Arizona State University, Tempe, 1996; New Mexico State University, Las Cruces, 1990; University of California, San Diego, 1978-1979.

Research Profile: Schmerl's research interests in model theory have emphasized the interplay between model theory and combinatorics. Perhaps this is most noticed in his work on nonstandard models of Peano Arithmetic, culminating in his 2006 book on the subject. Topics in the study of models of PA to which he has significantly contributed include substructure lattices, automorphism groups, indiscernibles, higher order logics, and hyperreals. Another area with some combinatorial flavor is his work on partially ordered sets, especially having to do with countable categoricity, but there is also some work on jump numbers which seem to have no model theoretic content. Effectiveness of combinatorial theorems and constructions, such as graph coloring, have been among Schmerl's interests, as also has been the more modern incarnation in reverse mathematics.

Main Publications:

1. On power-like models for hyperinaccessible cardinals, *J. Symb. Logic* 37 (1972), 531-537. (with S. Shelah)

2. Countable homogeneous partially ordered sets, *Algebra Universalis* 9 (1979), 317-321.

3. On the role of Ramsey quantifiers in first order arithmetic, *J. Symb. Logic* 47 (1982), 423-435. (with S. Simpson)

4. Recursively saturated models generated by indiscernibles, *Notre Dame J. Formal Logic*, 26 (1985), 99-105.

5. Transfer theorems and their applications to logics. In *Model-Theoretic Logics*, Perspectives Math. Logic, Springer, New York, 1985, pp. 177-209.

6. The chromatic number of graphs which induce neither $K_{1,3}$ nor K_{5-e}, *Discrete Math.* 58 (1986), 253-262. (with H. A. Kierstead)

7. Peano arithmetic and hyper-Ramsey logic, *Trans. Amer. Math. Soc.* 296 (1986), 481-505.

8. Isomorphic incidence algebras, *Adv. Math.* 84 (1990), 226-236. (with M. Parmenter and E. Spiegel)

9. Coinductive $\aleph_0$-categorical theories, *J. Symb. Logic* 55 (1990), 1130-1137.

10. Making the hyperreal line both saturated and complete, *J. Symb. Logic* 56 (1991), 1016-1025. (with H. J. Keisler)

11. Finite substructure lattices of models of Peano Arithmetic, *Proc. Amer. Math. Soc.* 117 (1993), 833-838.

12. Critically indecomposable partially ordered sets, graphs, tournaments, and other binary relational structures, *Discrete Math.* 113 (1993), 191-205. (with W. T. Trotter)

13. Tiling space with notched cubes, *Discrete Math.* 133 (1994), 225-235.

14. The automorphism group of an arithmetically saturated model of Peano Arithmetic, *J. London Math. Soc.* 52, Series 2, (1995), 235-244. (with R. Kossak)

15. Countable partitions of Euclidean space, *Math. Proc. Cambridge Philos. Soc.* 120 (1996), 7-12.

16. What's the difference? *Annals of Pure Applied Logic* 93 (1998), 255-261.

17. Avoidable algebraic subsets of Euclidean space, *Trans. Amer. Math. Soc.* 352 (2000), 2479-2489.

18. Reverse mathematics and graph coloring. In *Reverse Mathematics 2001*, Lecture Notes in Logic, 21. Assoc. Symb. Logic, LaJolla, CA 2005, 331- 348.

19. *The Structure of Models of Peano Arithmetic*, Oxford Logic Guides, 50. Oxford Science Publications. The Clarendon Press, Oxford 2006. xiv + 311 pp. (with Roman Kossak)

Work in Progress

20. Tennenbaum's theorem and recursive models (a paper that discusses various ways that Tennenbaum's theorem on the nonrecursiveness of nonstandard models of Peano Arithmetic can and cannot be generalized, emphasizing the role of wqo).

Teaching: Ermek Nurkhaidorov received his PhD under Schmerl's direction in 2004.

Vision Statement: I would like to see more interest in nonstandard models of Peano Arithmetic. It would be very satisfying if the question of which finite lattices can appear as substructure lattices for nonstandard models of Peano Arithmetic could be answered. I believe an answer might have repercussions extending beyond the question itself.

SCHROEDER-HEISTER, Peter

Specialties: Proof Theory, Computational Logic, Philosophy of Logic, History of Logic

Born: 2 March 1953 in Düren, Rhineland, Germany.

Educated: University of Bonn 'Staatsexamen' (Philosophy and Mathematics) 1977, University of Bonn Dr. phil. (Logic and Foundations of Mathematics) 1981, University of Konstanz Dr. phil. habil. (Philosophy) 1988.

Dissertation: *Untersuchungen zur regellogischen Deutung von Aussagenverknüpfungen ('Investigations into the rule-based interpretation of logical connectives')*; supervisors Gisbert Hasenjaeger, Dag Prawitz.

Regular Academic or Research Appointments: PROFESSOR OF LOGIC AND PHILOSOPHY OF LANGUAGE, UNIVERSITY OF TÜBINGEN, DEPARTMENT OF COMPUTER SCIENCE AND DEPARTMENT OF PHILOSOPHY, 1991–, Department of Computational Linguistics, 1989–1991; Lecturer and research associate, University of Konstanz, 1978–1989.

Visiting Academic or Research Appointments: Visiting Scholar, University of California, Irvine, 2005; Ohio State University, Columbus, 2003; Beijing University, 2002, Queen Mary and Westfield College, London 1999/2000, Imperial College, London 1997/1998; Chalmers University of Technology, Gothenburg, 1996; University of St Andrews, 1995 and 1985, University of Berne, 1994; University of Stockholm, 1987 and 1984, Institute for Advanced Studies in the Humanities, Edinburgh, 1983.

Research Profile: Schroeder-Heister's main area of interest is general proof theory and its application to questions of meaning, validity and consequence. He calls this subject *proof-theoretic semantics*, thus expressing that the proof-theoretic approach competes with the more common model-theoretic approaches to semantics. In contrast to Dag Prawitz, who developed the idea of a general proof theory, he favours an approach which is based on rules rather than whole proofs being the philosophically primary subjects of semantical considerations.

In the early 1980s, Schroeder-Heister developed a general schema for introduction and elimination rules for logical connectives and quantifiers, using rules of arbitrary finite levels. In joint work with Lars Hallnäs he used these ideas in a proof-theoretic approach to logic programming with iterated implications. Using an idea that they call *definitional reflection*, reading program clauses as definitions, they extended this approach to a conception of logic programming which allows the introduction of assumptions during the execution of a program.

Philosophically, these ideas led Schroeder-Heister to a general concept of definitional reasoning that permits a novel treatment of circular phenomena and paradoxical reasoning. This means in particular that sequent calculi are considered as reasoning systems in their own right, with the notion of an assumption being given equal emphasis to that of an assertion.

These approaches have been combined with aspects of substructural logic, in particular by considering contraction-free logics and Lambek calculi. The term *substructural logic*, which is due to Kosta Došen, was coined by a conference with that title in Tübingen in 1990, jointly organized by Došen and Schroeder-Heister.

Furthermore, Schroeder-Heister is interested in the history of modern logic, where he showed a special interest in the works of Gottlob Frege and Gerhard Gentzen, and their relationship with each other. He traced the origins of rule-based semantics back to Frege and Paul Hertz and found related ideas also in Karl Popper's logical writings.

Besides logic, Schroeder-Heister has also worked in general philosophy and in experimental psychology.

Main Publications:

1. "A natural extension of natural deduction". *Journal of Symbolic Logic* 49 (1984): 1284–1300.

2. "Generalized rules for quantifiers and the completeness of the intuitionistic operators $\wedge, \vee, \rightarrow, \bot, \forall, \exists$". In: M. M. Richter, E. Börger, W. Oberschelp, B. Schinzel, W. Thomas (eds.), *Computation and Proof Theory. Proceedings of the Logic Colloquium held in Aachen, July 18-23, 1983, Part II*. Springer, Berlin, 1984, pp. 399–426 (Lecture Notes in Mathematics, Vol. 1104).

3. "Popper's theory of deductive inference and the concept of a logical constant", *History and Philosophy of Logic* 5 (1984): 79–110.

4. "Proof-theoretic validity and the completeness of intuitionistic logic". In G. Dorn, P. Weingartner (eds.), *Foundations of Logic and Linguistics: Problems and Their Solutions*. Plenum Press, New York, 1985, pp. 43–87.

5. "A model-theoretic reconstruction of Frege's permutation argument", *Notre Dame Journal of Formal Logic* 28 (1987): 69–79.

6. "Uniqueness, definability and interpolation", with K. Došen. *Journal of Symbolic Logic* 53 (1988): 554–570.

7. "Reduction, representation and commensurability of theories", with F. Schaefer. *Philosophy of Science* 56 (1989): 130–157.

8. "A proof-theoretic approach to logic programming. I. Clauses as rules, II. Programs as definitions", with L. Hallnäs. *Journal of Logic and Computation* 1 (1990): 261—283, 635–660.

9. "Rules of definitional reflection". In: *Proceedings of the 8th Annual IEEE Symposium on Logic in Computer Science (Montreal 1993)*. IEEE Press, Los Alamitos, 1993, pp. 222–232.

10. *Substructural Logics*, edited with K. Došen. Clarendon Press, Oxford, 1993.

11. "Definitional reflection and the completion". In R. Dyckhoff (ed.), *Extensions of Logic Programming. Fourth International Workshop, St. Andrews, Scotland, April 1993, Proceedings*. Springer, Berlin, 1994, pp. 333–347 (Lecture Notes in Artificial Intelligence, Vol. 798).

12. "Classical Lambek logic", with J. Hudelmaier. In P. Baumgartner, R. Hähnle, J. Posegga (eds.), *Theorem Proving with Analytic Tableaux and Related Methods. 4th International Workshop, TABLEAUX '95 (St. Goar, May 7-10, 1995), Proceedings*. Springer, Berlin, 1995, pp. 247–262 (Lecture Notes in Artificial Intelligence, Vol. 918).

13. "Frege and the resolution calculus". *History and Philosophy of Logic* 18 (1997): 95–108.

14. "Resolution and the origins of structural reason-

ing: Early proof-theoretic ideas of Hertz and Gentzen". *Bulletin of Symbolic Logic* 8 (2002): 246–265.

15. "On the notion of assumption in logical systems". In R. Bluhm, C. Nimtz (eds.), *Selected Papers Contributed to the Sections of GAP5, Fifth International Congress of the Society for Analytical Philosophy, Bielefeld, 22-26 September 2003*, mentis, Paderborn, 2004, pp. 27–48.

16. "Frege's Permutation Argument Revisited", with K. F. Wehmeier. *Synthese* 147 (2005): 43–61

Work in Progress

17. "Validity Concepts in Proof-Theoretic Semantics". In R. Kahle, P. Schroeder-Heister (eds.), *Proof-Theoretic Semantics*, special issue of *Synthese*, 2006, to appear.

18. "Popper's structuralist theory of logic". In I. Jarvie, K. Milford, D. Miller (eds.), *Karl Popper: A Centenary Assessment. Volume III: Science and Social Science*, Ashgate, Aldershot, 2006, to appear.

19. "A survey of definitional reflection", with L. Hallnäs, in preparation.

20. *Proof-Theoretic Semantics*, monograph, in preparation.

Service to the Profession: Member Editorial Board: Notre Dame Journal of Formal Logic, 1992–2003; History and Philosophy of Logic, 1993–.

Vision Statement: Schroeder-Heister believes that the borderlines between mathematical logic, philosophical logic, logic in linguistics and logic in computer science will become increasingly irrelevant. Proof-theoretical and computational approaches will merge with model-theoretic ideas and alternative proposals (dynamical, probabilistic, game-theoretical ...). Logic has a bright future as a fundamental discipline relevant to many fields.

SCHWICHTENBERG, Helmut

Specialties: Proof theory, lambda calculus, recursion theory, applications of logic to computer science.

Born: 1942 in Sagan/Schlesien.

Educated: Universitaet Muenster, Habilitation fuer Mathematik, 1974; Mathematisches Institut, Universitaet Muenster, Dr.rer.nat, 1968; Berlin (Freie Universitaet), Muenster, 1961-1968.

Dissertation: *Eine Klassifikation der mehrfach-rekursiven Funktionen*, Universitaet Muenster, 1968; supervisor, D. Roedding.

Regular Academic or Research Appointments: PROFESSOR, ORDINARIUS, MATHEMATISCHES INSTITUT, UNIVERSITAET MUENCHEN, 1978–; Wiss. Rat. und Professor, Mathematisches Institut, Universitaet Heidelberg, 1974-1978.

Visiting Academic or Research Appointments: Participant, Logic Year at Mittag-Leffler Institute, Sweden, 2001; Visiting Professor, Stanford University, 2000; Researcher, Carnegie-Mellon-University, Pittsburgh, 1986-1987; Member, Bayerische Akademie der Wissenschaften; Researcher, Stanford University, with Feferman and Kreisel, 1971-1972, 1981-1982.

Research Profile: Helmut Schwichtenberg has been involved in various research projects, on topics including

Main Publications:

1. (with Anne S. Troelstra): Basic Proof Theory, Cambridge University Press, Second edition 2000.

2. New Developments in Proofs and Computations. In: New Computational Paradigms (B. Cooper, B. Löwe, A. Sorbi, eds.), 2008.

3. Realizability interpretation of proofs in constructive analysis. To appear in ToCS, 2007.

4. Recursion on the partial continuous functionals. In: Logic Colloquium '05, (C. Dimitracopoulos and L. Newelski and D. Normann and J. Steel, eds.), 2006.

5. Minlog. In: The Seventeen Provers of the World (F. Wiedijk, ed.), 2006

6. An arithmetic for polynomial-time computation. In: Theoretical Computer Science, 2006.

7. Program extraction from normalization proofs (with U. Berger, S. Berghofer and P. Letouzey). In Studia Logica, 2006.

8. A direct proof of the equivalence between Brouwer's fan theorem and K"onig's lemma with a uniqueness hypothesis. In: Journal of Universal Computer Science, 2005.

9. An arithmetic for non-size-increasing polynomial time computation (with K. Aehlig, U. Berger and M. Hofmann). In: Theoretical Computer Science, 2004.

10. Refined Program Extraction from Classical Proofs (with Ulrich Berger and Wilfried Buchholz). Annals of Pure and Applied Logic 114 (2002), pp. 3-25.

11. The Warshall Algorithm and Dickson's Lemma: Two Examples of Realistic Program Extraction (with Ulrich Berger and Monika Seisenberger). Journal of Automated Reasoning Vol. 26, 2001, pp. 205-221.

12. A syntactical analysis of non-size-increasing polynomial time computation (with Klaus Aehlig). Proc. Fifteenth Annual IEEE Symposium on Logic in Computer Science (LICS'2000), pp. 84-91.

13. Term rewriting for normalization by evaluation (with U. Berger and M. Eberl). Information and Computation Vol. 183, 2003, pp. 19-42. Classifying recursive functions. In: Handbook of Computability Theory, Editor E. Griffor, Elsevier Science Amsterdam 1999, pp. 533-586.