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John W. Gray and
Andre Scedrov, Editors

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PREFACE

John W. Gray

The conference on Categories in Computer Science and Logic was held from June 14 to June 20, 1987, at the University of Colorado, Boulder, Colorado. It was a joint Summer Research Conference in the Mathematical Sciences, sponsored by AMS-IMS-SIAM, and funded by the NSF. The organizers were:

J. W. Gray	University of Illinois at Urbana-Champaign, Chairman
A. Blass	University of Michigan
M. Makkai	McGill University
A. Pitts	University of Sussex
A. Scedrov	University of Pennsylvania
D. Scott	Carnegie-Mellon University

The program consisted of invited lectures plus contributed talks. The invited speakers were:

H. P. Barendregt	G. Huet
R. L. Constable	M. Hyland
P. J. Freyd	J. Lambek
J.-Y. Girard	F. W. Lawvere
J. Goguen	J. Reynolds

Furthermore, three evenings were devoted to animated discussions and presentations concerning various aspects of the syntax and semantics of polymorphism. These evenings were organized and led by P. Freyd, A. Scedrov, and D. Scott.

Category theory has had important uses in logic since the invention of topos theory seventeen years ago, and logic has always been an important component of theoretical computer science. What was new was the increasing direct interaction between category theory and computer science. The aim of this conference was to bring together researchers who were working on the interconnections between category theory and computer science or between category theory and logic. The conference emphasized how the general machinery developed in category theory could be applied to specific questions and utilized for category-theoretic studies of concrete issues. It was certainly not the first conference with this goal, but it happened at an especially propitious time since many people both in category theory and in computer science were coming to the realization that meaningful collaboration was in fact possible.

The papers in this collection reflect only part of the activities of the conference since the contributions of several of the participants are being published elsewhere. All the papers published here have been refereed. The papers that are here represent

several aspects of the conference:

i) There is a kernel of topics relevant to all three fields. It includes, for example, Horn logic (Barr), lambda calculus (Freyd), normal form reductions (Scedrov), algebraic theories (Gray) and categorical models for computability theory (Hyland and Pitts, Lamarche, Mitchell and Scott, Mulry, Roman, Seely). Such topics were the central focus of the conference, but there was also time for category-theoretic topics related just to logic or to computer science.

ii) On the logic side, the topics include semantical (algebraic or topos-theoretic) approaches to proof-theoretic questions (Blass, de Paiva, Girard), problems concerning the internal properties of specific objects in (pre-) topoi and their representations, and categorical sharpening of model-theoretic notions (Cockett, Lambek). Category theory is useful in studying the proof theory and model theory (Lawvere, Paré, Power) of various non-classical logics as well as classical first order logic.

iii) On the computer science side, it has recently been recognized that category theory is appropriate for formalizing many aspects of computer programming and program design (Latch). One reason for this is that in computer science it is necessary to consider many different structures at the same time. These structures must be viewed from different aspects and the interactions between them are a central component of program design. Category theory is specifically designed to deal with this kind of a situation on an abstract level. Specific areas where active research is going on include: semantics of programming languages, data type specifications, categorical programming, and categorical logic.

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