

**Milner, Robin**

**Functions as processes.** (English) [Zbl 0766.68036](#)

Automata, languages and programming, Proc. 17th Int. Colloq., Warwick/GB 1990, Lect. Notes Comput. Sci. 443, 167-180 (1990).

Summary: [For the entire collection see [Zbl 0758.00017](#).]

This paper exhibits accurate encodings of the  $\lambda$ -calculus in the  $\pi$ -calculus. The former is canonical for calculation with functions, while the latter is a recent step towards a canonical treatment of concurrent processes. With quite simple encodings, two  $\lambda$ -calculus reduction strategies are simulated very closely; each reduction in  $\lambda$ -calculus is mimicked by a short sequence of reductions in  $\pi$ -calculus. Abramsky's precongruence of applicative simulation [*S. Abramsky*, The lazy lambda calculus, to appear in Declarative Programming, ed. D. Turner, Addison Wesley (1988)] over  $\lambda$ -calculus is compared with that induced by the encoding of the lazy  $\lambda$ -calculus into  $\pi$ -calculus; a similar comparison is made for call-by-value  $\lambda$ -calculus.

The part of  $\pi$ -calculus which is needed for the encoding is formulated in a new way, inspired by Berry's and Boudol's chemical abstract machine [*G. Berry* and *G. Boudol*, Theor. Comput. Sci. 96, No. 1, 217-248 (1992; [Zbl 0747.68013](#))].

**MSC:**

- [68Q10](#) Modes of computation (nondeterministic, parallel, interactive, probabilistic, etc.)
- [03B40](#) Combinatory logic and lambda calculus
- [68Q05](#) Models of computation (Turing machines, etc.) (MSC2010)

Cited in 17 Documents

**Keywords:**

operational model of pure functional programming; concurrency; state; operational model of concurrent processes