,744,195; 5,747,918; 5,977,697; 5,982,095; 6,014,124; 6,250,984: Patents relating to design and manufacturing of field emission flat panel displays. Better emitter structures, more manufacturable gate electrodes, and spacer designs that will withstand higher voltages. We focussed on display designs that could be manufactured without lithography, using self-aligning masks, random particle masks, and embossed and screen-printed pillar structures.