

Matthew A. Kreitzer, Ph.D.
Professor of Biology
Dean of Science, Engineering & Education
Indiana Wesleyan University
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765-677-2301

Faculty Positions:

- Dean of Science, Engineering & Education, Indiana Wesleyan University, 2024-present.
- Professor of Biology, Indiana Wesleyan University, 2012-present.
- Chair of the Division of Natural Sciences, Indiana Wesleyan University, 2014-2017.
- Associate Professor of Biological Sciences, Indiana Wesleyan University, 2007-present.
- Assistant Professor of Biological Sciences, Indiana Wesleyan University, 2003-2007.

Academic Preparation:

- Undergraduate: Olivet Nazarene University, Bourbonnais, IL. Major: Biology, minor Chemistry. B.S., 1999.
- Graduate: University of Illinois at Chicago, Chicago, IL. Major: Biological Sciences. Ph.D., 2003.

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Undergraduate Research Program:

I have served as an undergraduate research mentor for 22 years (2004–present) at a primarily undergraduate institution. In this capacity I have mentored **approximately 70 undergraduate students** through neurophysiological research. **25 undergraduate students** during this time have carried out projects to the level of authorship on scientific research manuscripts while all have disseminated their results in local, regional, or national scholarly venues. My endeavors in undergraduate research and STEM undergraduate education have resulted in five grant awards from the National Science Foundation.

Publications: *denote undergraduate authors

Kreitzer MA, Vredeveld M*, Tinner K*, Powell AM*, Schantz AW*, Leninger R*, Merillat R*, Gongwer MW*, Tchernookova BK, Malchow. (2024). ATP-mediated increase in H⁺ efflux from retinal Müller cells of the axolotl. *Journal of Neurophysiology*. <https://doi.org/10.1152/jn.00321.2023>.

RP Malchow RP, Tchernookova BK, Choi J, Smith PJS, Kramer RH, **Kreitzer MA**. (2021). Review and Hypothesis: A Potential Common Link Between Glial Cells, Calcium Changes, Modulation of Synaptic Transmission, Spreading Depression, Migraine, and Epilepsy—H⁺. *Frontiers in Cellular Neuroscience*. <https://doi.org/10.3389/fncel.2021.693095>.

Choi J, Tchernookova BK, Kumar W*, Kiedrowski L, Goeke C, Guizzetti M, Larson J, **Kreitzer MA**, Malchow RP, (2021). Extracellular ATP-Induced Alterations in

Extracellular H⁺ Fluxes from Cultured Cortical and Hippocampal Astrocytes.
Frontiers in Cellular Neuroscience. <https://doi.org/10.3389/fncel.2021.640217>.

Tchernookova BK, Gongwer MW*, George A*, Goeglein B*, Powell AM*, Caringal HL*, Leuschner T*, Phillips AG*, Schantz AW*, Kiedrowski L, Chappell R, **Kreitzer MA**, Malchow RP. (2021). ATP-mediated Increase in H⁺ Flux from Retinal Müller Cells: a Role for Na⁺/H⁺ Exchange. *Journal of Neurophysiology*. <https://doi.org/10.1152/jn.00546.2020>.

Hu S, Anastassov IA, **Kreitzer MA**, Slaughter MM, & Chappell RL. (2020). A dark decrement for enhanced dynamic sensitivity of retinal photoreceptors. *Vision Research*. <https://doi.org/10.1016/j.visres.2020.12.005>.

Tchernookova BK, Heer C*, Young M*, Swygart D*, Kaufman R*, Jacoby J, **Kreitzer MA**, Malchow RP. (2018) Activation of Retinal Glial (Müller) Cells by Extracellular ATP Induces Pronounced Extracellular Acidification. *PLOSOne*. doi.org/10.1371/journal.pone.0190893

Kreitzer MA, Swygart D*, Osborn M*, Skinner B*, Heer C*, Kaufman R*, Williams B*, Shepherd L*, Caringal H*, Gongwer M*, Tchernookova BK & Malchow RP. (2017) Extracellular H⁺ fluxes from tiger salamander Müller (glial) cells measured using self referencing H⁺-selective microelectrodes. *Journal of Neurophysiology*. 118(6): 3051-3091. doi.org/10.1152/jn.00409.2017

Jacoby J, **Kreitzer MA**, Alford ST, & Malchow RP. (2014) Fluorescent imaging reports an extracellular alkalization induced by glutamatergic activation of isolated retinal horizontal cells. *Journal of Neurophysiology* 111(5): 1056-64.

Kreitzer MA & Malchow RP. (2013). Engaging Undergraduates in a Unique Neuroscience Research Opportunity: A Collaborative Research Experience Between a Primarily Undergraduate Institution (PUI) and a Major Research Institution. *Journal of Neuroscience Education* 12(1):A85-92.

Kreitzer MA, Jacoby J, Naylor ER*, Baker A*, Grable T*, Tran E*, Booth SE*, Qian H, & Malchow RP. (2012) Distinctive patterns of alterations in proton efflux from goldfish retinal horizontal cells monitored with self-referencing H⁺-selective electrodes. *European Journal of Neuroscience* 36(8):3040-50.

Jacoby J, **Kreitzer MA**, Alford ST, Qian H, Tchernookova BK, Naylor ER*, & Malchow RP. (2012). Extracellular pH dynamics of retinal horizontal cells examined using electrochemical and fluorometric methods. *Journal of Neurophysiology* 107(3):868-79.

Runyan JD & **Kreitzer MA**. Book Review of *The Neuroscience of Religious Experience* by Patrick McNamara. (2010). *Christian Scholars Review*.

Kreitzer MA, Birnbaum AD, Qian H & Malchow RP. (2009). Pharmacological characterization, localization, and regulation of ionotropic glutamate receptors in skate horizontal cells. *Vis Neurosci*. **26**, 375-387.

Kreitzer MA, Collis LP, Molina AJA, Smith PJS, & Malchow RP. (2007). Modulation of extracellular proton fluxes from retinal horizontal cells of the catfish by depolarization and glutamate. *J Gen Physiol* **130**, 169-182.

Kreitzer MA, Andersen KA & Malchow RP. (2003). Glutamate modulation of

GABA transport in retinal horizontal cells of the skate. *J Physiol* **546**, 717-731.

Liao GY, **Kreitzer MA**, Sweetman BJ & Leonard JP. (2000). PSD-95 regulates Src- and insulin-mediated current modulation of mouse NMDA receptors expressed in *Xenopus* oocytes. *J Neurochem.* **75**, 282-287.

Research Awards/Grants:

- National Science Foundation Award 2426451(2024-2029). co-PI. \$193,940. Collaborative Research: Rural Low Income Students S-STEM Investigations Network Groups Research Hub (RISING Hub).
- National Science Foundation Award 2130078 (2021-2027). co-PI. \$1,300,000. Connecting Science Identity to STEM Success at a Rural Primarily Undergraduate Institution Propelled by an Evidence-Based First Year Experience.
- National Science Foundation Award 1557820 (2016-2023). PI. \$450,000. Collaborative RUI: The role of extracellular H⁺ in processing visual signals.
- National Science Foundation S-STEM Award 1458331 (2015-2022). PI. \$623,000. Scholarships for Boosting Scientific Manpower in Rural Central Indiana. This award will create a scholarship program at Indiana Wesleyan University to enable 18 academically talented but financially-needy students from Central Indiana with an emphasis on Grant County to pursue and complete undergraduate degrees in biology, chemistry, and physics. The scholarships will support two student cohorts consisting of 9 STEM majors each over a period of four years.
- National Science Foundation Research Experiences for Undergraduates Supplemental Award (2014 & 2015). \$6,000/year to support undergraduates (David Swygart, 2014 and Chad Heer, 2015) as NSF REU Fellows.
- National Science Foundation Award 0924383 (2009-2015). PI. \$175,000. Collaborative RUI: The role of extracellular H⁺ in processing visual signals.
- Indiana Wesleyan University, University Scholar Award (2020-2023).
- Hodson Science Summer Research Award for research in the Summer Research Institute (2011-2015, 2017-2022, 2024).
- 2019 & 2021 Whitman Visiting Scientist Marine Biological Laboratory.
- 2019 & 2022 Travel Award from the American Association for the Advancement of Science (AAAS) to attend the 2019 S-STEM Symposium in Washington DC.
- 2018 Faculty for Undergraduate in Neuroscience Travel Award for Michael Gongwer to attend and present at the Society for Neuroscience Conference in San Diego.
- 2014 Faculty for Undergraduate in Neuroscience Travel Award for David Swygart to attend and present at the Society for Neuroscience Conference in Washington DC.
- Indiana Wesleyan University's Outstanding Scholarship Award (2014) for research achievements.
- Indiana Wesleyan University's President's Award for Meritorious Service (2010) for efforts in undergraduate research.
- Marine Biological Laboratory Whitman Summer Research Fellow. Woods Hole, MA (2006). Award to conduct collaborative research at the BioCurrents Research Center at the MBL. "Regulation of hydrogen flux from cone and rod horizontal cells."
- Indiana Wesleyan University Institutional fellowships including a Lilly Initiative Scholarship, the Hinds Fellowship, & the University Scholar Award (Institutional Research Award). (2006-2009, 2013-2015, & 2019-2022).

Synergistic publications/activities:

Rinehart K, Foster A, Hawk A, Goodfellow G, Kiedrowski L, Malchow RP & **Kreitzer MA**. (2024) WMRUGS 2024. Visualizing the Mechanism by which ATP Increases H⁺ Efflux from Isolated Axolotl Müller Cells.

Foster A, Rinehart K, Hawk A, Goodfellow G, Malchow RP, Kiedrowski L & **Kreitzer MA**. (2024) WMRUGS 2024. ATP Induces an H⁺ Efflux in Rat Hippocampal Astrocytes Through Activation of Sodium Hydrogen Exchangers and Monocarboxylate Transporters.

Kreitzer MA, Leonard S, Ostrander JS & Leonard J. (2022) Neuroscience 2022. Reducing barriers for undergraduate STEM success at a primarily undergraduate institution: success stories and lessons learned.

Kreitzer MA, Vredeveld M*, Tinner K*, Tchernookova BK & Malchow RP. (2022) Neuroscience 2022. ATP-mediated H⁺ efflux from isolated axolotl Müller cells: contributions from sodium-hydrogen exchange and monocarboxylate transport.

Kreitzer MA, Leininger R*, Merrillat R*, & Malchow RP. (2021) Neuroscience 2021. ATP-mediated H⁺ efflux from cultured mammalian astrocytes: a role for monocarboxylate transport.

Tchernookova BK, **Kreitzer MA**, & Malchow RP. (2021) Neuroscience 2021. Effects of glutamate on extracellular H⁺ in retinal slices of tiger salamander.

Tchernookova BK, Goeglein B*, Leuschner T*, Powell A*, Schantz A*, Malchow RP, & **Kreitzer MA**. (2019) Neuroscience 2019. Extracellular ATP-evoked signal transduction cascade underlying H⁺ efflux from retinal Müller glia. Chicago, IL.

Malchow RP, Tchernookova BK, Gongwer M*, Goeglein B*, Shepherd L*, Caringal H*, Leuschner T*, Kiedrowski L, & **Kreitzer MA**. (2019) ARVO. Signal transduction mechanism underlying H⁺ efflux from retinal Müller glial cells induced by extracellular ATP. Vancouver, British Columbia.

Gongwer M*, Tchernookova BK, Shepherd L*, Caringal H*, Goeglein B*, Leuschner T*, Malchow RP, & **Kreitzer MA**. (2019) Sodium-hydrogen exchange mediates ATP-induced extracellular acidification from retinal Müller (glial) cells. WMRUGS 2019. Van Andel Institute, Grand Rapids MI.

Powell A*, Schantz A*, Goeglein B*, Leuschner T*, Gongwer M*, Shepherd L*, Caringal H*, McKuras R*, Tchernookova BK, Malchow RP, & **Kreitzer MA**. (2019) Role of Calmodulin and PKC in ATP-induced Acidification of Muller Cells. WMRUGS 2019. Van Andel Institute, Grand Rapids MI.

Gongwer M*, Tchernookova BK, Shepherd L*, Caringal H*, Goeglein B*, Leuschner T*, Malchow RP, & **Kreitzer MA**. (2018) Neuroscience 2018 and Faculty for Undergraduates in Neuroscience Travel Award Recipient. Characteristics of ATP-induced extracellular acidification from retinal Müller (glial) cells. San Diego, CA.

Malchow RP, Tchernookova BK, Holzhausen LC, Kramer RH, & **Kreitzer MA**. (2018).

ATP-induced alterations in extracellular H⁺: a potent potential mechanism for modulation of neuronal signals by Müller (glial) cells in the vertebrate retina. *ARVO* 2018. Honolulu, HI.

Goeglein B*, Leuschner T*, Gongwer M*, Shepherd L*, Caringal H*, Tchernookova BK, Malchow RP, & **Kreitzer MA**. (2018) Muller Cell ATP-induced acidification is shaped by extracellular pH and carbonic anhydrase activity. WMRUGS 2018. Van Andel Institute, Grand Rapids MI.

Gongwer M*, Shepherd L*, Caringal H*, Parsons H*, Goeglein B*, Leuschner T*, Tchernookova BK, Malchow RP, & **Kreitzer MA**. (2018). Chicago SfN 2018. ATP-Induced extracellular acidification from retinal Müller glia is sensitive to extracellular concentrations of Na⁺ and K⁺. Chicago, IL.

Kreitzer MA, Tchernookova BK, Swygart D*, Heer C*, Gongwer M*, Shepherd L*, Caringal H*, & Malchow RP. (2017) Neuroscience 2017. Extracellular pH changes mediated by retinal Muller glia are shaped by two distinct molecular pathways. Washington D.C.

Heer C*, Young M*, Swygart D*, Kaufman R*, Tchernookova BK, Wlitzla M, Horb M, **Kreitzer MA**, & Malchow RP. (2016) Measurement of extracellular changes in acidity mediated by radial glial cells (Müller cells) of the vertebrate retina. WMRUGS 2016. Van Andel Institute, Grand Rapids MI.

Tchernookova BK, Heer C*, Young M*, Swygart D*, Kaufman R*, **Kreitzer MA**, & Malchow RP. (2016). Neuroscience 2016. ATP-induced changes in intracellular Ca levels and extracellular H⁺ concentration from retinal Muller (glial) cells. San Diego, CA.

Kreitzer MA, Swygart D*, Heer C*, Kaufman R*, Williams B*, Tchernookova BK, & Malchow RP. (2015). Neuroscience 2015. Regulation of extracellular pH by isolated Müller cells of the tiger salamander: HCO₃⁻-dependent and HCO₃⁻-independent mechanisms. Chicago, IL

Steinke E*, Miller D*, Swygart D*, Kaufman R*, Williams B*, Laubach T*, Burns C*, Heer C*, Gerick N*, Hixson D*, Osborn M*, Skinner B*, Naylor E*, Malchow RP & **Kreitzer MA**. (2015). Chicago SfN 2015. Inhibiting extracellular carbonic anhydrase increases the dose-dependent, K⁺-induced increase in proton flux of Müller cells. Chicago, IL.

Swygart D*, Osborn M*, Skinner B*, Naylor E*, Kaufman R*, Williams B*, Tchernookova BK, Malchow RP & **Kreitzer MA**. (2014). Neuroscience 2014. Bicarbonate-dependent, potassium-induced increase in proton flux at the endfoot of isolated Muller cells of the tiger salamander. Washington D.C.

Swygart D*, Kaufman R*, Tchernookova BK, Jacoby J, Malchow RP, & **Kreitzer MA**. (2014). Chicago SfN 2014. HCO₃⁻-dependent, K⁺-induced increase in proton flux at the endfoot of isolated Muller cells of the tiger salamander. Chicago, IL.

Tchernookova BK, Naylor ER*, Osborn M*, Skinner B*, Steinke E*, Rasmussen L*, **Kreitzer MA**, & Malchow RP. (2013). Great Lakes Glia Conference. Glutamate-induced changes in proton fluxes measured from isolated Muller cells. Traverse City, Michigan.

- Tchernookova BK, Naylor ER*, Osborn M*, Skinner B*, Steinke E*, Rasmussen L*, **Kreitzer MA**, & Malchow RP. (2013). Neuroscience 2013. Glutamate-induced changes in extracellular H⁺ fluxes measured from isolated Muller cells of the tiger salamander retina. San Diego, CA.
- Kreitzer MA**. (2013). Regulation of Extracellular pH dynamics by cells of the outer retina. Neuro Group. University of Illinois at Chicago.
- Jacoby J, Naylor E*, Baker A*, Grable T*, Tran E*, Qian H, Malchow RP, & **Kreitzer MA**. Distinctive patterns of alterations in proton efflux from goldfish retinal horizontal cells monitored with self-referencing pH-selective electrodes. (2012). *Neuroscience 2012*. New Orleans, LA.
- Malchow RP, Jacoby J, Alford ST, Qian H, & **Kreitzer MA**. (2012). The pH-sensitive Dye HAF Reports An Extracellular Alkalinization Upon Stimulation Of Catfish Horizontal Cells: Testing The H⁺ Hypothesis Of Lateral Inhibition. *ARVO 2012*. Ft. Lauderdale, FA.
- Naylor E*, Jacoby J, Montgomery L*, Qian H, Malchow RP & **Kreitzer MA**. (2011). Calcium-dependent regulation of H⁺ flux from isolated retinal horizontal cells. *Neuroscience 2011*. Washington D.C.
- Jacoby J, Alford ST, **Kreitzer MA**, Qian H & Malchow RP. (2011). Extracellular pH dynamics of retinal horizontal cells examined using electrochemical and fluorometric methods. *Neuroscience 2011*. Washington D.C.
- Malchow RP, Jacoby J, Alford ST, Qian H & **Kreitzer MA**. (2011). Does H⁺ release from horizontal cells mediate lateral feedback inhibition in the outer retina? A tale of two techniques. *IBRO World Congress of Neuroscience*. Florence, Italy.
- Malchow RP, Jacoby J, Booth SE*, Alford ST, Qian H, & **Kreitzer MA**. (2011). Testing the H⁺ Hypothesis of Feedback Inhibition from Horizontal Cells to Vertebrate Photoreceptors: a Tale of Two Techniques. *ARVO 2011*. Ft. Lauderdale, FA.
- Kreitzer MA**. (2011). Extracellular pH dynamics in the outer retina: An inter-institutional undergraduate adventure. Neurobiology Group, University of Illinois at Chicago.
- Kreitzer MA** & Malchow RP. (2010). Stimulating student interest and critical thinking in the Neurosciences: a unique collaborative research program involving a primarily undergraduate institution and a major research institution. *Neuroscience 2010*. San Diego, CA.
- Kreitzer MA**, Grable T*, Naylor E*, Montgomery L*, & Malchow RP. (2010). Evoked and spontaneous extracellular alkalinizations in isolated goldfish horizontal cells. *Neuroscience 2010*. San Diego, CA.
- Jacoby J, Alford ST, **Kreitzer MA**, Qian H, & Malchow RP. (2010). A tale of two responses: testing the H⁺ hypothesis of feedback inhibition from horizontal cells to vertebrate photoreceptors. *Neuroscience 2010*. San Diego, CA.
- Grable T*, Keller C*, & **Kreitzer MA**. (2010). Depolarization-dependent extracellular alkalinizations from isolated goldfish retinal horizontal cells. *Midwest/Great Lakes Undergraduate Research Symposium 2010*. Ohio Wesleyan University.

- Kreitzer MA** & Malchow RP. (2010). Investigating the role of extracellular H⁺ in visual processing: linking cells, labs and undergrads. *Indiana University School of Medicine Research Seminar*, Indiana University School of Medicine Northwest.
- Kreitzer MA** & Malchow RP. (2009). Bridging the gap: Using Skype to initiate collaborative undergraduate neuroscience educational experiences between small and large educational institutions. *Neuroscience 2009*, Chicago, IL.
- Kreitzer MA**. (2009). Using Skype to strengthen a collaborative research effort between two distant universities. *I-Light Gigapop Conference 2009*, Indianapolis, IN.
- Malchow RP, **Kreitzer MA**, Molina AJA, Collis LP & Smith PJS. (2008). Testing the proton hypothesis of lateral inhibition: measurements of H⁺ flux from isolated horizontal cells of the catfish, skate and goldfish. ARVO. Fort Lauderdale, FA. Paper Presentation.
- Kreitzer MA** & Malchow RP. (2008). Modulation of horizontal cell AMPA/kainite glutamate receptor responses of the skate retina by extracellular zinc, calcium and H⁺. *Neuroscience 2008*. Washington D.C.
- Kreitzer MA**, Collis LP, Molina AJA, Smith PJS, & Malchow RP. (2007). Do protons mediate lateral inhibition in the outer retina? Proton flux measurements from catfish horizontal cells. *Neuroscience 2007*, San Diego, CA.

Research Service:

- NSF RISING Leadership team and Summer Institute participant. Mississippi State University (2025).
- National Science Foundation Panel Reviewer (2015).
- Ph.D. Dissertation committees for Jason Jacoby (2013) and Boriana Tchernookova (2016). University of Illinois at Chicago. Chicago, IL.
- Institutional Animal Care and Use Committee co-establisher with OLAW assurance (w/ Mark Asnicar, Associate Professor of Biology) of Indiana Wesleyan University's Institutional Animal Care and Use Committee (2016).
- PUI BRAIN STEM WORKSHOP Discussion Leader: The central goal of this workshop was to enhance the engagement of faculty and students from PUI's in the challenges faced by the National Science Foundation's BRAIN Initiative. 2015 NSF Workshop, Chicago.
- IWU Citizen's Advisory Council Breakfast (2017) presentation on NSF S-STEM.
- Academic sub-committee of IWU Board of Trustees (2017) presentation on grant funding and research.
- 2013 Archive Vision and Change Scholar; American Physiological Society
- Indiana Wesleyan University Faculty Luncheon Presentation (2009). Envisioning a path for funding undergraduate research at IWU: An undergraduate study of visual processing.
- Presented at Citizen's Advisory Council Breakfast with undergraduate research student (Luke Menner) (2009).
- Seminar Presentation to Laboratory of Integrative Neuroscience program at University of Illinois at Chicago. "Examining the mechanism of lateral inhibition in the outer retina - the H⁺ hypothesis." (2007).

- Co-developed (Jason Runyan, PhD, Associate Professor of Psychology at IWU) interdisciplinary, Integrative Neuroscience Course at Indiana Wesleyan University (2009-present).
- Oral Presentations at Indiana Wesleyan University's Science Faculty Symposium (2004-08).

Professional Affiliations:

- Society for Neuroscience Member (2000-present).
- American Physiological Society Member (2012-2020).
- The Association for Research in Vision and Ophthalmology (2017-2020)
- Faculty for Undergraduates in Neuroscience Member. (2006-2018).

Course Experience at Indiana Wesleyan University:

- Principles of Biology (BIO 125). 2012-2014, 2022-2024.
- General Physiology (BIO 312). 2004-2024.
- Mammalian Anatomy (BIO 311). 2003-2014.
- Integrative Neuroscience (BIO 396). 2009-2019.
- Anatomy & Physiology I and II (BIO 111-112). 2003-present.
- Undergraduate Research Course (BIO 495). 2004-present.

Institutional (IWU) Committee Service (years of service):

- Chair of Indiana Wesleyan University's Academic Policy Committee (2024-present).
- Chair of STEM Curriculum Committee (2024-present)
- Faculty Development Committee (2025-present)
- Chair of Indiana Wesleyan University's Institutional Animal Care and Use Committee (2021-present).
- Committee member (and co-developer) of Indiana Wesleyan University's Institutional Animal Care and Use Committee (2009-2021).
- Scholarship Council (2011-2014; 2018-2023)
- Executive Scholarship Council (2011-2014)
- Chair of the Division of Natural Sciences (2014-2017)
- Faculty Senate (2011-2015, 2022-2024)
- Academic Affairs Committee (2007-8, 2014- 2017, 2023-present)
- School of Physical and Applied Sciences Curriculum Committee (2014-2017)
- Physics Department Coordinator (2014-2016)
- Engineering Program Development Team (2015-2019)
- Leadership Development Institute (2013); developmental effort for selected future institutional leaders.
- Premedical Advisory Committee (2005-2024)
- Division of Natural Sciences Laboratory Safety Committee (2017-2022)

Curriculum Vitae | Matthew A. Kreitzer

- Health Science Committee (2011-12)
- Instructional Technology Committee (2011-2012)
- Higher Learning Commission preparatory subcommittee (2009-10)
- Biology and Physics Faculty Search Committees (2009-10, 2015-16)
- University Technology Council (2009-10)
- Technology Committee Chair (2008-9)
- Student Development Council (2006-7)
- Technology Committee (2004-6)