Processes and channels

	$P,\ Q,\ \cdots$	process names (2.1)
	$x,\ y,\ \cdots$	channel names (2.2)
	$\overline{x},\ \overline{y},\ \cdots$	channel co-names (2.3)

Events

$\pi ::=$	x	communication on channel name x (2.4)
	$\overline{x}$	communication on channel co-name x (2.5)
	$x(y)$	receive y along x (2.6)
	$\overline{x}\langle y\rangle$	send y along x (2.7)

Process syntax

$P ::=$	$P_1 \mid P_2$	parallel processes (2.8)
	$\pi\ .\ P_1$	sequential prefixing by communication (2.9)
	$\pi_1\ .\ P_1\ +\ \pi_2\ .\ P_2$	mutually exclusive communications (2.10)
	$(\mathsf{new}\ x)P$	new communication scope (2.11)
	0	inert process (2.12)

Structural congruence

$P \mid Q \equiv Q \mid P$	commutativity of PAR (2.13)
$(P \mid Q) \mid R \equiv P \mid (Q \mid R)$	associativity of PAR (2.14)
$P\ +\ Q \equiv Q\ +\ P$	commutativity of summation (2.15)
$(P\ +\ Q)\ +\ R \equiv P\ +\ (Q\ +\ R)$	associativity of summation (2.16)
$(\mathsf{new}\ x)0 \equiv 0$	scope of inert processes (2.17)
$(\mathsf{new}\ x)(\mathsf{new}\ y)P \equiv (\mathsf{new}\ y)(\mathsf{new}\ x)P$	multiple communication scopes (2.18)
$((\mathsf{new}\ x)P) \mid Q) \equiv (\mathsf{new}\ x)(P \mid Q)$ if $x \notin FN(Q)$	scope extrusion (2.19)
$A(\vec{y}) \equiv \{\vec{y}/\vec{x}\}Q_A$	recursive parametric definition (2.20)
$x(y).P = x(z).(\{z/y\}\,P)$ if $z \notin FN(P)$	renaming of input channel y (2.21)
$(\mathsf{new}\ y).P = (\mathsf{new}\ z).(\{z/y\}\,P)$ if $z \notin FN(P)$	renaming of restricted channel y (2.22)

Reaction rules

$(\cdots + \overline{x}\langle z\rangle.Q)\vert(\cdots + x(y).P) \rightarrow Q\vert P\,\{z/y\}$	communication (COMM)(2.23)
if $P \rightarrow P'$ then $P\vert Q \rightarrow P'\vert Q$	reaction under parallel composition (2.24)
if $P \rightarrow P'$ then $(\mathsf{new}\ x)P \rightarrow (\mathsf{new}\ x)P'$	reaction within restricted scope (2.25)
if $Q \equiv P, P \rightarrow P'$, and $P' \equiv Q'$ then $Q \rightarrow Q'$	reaction up to structural congruence (2.26)

Figure 1: The π-calculus: The calculus consists of three components: a simple syntax for writing formal descriptions; a set of congruence laws that determine when two syntactic expressions are equivalents; and an operational semantics, consisting of reduction rules, which delineate the potential changes in the system following a communication event. The use of the calculus for modeling of biochemical systems is explained in the text, highlighting the syntax, and the basic communication rule, COMM.