

GARY KLEIN

EDUCATION

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| Ph.D. | Experimental Psychology, 1969 | University of Pittsburgh |
| M.S. | Physiological Psychology, 1967 | University of Pittsburgh |
| B.A. | Psychology, 1964 | City College of New York |

PROFESSIONAL EXPERIENCE

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| 2009 – Present | MacroCognition LLC – Senior Scientist |
| 2005 – 2010 | <u>Cognitive Solutions Division of Applied Research Associates</u> – Senior Scientist. |
| 1978 - 2005 | <u>Klein Associates Inc.</u> – Chairman and Chief Scientist. |
| 1974-1978 | <u>Air Force Human Resources Laboratory</u> , WPAFB – Research Psychologist. |
| 1969-1974 | <u>Oakland University, Rochester, MI</u> – Assistant Professor of Psychology. |

KEY ACCOMPLISHMENTS

- Cognitive Models:
 - RPD model of how people make decisions in the face of time pressure and uncertainty.
 - Data/Frame model of sensemaking.
 - Concept of Management by Discovery to explain planning in the face of ill-defined goals and wicked problems.
 - Triple-path model of insight.
- Cognitive Methods:
 - Cognitive Task Analysis methods (Critical Decision method, Knowledge Audit).
 - PreMortem method for Risk Assessment.
 - ShadowBox method for training cognitive skills.
- Cognitive Movement: Helped to establish the Naturalistic Decision Making (NDM) framework, resulting in an International NDM community that has continued to meet for over 25 years.
- Entrepreneurial activities: Started two companies; about a dozen small R&D companies spun off the original Klein Associates (which was sold in 2005 when it reached 37 employees).
- Selected as Fellow of the American Psychological Association and also of the Human Factors and Ergonomics Society.
- Recipient, Jack A. Kraft Innovator Award, Human Factors and Ergonomics Society, 2008.
- Helped to lead a team to study the decision requirements for the White House Situation Room, leading to the complete redesign and reconstruction of the Situation Room.
- Helped to lead a team to study the impact of fatigue on government workers, leading to a governmental revision that improved the working conditions of thousands of workers.
- Wrote *Sources of Power* (1998), *The Power of Intuition* (2004) *Working Minds* (2006, Crandall, Klein and Hoffman); *Streetlights and Shadows* (2009); *Seeing What Others Don't* (2013).

SELECTED PUBLICATIONS

- Klein, G., & Borders, J. (in press). The ShadowBox approach to cognitive skills training. *Journal of Cognitive Engineering and Decision Making*.
- Lintern, G., Moon, B., Klein, G., & Hoffman, R. R. (in press). Eliciting and representing the knowledge of the expert. In K. A. Ericsson (Ed.), *Cambridge handbook for expertise and expert performance* (2nd ed.).
- Mosier, K., Fischer, U., Hoffman, R. R., & Klein, G. (in press). Expert professional judgments and “Naturalistic Decision Making.” In K. A. Ericsson (Ed.), *Cambridge handbook for expertise and expert performance* (2nd ed.).

- Klein, G., Militello, L. G., Dominguez, C., & Lintern, G. (in press). A one-day workshop for teaching cognitive systems engineering. *Theoretical Issues in Ergonomics Science*.
- Klein, G. (in press). Blinded by data. In J. Brockman (Ed.), *What do you consider the most interesting recent [scientific] news? What makes it important*. Harper Perennial.
- Klein, H. A., Lin, M. H., Miller, N., Militello, L. G., Lyons, J., Stokes, C. K., Finkeldey, J., & Klein, G. (2014). *Mapping the terrain of multinational trust*. Manuscript in preparation.
- Lande, B., & Klein, G. (2016, March). Moving the needle: The science of good police-citizen encounters. *The Police Chief*, 83(3), 28-33.
- Patterson, M. D., Militello, L. G., Bunger, A., Taylor, R.G., Wheeler, D. S., Klein, G., & Geis, G. L. (2016). Leveraging the critical decision method to develop simulation-based training for early recognition of sepsis. *Journal of Cognitive Engineering and Decision Making*, 10(1), 36-56.
- Klein, G., & Wright, C. (2016). Macrocognition: From theory to toolbox. *Frontiers in Psychology*, 7(54).
- Klein, G., Klein, H. A., Borders, J., Whitacre, J. C., & Lande, B. (2015, November). *Police and military as good strangers*. Paper presented at the Human Factors and Ergonomics Society Annual Meeting, Los Angeles, CA.
- Klein, G. (2015). A naturalistic decision making perspective on studying intuitive decision making. *Journal of Applied Research in Memory and Cognition*, 4(3), 164-168.
- Klein, G. (2015). Reflections on applications of naturalistic decision making. *Journal of Occupational and Organizational Psychology*, 88, 382-386.
- Klein, G., Klein, H. A., Lande, B., Borders, J., & Whitacre, J. C. (2015). Police and military as good strangers. *Journal of Occupational and Organizational Psychology*, 88(2), 231-250.
- Klein, G., Borders, J., Wright, C., & Newsome, E. (2015, June). *An empirical evaluation of the ShadowBox training method*. Paper presented at the 12th International Conference on Naturalistic Decision Making, McLean, VA.
- Klein, G., Rasmussen, L., Lin, M. H., Hoffman, R. R., & Case, J. (2014). Influencing preferences for different types of causal explanation of complex events. *Human Factors*, 56, 1380-1400.
- Klein, G. (2014). Whose fallacies? *Journal of Cognitive Engineering and Decision Making*, 9, 55-58.
- Klein, G. (2013). *Seeing what others don't: The remarkable ways we gain insights*. New York, NY: PublicAffairs.
- Klein, G., Hintze, N., & Saab, D. (2013). Thinking inside the box. The ShadowBox method for cognitive skill development. *Proceedings of the 11th International Conference on Naturalistic Decision Making*, Marseille, France.
- Klein, H. A., & Klein, G. (2013). Cultivating good will amidst hostility. *Proceedings of the 11th International Conference on Naturalistic Decision Making*, Marseille, France.
- Klein, H. A., Jackson, S. M., Street, K., Whitacre, J., & Klein, G. (2013). Diabetes self-management education: Miles to go. *Nursing Research and Practice*, 2013. doi:10.1155/2013/581012
- Militello, L. G., & Klein, G. (2013). Decision-centered design. In J. Lee, & A. Kirlik, (Eds.), *Oxford handbook of cognitive engineering*. New York, NY: Oxford University Press USA.
- Fadde, P. J., & Klein, G. (2011). Accelerating expertise using action learning exercises. *Proceedings of the 10th International Conference on Naturalistic Decision Making*, Orlando, Florida.
- Klein, G., & Jarosz, A. (2011). A naturalistic study of insight. *Journal of Cognitive Engineering and Decision Making*, 5, 335-351.
- Klein, G. (2011). Critical thoughts about critical thinking. *Theoretical Issues in Ergonomics Science*, 12(3), 210-224.
- Nemeth, C., & Klein, G. (2011). The naturalistic decision making perspective. In J. J. Cochran (Ed.), *Wiley Encyclopedia of Operations Research and Management Science*. Hoboken, NJ: Wiley.
- Klein, G., Snowden, D., & Chew, L. P. (2011). Anticipatory thinking. In K. L. Mosier, & U. M. Fischer (Eds.), *Informed by knowledge: Expert performance in complex situations* (pp. 235-245). New York, NY: Psychology Press.
- Klein, G., Calderwood, R., & Clinton-Cirocco, A. (2010). Rapid decision making on the fire ground: The original study plus a postscript. *Journal of Cognitive Engineering and Decision Making*, 4, 186-209.
- Klein, G. (2010). Macrocognitive measures for evaluating cognitive work. In E. S. Patterson, & J. E. Miller (Eds.), *Macrocognition metrics and scenarios: Design and evaluation for real-world teams* (pp. 47-64). Surrey, UK: Ashgate.

- Klein, G., Wiggins, S., & Dominguez, C. (2010). Team sensemaking. *Theoretical Issues in Ergonomic Science*, 11(4), 304-320.
- Fadde, P. J., & Klein, G. (2010). Deliberate performance: Accelerating expertise in natural settings. *Performance Improvement*, 49(9), 5-14.
- Kahneman, D., & Klein, G. (2009). Conditions for intuitive expertise: A failure to disagree. *American Psychologist*, 64, 515-526.
- Veinott, E. S., Klein, G., & Wiggins, S. (2009). Evaluating the effectiveness of the PreMortem technique on plan confidence. *Proceedings of ISCRAM*, Seattle, WA.
- Klein, G. (2009). Looking for trouble. *Ethos*, 7, 19-23.
- Klein, G., Veinott, E.S., & Sieck, W.R. (2009). Advancing our understanding of battlefield decision making. In P. McDermott, & L. Allender (Eds.), *Advanced decision architectures for the warfighter: Foundations and technology*. Partners of the Army Research Laboratory Advanced Decision Architectures Collaborative Technology Alliance.
- Klein, G., & Hoffman, R. (2009). Causal reasoning: Initial report of a naturalistic study of causal inferences. *Proceedings of the 9th International Conference on Naturalistic Decision Making*, London, U.K.
- Mueller, S. T., Klein, G., & Burns, C. (2009). Experiencing the tool without experiencing the pain: Concepts for an experiential user guide. *Proceedings of the 9th International Conference on Naturalistic Decision Making*, London, U.K.
- Hoffman, R. R., Feltovich, P. J., Fiore, S. M., Klein, G., & Ziebell, D. (2009). Accelerated learning (?). *IEEE Intelligent Systems*, 22(2), 18-22.
- Klein, G. (2009). *Streetlights and shadows: Searching for the keys to adaptive decision making*. Cambridge, MA: MIT Press.
- Militello, L. G., Lintern, G., Dominguez, C. O., & Klein, G. (2009). Cognitive systems engineering for system design. *INCOSE Insight Magazine*, 12(1), 11-14.
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- Klein, G., & Baxter, H. C. (2009). Cognitive transformation theory: Contrasting cognitive and behavioral learning. In D. Schmorow, J. Cohn, & D. Nicholson (Eds.), *The PSI handbook of virtual environments for training and education: Developments for the military and beyond. Volume I: Learning, requirements and metrics* (pp. 50-64). Westport, CT: Praeger Security International.
- Klein, G., & Rothman, J. (2008). New directions: Staying on course when your destination keeps changing. *The Conference Board Review* (Vol. 45), 24-27.
- Klein, G. (2008). Naturalistic decision making. *Human Factors*, 50(3), 456-460.
- Klein, G., & Hoffman, R. R. (2008). Macrocognition, mental models, and cognitive task analysis methodology. In J. M. Schraagen, L. G. Militello, T. Ormerod, & R. Lipshitz (Eds.), *Naturalistic decision making and macrocognition* (pp. 3-25). Hampshire, UK: Ashgate.
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- Klein, G. (2007). Corruption and recovery of sensemaking during navigation. In M. Cook, J. Noyes, & Y. Masakowski (Eds.), *Decision making in complex environments* (pp. 13-32). Hampshire, UK: Ashgate.
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- Sieck, W. R., & Klein, G. (2007). Decision-making. In F. T. Durso (Ed.), *Handbook of applied cognition* (pp. 195-217). West Sussex, England: WileyBlackwell.
- Snowden, D., Klein, G., Chew, L. P., & Teh, C. A. (2007). A sensemaking experiment: Techniques to achieve cognitive precision. *Proceedings of the 12th International Command and Control Research and Technology Symposium*. Newport, RI: Naval War College.

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- Klein, G., Phillips, J. K., Rall, E., & Peluso, D. A. (2007). A data/frame theory of sensemaking. In R. R. Hoffman (Ed.), *Expertise out of context* (pp. 113-155). Mahwah, NJ: Erlbaum.
- Klein, G. (2006). The strengths and limitations of teams for detecting problems. *Cognition, Technology & Work*, 8, 227-236.
- Klein, G., & Baxter, H. C. (2006). Cognitive transformation theory: Contrasting cognitive and behavioral learning. *Proceedings of the Interservice/Industry Training, Simulation & Education Conference (IITSEC)*, Orlando, FL.
- Crandall, B., Klein, G., & Hoffman, R. R. (2006). *Working minds: A practitioner's guide to cognitive task analysis*. Cambridge, MA: MIT Press.
- Klein, G., Moon, B., & Hoffman, R. R. (2006). Making sense of sensemaking 1: Alternative perspectives. *IEEE Intelligent Systems*, 21(4), 70-73.
- Klein, G., Moon, B., & Hoffman, R. R. (2006). Making sense of sensemaking 2: A macrocognitive model. *IEEE Intelligent Systems*, 21(5), 88-92.
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- Dominguez, C. O., Cox, D. A., Long, W. G., Moon, B., & Klein, G. (2005, September). *Helping analysts deal with data overload: Profiling profilers*. Paper presented at the Human Factors and Ergonomics Society 49th Annual Meeting, Orlando, FL.
- Klein, G. (2005, April 1). Our brackets, ourselves. *The New York Times*, p. A25.
- Klein, G., Pliske, R. M., Crandall, B., & Woods, D. (2005). Problem detection. *Cognition, Technology, and Work*, 7, 14-28.
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- Klein, G. (2005). *The power of intuition*. New York, NY: A Currency Book/Doubleday. Hardcover edition entitled *Intuition at Work* (2004). Listed in *The 100 Best Business Books of All Time* (J. Covert and Todd Satterstein, 2009).
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