Stephen Brookes and Susan Older
Full abstraction for strongly fair communicating processes
`http://www.elsevier.nl/locate/entcs/volume1/brookes`

We present a denotational semantics for a language of parallel communicating processes based on Hoare's CSP and Milner's CCS, and we prove that the semantics is fully abstract with respect to a deadlock-sensitive notion of fair behavior. The model incorporates the assumption of strong fairness: every process which is enabled infinitely often makes progress infinitely often. The combination of fairness and deadlock causes problems because the "enabledness" of a process may depend on the status of o ther processes. We formulate a parameterized notion of strong fairness, generalizing the traditional notion of strong fairness in a way that facilitates compositional analysis. We then provide a denotational semantics which uses a form of trace, augmented with information about enabledness, and is related to the failures model for CSP and to Hennessy's acceptance trees. By introducing closure conditions on trace sets, we achieve full abstraction: two processes have the same meaning if and only if they exhibit identical behaviors in all contexts.

J.R.B. Cockett and D.A. Spooner
Categories for synchrony and asynchrony
`http://www.elsevier.nl/locate/entcs/volume1/cockett`

The purpose of this paper is to show how one may construct from a synchronous interaction category, such as **SProc**, a corresponding asynchronous version. Significantly, it is not a simple Kleisli construction, but rather arises due to particular properties of a monad combined with the existence of a certain type of distributive law.

Following earlier work we consider those synchronous interaction categories which arise from model categories through a quotiented span construction: **SProc** arises in this way from labelled transition systems. The quotienting is determined by a cover system which expresses bisimulation. Asynchrony is introduced into a model category by a monad which, in the case of transition systems, adds the ability to idle. To form a process category atop this two further ingredients are required: pullbacks in the Kleisli category, and a cover system to express (weak) bisimulation.

The technical results of the paper provide necessary and sufficient conditions for a Kleisli category to have finite limits. Furthermore, they show how distributive laws can be used to induce cover systems on such Kleisli categories. These provide the ingredients for the construction of asynchronous settings.

Krishna Kishore Dhara and Gary T. Leavens
Weak behavioral subtyping for types with mutable objects
`http://www.elsevier.nl/locate/entcs/volume1/dhara`

This paper studies the question of when one abstract data type (ADT) is a behavioral subtype of another, and proposes a model-theoretic notion of weak behavioral subtyping. Weak behavioral subtyping permits supertype abstraction to be a sound and modular reasoning principle in a language with mutation and limited forms of aliasing. The necessary restrictions on aliasing can be statically checked. Weak behavioral subtyping allows types with mutable objects to be subtypes of types with immutable objects.

Abbas Edalat
Domain theory in learning processes
`http://www.elsevier.nl/locate/entcs/volume1/edalat`

We present applications of domain theory in stochastic learning automata and in neural nets. We show that a basic probabilistic algorithm, the so-called linear reward-penalty scheme, for the binary-state stochastic learning automata can be modelled by the dynamics of an iterated function system on a probabilistic power domain and we compute the expected value of any continuous function in the learning process. We then

consider a general class of, so-called forgetful, neural nets in which pattern learning takes place by a local iterative scheme, and we present a domain-theoretic framework for the distribution of synaptic couplings in these networks using the action of an iterated function system on a probabilistic power domain. We then obtain algorithms to compute the decay of the embedding strength of the stored patterns.

Jonathan Eifrig, Scott Smith and Valery Trifonov
Type inference for recursively constrained types and its application to OOP
`http://www.elsevier.nl/locate/entcs/volume1/eifrig`

We define a powerful type inference mechanism with application to object-oriented programming. The types inferred are *recursively constrained* types, types that come with a system of constraints. These types may be viewed as generalizations of recursive types and F-bounded polymorphic types, the forms of type that are necessary to properly encode object typings. The base language we study, I-Soop, incorporates state and records, the two features critical to encode objects in a non-object-oriented language. Soundness and completeness of the type inference algorithm are established by operational means. Our method for establishing these properties is somewhat novel. We illustrate how the algorithm may be fruitfully applied to infer types of object-oriented programs.

Zoltan Ésik and L. Bernátsky
Scott induction and equational proofs
`http://www.elsevier.nl/locate/entcs/volume1/esik`

The equational properties of the iteration operation in Lawvere theories are captured by the notion of iteration theories axiomatized by the Conway identities together with a complicated equation scheme, the "commutative identity". The first result of the paper shows that the commutative identity is implied by the Conway identities and the Scott induction principle formulated to involve only equations. Since the Scott induction principle holds in free iteration theories, we obtain a relatively simple first order axiomatization of the equational properties of iteration theories. We show, by means of an example that a simplified version of the Scott induction principle does not suffice for this purpose: There exists a Conway theory satisfying the scalar Scott induction principle which is not an iteration theory. A second example shows that there exists an iteration theory satisfying the scalar version of the Scott induction principle in which the general form fails. Finally, an example is included to verify the expected fact that there exists an iteration theory violating the scalar Scott induction principle. Interestingly, two of these examples are ordered theories in which the iteration operation is defined via least pre-fixed points.

Bob Flagg and Ralph Kopperman
Fixed points and reflexive domain equations in categories of continuity spaces
`http://www.elsevier.nl/locate/entcs/volume1/flagg`

This paper continues the study of the general theory, begun in earlier work of the authors, of semantic domains based on the notion of a symmetrically compact V-continuity space, where V is a value quantale. It was previously shown that this theory naturally includes the traditional examples of domains of cpo's and metric spaces, is closed under the key type forming operations needed in denotational semantics, and provides new examples which may be suitable for modeling language constructs that occur in concurrent and probabilistic programming. Here it is shown that V-**Dom** supports a rich theory of fixed points for morphisms and has solutions to a wide class of reflexive domain equations.