

## Barbed-end reactions

Name	Barbed-end hydrolysis
Formula	BarbT $\rightarrow$ BarbI
Rate Expression	$r_{\text{hydrolysis}} * \text{BarbT}$
Parameters	$r_{\text{hydrolysis}} = 0.3 \text{ s}^{-1}$
Notes	Hydrolysis rate at barbed-end is assumed to equal the bulk hydrolysis rate.

Name	Barbed-end phosphate release
Formula	BarbI $\rightarrow$ BarbD
Rate Expression	$k_{\text{barb\_DI}} * \text{BarbI} - k_{\text{barb\_ID}} * \text{Pi} * \text{BarbD}$
Parameters	$k_{\text{barb\_DI}} = 0.0026 \text{ s}^{-1}$ , $k_{\text{barb\_ID}} = 5.2\text{E-}6 \mu\text{M}^{-1} \text{ s}^{-1}$
Notes	Release rates at the barbed end are assumed to equal the bulk release rates.

Name	Gt adds to BarbT
Formula	Gt $\rightarrow$ Fi
Rate Expression	$k_{\text{on\_barbT}} * \text{Gt} * \text{BarbT} - k_{\text{off\_barbT}} * \text{BarbT} * (\text{BarbT}/\text{BarbedEndTotal}) * \text{Fi\_stability}$
Parameters	$k_{\text{on\_barbT}} = 10 \mu\text{M}^{-1} \text{ s}^{-1}$ , $k_{\text{off\_barbT}} = 1.0 \text{ s}^{-1}$
Notes	The probability of dissociating a BarbT and exposing a BarbT is proportional to the local fraction of barbed ends in the ATP state.

Name	Gt adds to BarbI
Formula	Gt + BarbI $\rightarrow$ BarbT + Fi
Rate Expression	$k_{\text{on\_barbT}} * \text{Gt} * \text{BarbI} - k_{\text{off\_barbT}} * \text{BarbT} * (\text{BarbI}/\text{BarbedEndTotal}) * \text{Fi\_stability}$
Parameters	$k_{\text{on\_barbT}} = 10 \mu\text{M}^{-1} \text{ s}^{-1}$ , $k_{\text{off\_barbT}} = 1.0 \text{ s}^{-1}$
Notes	The probability of dissociating a BarbT and exposing a BarbI is proportional to the local fraction of barbed ends in the ADP-Pi state.

Name	Gt adds to BarbD
Formula	Gt + BarbD $\rightarrow$ BarbT + Fd
Rate Expression	$k_{\text{on\_barbT}} * \text{Gt} * \text{BarbD} - k_{\text{off\_barbT}} * \text{BarbT} * (\text{BarbD}/\text{BarbedEndTotal}) * \text{Fd\_stability}$
Parameters	$k_{\text{on\_barbT}} = 10 \mu\text{M}^{-1} \text{ s}^{-1}$ , $k_{\text{off\_barbT}} = 1.0 \text{ s}^{-1}$
Notes	The probability of dissociating a BarbT and exposing a BarbD is proportional to the local fraction of barbed ends in the ADP state.

Name	Gd adds to BarbT giving Barbl
Formula	$Gd + BarbT \rightarrow Barbl + Fi$
Rate Expression	$kon\_barbl\_eff * Gd * BarbT - koff\_barbl * Barbl * (BarbT/BarbedEndTotal) * Fi\_stability$
Parameters	$kon\_barbl\_eff = kon\_barbl * [barbQ\_ID / (barbQ\_ID + barbQ\_DI)]$  $kon\_barbl = 10 \mu M^{-1} s^{-1}$  $koff\_barbl = 1.0 s^{-1}$
Notes	<p>The probability of dissociating a Barbl and exposing a BarbT is proportional to the local fraction of barbed ends in the ATP state.</p> <p>The on and off rates for ADP-Pi actin are assumed to equal the on and off rates of ATP actin.</p>

Name	Gd adds to Barbl giving Barbl
Formula	$Gd \rightarrow Fi$
Rate Expression	$kon\_barbl\_eff * Gd * Barbl - koff\_barbl * Barbl * (Barbl/BarbedEndTotal) * Fi\_stability$
Parameters	$kon\_barbl\_eff = kon\_barbl * [barbQ\_ID / (barbQ\_ID + barbQ\_DI)]$  $kon\_barbl = 10 \mu M^{-1} s^{-1}$  $koff\_barbl = 1.0 s^{-1}$
Notes	<p>The probability of dissociating a Barbl and exposing a Barbl is proportional to the local fraction of barbed ends in the ADP-Pi state.</p> <p>The on and off rates for ADP-Pi actin are assumed to equal the on and off rates of ATP actin.</p>

Name	Gd adds to BarbD giving Barbl
Formula	$Gd + BarbD \rightarrow Barbl + Fd$
Rate Expression	$kon\_barbl\_eff * Gd * BarbD - koff\_barbl * Barbl * (BarbD/BarbedEndTotal) * Fd\_stability$
Parameters	$kon\_barbl\_eff = kon\_barbl * [barbQ\_ID / (barbQ\_ID + barbQ\_DI)]$  $kon\_barbl = 10 \mu M^{-1} s^{-1}$  $koff\_barbl = 1.0 s^{-1}$
Notes	The probability of dissociating a Barbl and exposing a BarbD is proportional to the local fraction of barbed ends in the ADP state.

	The on and off rates for ADP-Pi actin are assumed to equal the on and off rates of ATP actin.
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Name	Gd adds to BarbT giving BarbD
Formula	$Gd + BarbT \rightarrow BarbD + Fi$
Rate Expression	$kon\_barbD\_eff * Gd * BarbT - koff\_barbD * BarbD * (BarbT/BarbedEndTotal) * Fi\_stability$
Parameters	$kon\_barbD\_eff = kon\_barbD * [barbQ\_DI/(barbQ\_ID + barbQ\_DI)]$  $kon\_barbD = 2.5 \mu M^{-1} s^{-1}$  $koff\_barbD = 4.25 s^{-1}$
Notes	The probability of dissociating a BarbD and exposing a BarbT is proportional to the local fraction of barbed ends in the ATP state.

Name	Gd adds to Barbl giving BarbD
Formula	$Gd + Barbl \rightarrow BarbD + Fi$
Rate Expression	$kon\_barbD\_eff * Gd * Barbl - koff\_barbD * BarbD * (Barbl/BarbedEndTotal) * Fi\_stability$
Parameters	$kon\_barbD\_eff = kon\_barbD * [barbQ\_DI/(barbQ\_ID + barbQ\_DI)]$  $kon\_barbD = 2.5 \mu M^{-1} s^{-1}$  $koff\_barbD = 4.25 s^{-1}$
Notes	The probability of dissociating a BarbD and exposing a Barbl is proportional to the local fraction of barbed ends in the ADP-Pi state.

Name	Gd adds to BarbD giving BarbD
Formula	$Gd \rightarrow Fd$
Rate Expression	$kon\_barbD\_eff * Gd * BarbD - koff\_barbD * BarbD * (BarbD/BarbedEndTotal) * Fd\_stability$
Parameters	$kon\_barbD\_eff = kon\_barbD * [barbQ\_DI/(barbQ\_ID + barbQ\_DI)]$  $kon\_barbD = 2.5 \mu M^{-1} s^{-1}$  $koff\_barbD = 4.25 s^{-1}$
Notes	The probability of dissociating a BarbD and exposing a BarbD is proportional to the local fraction of barbed ends in the ADP state.

Name	ProfGt adds to BarbT
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Formula	ProfGt → Fi + Prof
Rate Expression	$\text{kon\_barb\_profT\_eff} * \text{ProfGt} * \text{BarbT} - \text{koff\_barb\_profT\_eff} * \text{Prof} * \text{BarbT} * (\text{BarbT}/\text{BarbedEndTotal}) * \text{Fi\_stability}$
Parameters	$\text{kon\_barb\_profT\_eff} = \text{kon\_barb\_profT} * [\text{koff\_profToBarb}/(\text{koff\_profToBarb} + \text{koff\_barb\_profT})]$  $\text{koff\_barb\_profT\_eff} = \text{kon\_profToBarb} * [\text{koff\_barb\_profT}/(\text{koff\_barb\_profT} + \text{koff\_profToBarb})]$  $\text{kon\_barb\_profT} = 9 \mu\text{M}^{-1} \text{s}^{-1}, \text{kon\_profToBarb} = 15 \mu\text{M}^{-1} \text{s}^{-1}$  $\text{koff\_barb\_profT} = 5.5 \text{s}^{-1}, \text{koff\_profToBarb} = 300 \text{s}^{-1}$
Notes	<p>This reaction describes the two-step process of a ProfGt complex adding to a BarbT, temporarily creating a profilin-capped barbed end, and the subsequent dissociation of profilin to leave an exposed BarbT.</p> <p>The probability of the (two step) dissociation reaction exposing a BarbT is proportional to the local fraction of barbed ends in the ATP state.</p>

Name	ProfGt adds to Barbl
Formula	ProfGt + Barbl → BarbT + Fi + Prof
Rate Expression	$\text{kon\_barb\_profT\_eff} * \text{ProfGt} * \text{Barbl} - \text{koff\_barb\_profT\_eff} * \text{Prof} * \text{BarbT} * (\text{Barbl}/\text{BarbedEndTotal}) * \text{Fi\_stability}$
Parameters	$\text{kon\_barb\_profT\_eff} = \text{kon\_barb\_profT} * [\text{koff\_profToBarb}/(\text{koff\_profToBarb} + \text{koff\_barb\_profT})]$  $\text{koff\_barb\_profT\_eff} = \text{kon\_profToBarb} * [\text{koff\_barb\_profT}/(\text{koff\_barb\_profT} + \text{koff\_profToBarb})]$  $\text{kon\_barb\_profT} = 9 \mu\text{M}^{-1} \text{s}^{-1}, \text{kon\_profToBarb} = 15 \mu\text{M}^{-1} \text{s}^{-1}$  $\text{koff\_barb\_profT} = 5.5 \text{s}^{-1}, \text{koff\_profToBarb} = 300 \text{s}^{-1}$
Notes	<p>This reaction describes the two-step process of a ProfGt complex adding to a Barbl, temporarily creating a profilin-capped barbed end, and the subsequent dissociation of profilin to leave an exposed BarbT.</p> <p>The probability of the (two step) dissociation reaction exposing a Barbl is proportional to the local fraction of barbed ends in the ADP-Pi state.</p>

Name	ProfGt adds to BarbD
Formula	ProfGt + BarbD → BarbT + Fd + Prof
Rate Expression	$\text{kon\_barb\_profT\_eff} * \text{ProfGt} * \text{BarbD} - \text{koff\_barb\_profT\_eff} * \text{Prof} * \text{BarbT} *$

	(BarbD/BarbedEndTotal) * Fd_stability
Parameters	$\text{kon\_barb\_profT\_eff} = \text{kon\_barb\_profT} * [\text{koff\_profToBarb}/(\text{koff\_profToBarb} + \text{koff\_barb\_profT})]$ $\text{koff\_barb\_profT\_eff} = \text{kon\_profToBarb} * [\text{koff\_barb\_profT}/(\text{koff\_barb\_profT} + \text{koff\_profToBarb})]$ $\text{kon\_barb\_profT} = 9 \mu\text{M}^{-1} \text{s}^{-1}, \text{kon\_profToBarb} = 15 \mu\text{M}^{-1} \text{s}^{-1}$ $\text{koff\_barb\_profT} = 5.5 \text{s}^{-1}, \text{koff\_profToBarb} = 300 \text{s}^{-1}$
Notes	<p>This reaction describes the two-step process of a ProfGt complex adding to a BarbD, temporarily creating a profilin-capped barbed end, and the subsequent dissociation of profilin to leave an exposed BarbT.</p> <p>The probability of the (two step) dissociation reaction exposing a BarbD is proportional to the local fraction of barbed ends in the ADP state.</p>

Name	ProfGd adds to BarbT giving Barbl
Formula	ProfGd + BarbT → Barbl + Fi + Prof
Rate Expression	$\text{kon\_barb\_profil\_eff} * \text{ProfGd} * \text{BarbT} - \text{koff\_barb\_profil\_eff} * \text{Prof} * \text{Barbl} * (\text{BarbT}/\text{BarbedEndTotal}) * \text{Fi\_stability}$
Parameters	$\text{kon\_barb\_profil\_eff} = \text{kon\_barb\_profil\_mod} * [\text{barbprofQ\_ID}/(\text{barbprofQ\_ID} + \text{barbprofQ\_DI})]$ $\text{kon\_barb\_profil\_mod} = \text{kon\_barb\_profil} * [\text{koff\_profToBarb}/(\text{koff\_profToBarb} + \text{koff\_barb\_profil})]$ $\text{koff\_barb\_profil\_eff} = \text{kon\_profToBarb} * [\text{koff\_barb\_profil}/(\text{koff\_barb\_profil} + \text{koff\_profToBarb})]$ $\text{kon\_barb\_profil} = 9 \mu\text{M}^{-1} \text{s}^{-1}, \text{kon\_profToBarb} = 15 \mu\text{M}^{-1} \text{s}^{-1}$ $\text{koff\_barb\_profil} = 5.5 \text{s}^{-1}, \text{koff\_profToBarb} = 300 \text{s}^{-1}$
Notes	<p>This reaction describes the two-step process of a ProfGd complex adding to a BarbT, temporarily creating a profilin-capped barbed end, and the subsequent dissociation of profilin to leave an exposed Barbl.</p> <p>The probability of the (two step) dissociation reaction exposing a BarbT is proportional to the local fraction of barbed ends in the ATP state.</p> <p>The on and off rates for ADP-Pi actin are assumed to equal the on and off rates of ATP actin.</p>

Name	ProfGd adds to Barbl giving Barbl
Formula	ProfGd $\rightarrow$ Fi + Prof
Rate Expression	$\text{kon\_barb\_profil\_eff} * \text{ProfGd} * \text{Barbl} - \text{koff\_barb\_profil\_eff} * \text{Prof} * \text{Barbl} * (\text{Barbl}/\text{BarbedEndTotal}) * \text{Fi\_stability}$
Parameters	$\text{kon\_barb\_profil\_eff} = \text{kon\_barb\_profil\_mod} * [\text{barbprofQ\_ID}/(\text{barbprofQ\_ID} + \text{barbprofQ\_DI})]$  $\text{kon\_barb\_profil\_mod} = \text{kon\_barb\_profil} * [\text{koff\_profToBarb}/(\text{koff\_profToBarb} + \text{koff\_barb\_profil})]$  $\text{koff\_barb\_profil\_eff} = \text{kon\_profToBarb} * [\text{koff\_barb\_profil}/(\text{koff\_barb\_profil} + \text{koff\_profToBarb})]$  $\text{kon\_barb\_profil} = 9 \mu\text{M}^{-1} \text{s}^{-1}, \text{kon\_profToBarb} = 15 \mu\text{M}^{-1} \text{s}^{-1}$  $\text{koff\_barb\_profil} = 5.5 \text{s}^{-1}, \text{koff\_profToBarb} = 300 \text{s}^{-1}$
Notes	<p>This reaction describes the two-step process of a ProfGd complex adding to a Barbl, temporarily creating a profilin-capped barbed end, and the subsequent dissociation of profilin to leave an exposed Barbl.</p> <p>The probability of the (two step) dissociation reaction exposing a Barbl is proportional to the local fraction of barbed ends in the ADP-Pi state.</p> <p>The on and off rates for ADP-Pi actin are assumed to equal the on and off rates of ATP actin.</p>

Name	ProfGd adds to BarbD giving Barbl
Formula	ProfGd + BarbD $\rightarrow$ Barbl + Fd + Prof
Rate Expression	$\text{kon\_barb\_profil\_eff} * \text{ProfGd} * \text{BarbD} - \text{koff\_barb\_profil\_eff} * \text{Prof} * \text{Barbl} * (\text{BarbD}/\text{BarbedEndTotal}) * \text{Fd\_stability}$
Parameters	$\text{kon\_barb\_profil\_eff} = \text{kon\_barb\_profil\_mod} * [\text{barbprofQ\_ID}/(\text{barbprofQ\_ID} + \text{barbprofQ\_DI})]$  $\text{kon\_barb\_profil\_mod} = \text{kon\_barb\_profil} * [\text{koff\_profToBarb}/(\text{koff\_profToBarb} + \text{koff\_barb\_profil})]$  $\text{koff\_barb\_profil\_eff} = \text{kon\_profToBarb} * [\text{koff\_barb\_profil}/(\text{koff\_barb\_profil} + \text{koff\_profToBarb})]$  $\text{kon\_barb\_profil} = 9 \mu\text{M}^{-1} \text{s}^{-1}, \text{kon\_profToBarb} = 15 \mu\text{M}^{-1} \text{s}^{-1}$  $\text{koff\_barb\_profil} = 5.5 \text{s}^{-1}, \text{koff\_profToBarb} = 300 \text{s}^{-1}$
Notes	This reaction describes the two-step process of a ProfGd complex adding to a

	<p>BarbD, temporarily creating a profilin-capped barbed end, and the subsequent dissociation of profilin to leave an exposed Barbl.</p> <p>The probability of the (two step) dissociation reaction exposing a BarbD is proportional to the local fraction of barbed ends in the ADP state.</p> <p>The on and off rates for ADP-Pi actin are assumed to equal the on and off rates of ATP actin.</p>
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Name	ProfGd adds to BarbT giving BarbD
Formula	ProfGd + BarbT → BarbD + Fi + Prof
Rate Expression	$kon\_barb\_profD\_eff * ProfGd * BarbT - koff\_barb\_profD\_eff * Prof * BarbD * (BarbT/BarbedEndTotal) * Fi\_stability$
Parameters	$kon\_barb\_profD\_eff = kon\_barb\_profD\_mod * [barbprofQ\_DI/(barbprofQ\_ID + barbprofQ\_DI)]$  $kon\_barb\_profD\_mod = kon\_barb\_profD * [koff\_profToBarb/(koff\_profToBarb + koff\_barb\_profD)]$  $koff\_barb\_profD\_eff = kon\_profToBarb * [koff\_barb\_profD/(koff\_barb\_profD + koff\_profToBarb)]$  $kon\_barb\_profD = 1.26 \mu M^{-1} s^{-1}, kon\_profToBarb = 15 \mu M^{-1} s^{-1}$  $koff\_barb\_profD = 12.6 s^{-1}, koff\_profToBarb = 300 s^{-1}$
Notes	<p>This reaction describes the two-step process of a ProfGd complex adding to a BarbT, temporarily creating a profilin-capped barbed end, and the subsequent dissociation of profilin to leave an exposed BarbD.</p> <p>The probability of the (two step) dissociation reaction exposing a BarbT is proportional to the local fraction of barbed ends in the ATP state.</p>

Name	ProfGd adds to Barbl giving BarbD
Formula	ProfGd + Barbl → BarbD + Fi + Prof
Rate Expression	$kon\_barb\_profD\_eff * ProfGd * Barbl - koff\_barb\_profD\_eff * Prof * BarbD * (Barbl/BarbedEndTotal) * Fi\_stability$
Parameters	$kon\_barb\_profD\_eff = kon\_barb\_profD\_mod * [barbprofQ\_DI/(barbprofQ\_ID + barbprofQ\_DI)]$  $kon\_barb\_profD\_mod = kon\_barb\_profD * [koff\_profToBarb/(koff\_profToBarb + koff\_barb\_profD)]$

	$\text{koff\_barb\_profD\_eff} = \text{kon\_profToBarb} * [\text{koff\_barb\_profD}/(\text{koff\_barb\_profD} + \text{koff\_profToBarb})]$ $\text{kon\_barb\_profD} = 1.26 \mu\text{M}^{-1} \text{s}^{-1}, \text{kon\_profToBarb} = 15 \mu\text{M}^{-1} \text{s}^{-1}$ $\text{koff\_barb\_profD} = 12.6 \text{s}^{-1}, \text{koff\_profToBarb} = 300 \text{s}^{-1}$
Notes	<p>This reaction describes the two-step process of a ProfGd complex adding to a BarbI, temporarily creating a profilin-capped barbed end, and the subsequent dissociation of profilin to leave an exposed BarbD.</p> <p>The probability of the (two step) dissociation reaction exposing a BarbI is proportional to the local fraction of barbed ends in the ADP-Pi state.</p>

Name	ProfGd adds to BarbD giving BarbD
Formula	ProfGd → Fd + Prof
Rate Expression	$\text{kon\_barb\_profD\_eff} * \text{ProfGd} * \text{BarbD} - \text{koff\_barb\_profD\_eff} * \text{Prof} * \text{BarbD} * (\text{BarbD}/\text{BarbedEndTotal}) * \text{Fi\_stability}$
Parameters	$\text{kon\_barb\_profD\_eff} = \text{kon\_barb\_profD\_mod} * [\text{barbprofQ\_DI}/(\text{barbprofQ\_ID} + \text{barbprofQ\_DI})]$ $\text{kon\_barb\_profD\_mod} = \text{kon\_barb\_profD} * [\text{koff\_profToBarb}/(\text{koff\_profToBarb} + \text{koff\_barb\_profD})]$ $\text{koff\_barb\_profD\_eff} = \text{kon\_profToBarb} * [\text{koff\_barb\_profD}/(\text{koff\_barb\_profD} + \text{koff\_profToBarb})]$ $\text{kon\_barb\_profD} = 1.26 \mu\text{M}^{-1} \text{s}^{-1}, \text{kon\_profToBarb} = 15 \mu\text{M}^{-1} \text{s}^{-1}$ $\text{koff\_barb\_profD} = 12.6 \text{s}^{-1}, \text{koff\_profToBarb} = 300 \text{s}^{-1}$
Notes	<p>This reaction describes the two-step process of a ProfGd complex adding to a BarbD, temporarily creating a profilin-capped barbed end, and the subsequent dissociation of profilin to leave an exposed BarbD.</p> <p>The probability of the (two step) dissociation reaction exposing a BarbD is proportional to the local fraction of barbed ends in the ADP state.</p>

Name	Cap BarbT
Formula	Cap + BarbT → CapBarb
Rate Expression	$\text{kon\_cap} * \text{Cap} * \text{BarbT} - \text{koff\_cap} * \text{CapBarb} * (\text{BarbT}/\text{BarbedEndTotal})$
Parameters	$\text{kon\_cap} = 10 \mu\text{M}^{-1} \text{s}^{-1}, \text{koff\_cap} = 0.01 \text{s}^{-1}$
Notes	Capping rates independent of barbed-end species.



	Probability to uncap and expose a BarbT is proportional to the local fraction of free ATP-barbed ends.
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Name	Cap Barbl
Formula	Cap + Barbl → CapBarb
Rate Expression	$\text{kon\_cap} * \text{Cap} * \text{Barbl} - \text{koff\_cap} * \text{CapBarb} * (\text{Barbl}/\text{BarbedEndTotal})$
Parameters	$\text{kon\_cap} = 10 \mu\text{M}^{-1} \text{s}^{-1}$ , $\text{koff\_cap} = 0.01 \text{s}^{-1}$
Notes	Capping rates independent of barbed-end species.  Probability to uncap and expose a Barbl is proportional to the local fraction of free ADP-Pi-barbed ends.

Name	Cap BarbD
Formula	Cap + BarbD → CapBarb
Rate Expression	$\text{kon\_cap} * \text{Cap} * \text{BarbD} - \text{koff\_cap} * \text{CapBarb} * (\text{BarbD}/\text{BarbedEndTotal})$
Parameters	$\text{kon\_cap} = 10 \mu\text{M}^{-1} \text{s}^{-1}$ , $\text{koff\_cap} = 0.01 \text{s}^{-1}$
Notes	Capping rates independent of barbed-end species.  Probability to uncap and expose a Barbl is proportional to the local fraction of free ADP-Pi-barbed ends.

## Pointed-end reactions

Name	Pointed-end hydrolysis
Formula	PointT → PointI
Rate Expression	$r\_hydrolysis * \text{PointT}$
Parameters	$r\_hydrolysis = 0.3 \text{s}^{-1}$
Notes	Hydrolysis rate at pointed end is assumed to equal the bulk hydrolysis rate.

Name	Pointed-end phosphate release
Formula	PointI → PointD
Rate Expression	$\text{kpoint\_DI} * \text{PointI} - \text{kpoint\_ID} * \text{Pi} * \text{PointD}$
Parameters	$\text{kpoint\_DI} = 0.0026 \text{s}^{-1}$ , $\text{kpoint\_ID} = 5.2\text{E-}6 \mu\text{M}^{-1} \text{s}^{-1}$
Notes	Release rates at the pointed end are assumed to equal the bulk release rates.

Name	Gt adds to PointT
Formula	Gt → Fi
Rate Expression	$\text{kon\_pointT} * \text{Gt} * \text{PointT} - \text{koff\_pointT} * \text{PointT} * (\text{PointT}/\text{PointedEndTotal}) *$

	Fi_stability
Parameters	$\text{kon\_pointT} = 1.3 \mu\text{M}^{-1} \text{s}^{-1}$ , $\text{koff\_pointT} = 0.8 \text{s}^{-1}$
Notes	The probability of dissociating a PointT and exposing a PointT is proportional to the local fraction of pointed ends in the ATP state.

Name	Gt adds to PointI
Formula	$\text{Gt} + \text{PointI} \rightarrow \text{PointT} + \text{Fi}$
Rate Expression	$\text{kon\_pointT} * \text{Gt} * \text{PointI} - \text{koff\_pointT} * \text{PointT} * (\text{PointI}/\text{PointedEndTotal}) * \text{Fi\_stability}$
Parameters	$\text{kon\_pointT} = 1.3 \mu\text{M}^{-1} \text{s}^{-1}$ , $\text{koff\_pointT} = 0.8 \text{s}^{-1}$
Notes	The probability of dissociating a PointT and exposing a PointI is proportional to the local fraction of pointed ends in the ADP-Pi state.

Name	Gt adds to PointD
Formula	$\text{Gt} + \text{PointD} \rightarrow \text{PointT} + \text{Fd}$
Rate Expression	$\text{kon\_pointT} * \text{Gt} * \text{PointD} - \text{koff\_pointT} * \text{PointT} * (\text{PointD}/\text{PointedEndTotal}) * \text{Fd\_stability}$
Parameters	$\text{kon\_pointT} = 1.3 \mu\text{M}^{-1} \text{s}^{-1}$ , $\text{koff\_pointT} = 0.8 \text{s}^{-1}$
Notes	The probability of dissociating a PointT and exposing a PointD is proportional to the local fraction of pointed ends in the ADP state.

Name	Gd adds to PointT giving PointI
Formula	$\text{Gd} + \text{BarbT} \rightarrow \text{BarbI} + \text{Fi}$
Rate Expression	$\text{kon\_pointI\_eff} * \text{Gd} * \text{PointT} - \text{koff\_pointI} * \text{PointI} * (\text{PointT}/\text{PointedEndTotal}) * \text{Fi\_stability}$
Parameters	$\text{kon\_pointI\_eff} = \text{kon\_pointI} * [\text{pointQ\_ID}/(\text{pointQ\_ID} + \text{pointQ\_DI})]$  $\text{kon\_pointI} = 1.3 \mu\text{M}^{-1} \text{s}^{-1}$  $\text{koff\_pointI} = 0.8 \text{s}^{-1}$
Notes	The probability of dissociating a PointI and exposing a PointT is proportional to the local fraction of pointed ends in the ATP state.  The on and off rates for ADP-Pi actin are assumed to equal the on and off rates of ATP actin.

Name	Gd adds to PointI giving PointI
Formula	$\text{Gd} \rightarrow \text{Fi}$
Rate Expression	$\text{kon\_pointI\_eff} * \text{Gd} * \text{PointI} - \text{koff\_pointI} * \text{PointI} * (\text{PointI}/\text{PointedEndTotal}) * \text{Fi\_stability}$

Parameters	$\text{kon\_pointI\_eff} = \text{kon\_pointI} * [\text{pointQ\_ID} / (\text{pointQ\_ID} + \text{pointQ\_DI})]$ $\text{kon\_pointI} = 1.3 \mu\text{M}^{-1} \text{s}^{-1}$ $\text{koff\_pointI} = 0.8 \text{s}^{-1}$
Notes	<p>The probability of dissociating a PointI and exposing a PointI is proportional to the local fraction of pointed ends in the ADP-Pi state.</p> <p>The on and off rates for ADP-Pi actin are assumed to equal the on and off rates of ATP actin.</p>

Name	Gd adds to PointD giving PointI
Formula	$\text{Gd} + \text{PointD} \rightarrow \text{PointI} + \text{Fd}$
Rate Expression	$\text{kon\_pointI\_eff} * \text{Gd} * \text{PointD} - \text{koff\_pointI} * \text{PointI} * (\text{PointD} / \text{PointedEndTotal}) * \text{Fd\_stability}$
Parameters	$\text{kon\_pointI\_eff} = \text{kon\_pointI} * [\text{pointQ\_ID} / (\text{pointQ\_ID} + \text{pointQ\_DI})]$ $\text{kon\_pointI} = 1.3 \mu\text{M}^{-1} \text{s}^{-1}$ $\text{koff\_pointI} = 0.8 \text{s}^{-1}$
Notes	<p>The probability of dissociating a PointI and exposing a PointD is proportional to the local fraction of pointed ends in the ADP state.</p> <p>The on and off rates for ADP-Pi actin are assumed to equal the on and off rates of ATP actin.</p>

Name	Gd adds to PointT giving PointD
Formula	$\text{Gd} + \text{PointT} \rightarrow \text{PointD} + \text{Fi}$
Rate Expression	$\text{kon\_pointD\_eff} * \text{Gd} * \text{PointT} - \text{koff\_pointD} * \text{PointD} * (\text{PointT} / \text{PointedEndTotal}) * \text{Fi\_stability}$
Parameters	$\text{kon\_pointD\_eff} = \text{kon\_pointD} * [\text{pointQ\_DI} / (\text{pointQ\_ID} + \text{pointQ\_DI})]$ $\text{kon\_pointD} = 0.16 \mu\text{M}^{-1} \text{s}^{-1}$ $\text{koff\_pointD} = 0.3 \text{s}^{-1}$
Notes	The probability of dissociating a PointD and exposing a PointT is proportional to the local fraction of pointed ends in the ATP state.

Name	Gd adds to PointI giving PointD
Formula	$\text{Gd} + \text{PointI} \rightarrow \text{PointD} + \text{Fi}$
Rate Expression	$\text{kon\_pointD\_eff} * \text{Gd} * \text{PointI} - \text{koff\_pointD} * \text{PointD} * (\text{PointI} / \text{PointedEndTotal})$

	* Fi_stability
Parameters	$\text{kon\_pointD\_eff} = \text{kon\_pointD} * [\text{pointQ\_DI} / (\text{pointQ\_ID} + \text{pointQ\_DI})]$  $\text{kon\_pointD} = 0.16 \mu\text{M}^{-1} \text{s}^{-1}$  $\text{koff\_pointD} = 0.3 \text{s}^{-1}$
Notes	The probability of dissociating a PointD and exposing a PointI is proportional to the local fraction of pointed ends in the ADP-Pi state.

Name	Gd adds to PointD giving PointD
Formula	Gd $\rightarrow$ Fd
Rate Expression	$\text{kon\_pointD\_eff} * \text{Gd} * \text{PointD} - \text{koff\_pointD} * \text{PointD} * (\text{PointD} / \text{PointedEndTotal}) * \text{Fd\_stability}$
Parameters	$\text{kon\_pointD\_eff} = \text{kon\_pointD} * [\text{pointQ\_DI} / (\text{pointQ\_ID} + \text{pointQ\_DI})]$  $\text{kon\_pointD} = 0.16 \mu\text{M}^{-1} \text{s}^{-1}$  $\text{koff\_pointD} = 0.3 \text{s}^{-1}$
Notes	The probability of dissociating a PointD and exposing a PointD is proportional to the local fraction of pointed ends in the ADP state.

## Debranching reactions

Name	Branch point phosphate release
Formula	BranchI $\rightarrow$ BranchD
Rate Expression	$\text{kbranch\_DI} * \text{BranchI} - \text{kbranch\_ID} * \text{Pi} * \text{BranchD}$
Parameters	$\text{kbranch\_DI} = 0.0026 \text{s}^{-1}$ , $\text{kbranch\_ID} = 5.2\text{E-}6 \mu\text{M}^{-1} \text{s}^{-1}$
Notes	Release rates at branch points are assumed to equal the bulk release rates.

Name	BranchI dissociates to PointT and Fi
Formula	BranchI $\rightarrow$ PointT + Fi + Arp23
Rate Expression	$\text{k\_debranch\_BrT} * \text{BranchI} * (\text{PointT} / \text{PointedEndTotal})$
Parameters	$\text{k\_debranch\_BrT} = 0.04 \text{s}^{-1}$
Notes	The probability of dissociating a branch point and exposing a PointT is proportional to the local fraction of pointed ends in the ATP state.

Name	BranchI dissociates to PointI and Fi
Formula	BranchI $\rightarrow$ PointI + Fi + Arp23
Rate Expression	$\text{k\_debranch\_BrT} * \text{BranchI} * (\text{PointI} / \text{PointedEndTotal})$

Parameters	$k_{\text{debranch\_BrT}} = 0.04 \text{ s}^{-1}$
Notes	The probability of dissociating a branch point and exposing a PointI is proportional to the local fraction of pointed ends in the ADP-Pi state.

Name	BranchI dissociates to PointD and Fi
Formula	$\text{BranchI} \rightarrow \text{PointD} + \text{Fi} + \text{Arp23}$
Rate Expression	$k_{\text{debranch\_BrT}} * \text{BranchI} * (\text{PointD}/\text{PointedEndTotal})$
Parameters	$k_{\text{debranch\_BrT}} = 0.04 \text{ s}^{-1}$
Notes	The probability of dissociating a branch point and exposing a PointD is proportional to the local fraction of pointed ends in the ADP state.

Name	BranchD dissociates to PointT and Fd
Formula	$\text{BranchD} \rightarrow \text{PointT} + \text{Fd} + \text{Arp23}$
Rate Expression	$k_{\text{debranch\_BrD}} * \text{BranchD} * (\text{PointT}/\text{PointedEndTotal})$
Parameters	$k_{\text{debranch\_BrD}} = 0.2 \text{ s}^{-1}$
Notes	The probability of dissociating a branch point and exposing a PointT is proportional to the local fraction of pointed ends in the ATP state.  Arp2/3 dissociates from an Fd subunit five times faster than from an Fi subunit.

Name	BranchD dissociates to PointI and Fd
Formula	$\text{BranchD} \rightarrow \text{PointI} + \text{Fd} + \text{Arp23}$
Rate Expression	$k_{\text{debranch\_BrD}} * \text{BranchD} * (\text{PointI}/\text{PointedEndTotal})$
Parameters	$k_{\text{debranch\_BrD}} = 0.2 \text{ s}^{-1}$
Notes	The probability of dissociating a branch point and exposing a PointI is proportional to the local fraction of pointed ends in the ADP-Pi state.  Arp2/3 dissociates from an Fd subunit five times faster than from an Fi subunit.

Name	BranchD dissociates to PointD and Fi
Formula	$\text{BranchD} \rightarrow \text{PointD} + \text{Fd} + \text{Arp23}$
Rate Expression	$k_{\text{debranch\_BrD}} * \text{BranchD} * (\text{PointD}/\text{PointedEndTotal})$
Parameters	$k_{\text{debranch\_BrD}} = 0.2 \text{ s}^{-1}$
Notes	The probability of dissociating a branch point and exposing a PointD is proportional to the local fraction of pointed ends in the ADP state.  Arp2/3 dissociates from an Fd subunit five times faster than from an Fi subunit.

## Branching reactions

Name	Arp2/3 activation (1:1:1)
Formula	ActiveNWASP + Arp23 $\rightarrow$ ActiveArp23
Rate Expression	$\text{kon\_arp23\_nwasp} * \text{ActiveNWASP} * \text{Arp23} - \text{koff\_arp23\_nwasp} * \text{ActiveArp23}$
Parameters	$\text{kon\_arp23\_nwasp} = 1.0 \mu\text{M}^{-1} \text{s}^{-1}$ , $\text{koff\_arp23\_nwasp} = 1.6 \text{s}^{-1}$
Notes	This reaction assumes that a single N-WASp activates a single Arp2/3.

Name	Arp2/3 activation (2:2:1)
Formula	2 ActiveNWASP + Arp23 $\rightarrow$ ActiveArp23
Rate Expression	$\text{MaxNckDensity}^{(3/2)} * \text{kf} * (\text{ActiveNWASP} / \text{MaxNckDensity})^2 * \text{Arp23} - \text{kr} * \text{ActiveArp23}$
Parameters	$\text{kon\_arp23\_nwasp} = 1.0 \mu\text{M}^{-1} \text{s}^{-1}$ , $\text{koff\_arp23\_nwasp} = 0.009 \text{s}^{-1}$
Notes	This reaction describes a dimer of N-WASp binding and activating a single Arp2/3 complex. $(\text{ActiveNWASP} / \text{MaxNckDensity})^2 * \text{MaxNckDensity}$ describes the number of Arp2/3 binding sites depending on N-WASp binding NckSH3. MaxNckDensity describes the density of NckSH3 within an aggregate. In the body of the manuscript, $\text{MaxNckDensity} = \text{TotalLatticeSites}$ .

Name	Arp2/3 activation (4:2:1)
Formula	2 ActiveNWASP + Arp23 $\rightarrow$ ActiveArp23
Rate Expression	$\text{MaxNckDensity}^{(3/4)} * \text{kf} * \text{Arp23} * ((2 * \text{ActiveNWASP}) / \text{MaxNckDensity})^2 * (1 / (1 - 3 * (\text{ActiveArp23} / \text{MaxNckDensity}) - (\text{ActiveNWASP} / \text{MaxNckDensity}))) - \text{kr} * \text{ActiveArp23}$
Parameters	$\text{kon\_arp23\_nwasp} = 1.0 \mu\text{M}^{-1} \text{s}^{-1}$ , $\text{koff\_arp23\_nwasp} = 0.009 \text{s}^{-1}$
Notes	This reaction describes a dimer of N-WASp binding and activating a single Arp2/3 complex. MaxNckDensity describes the density of NckSH3 within an aggregate. In the body of the manuscript, $\text{MaxNckDensity} = \text{TotalLatticeSites}$ .

Name	NWASP binds NckSH3 (1:1:1, 2:2:1)
Formula	NckSH3 + NWASP $\rightarrow$ ActiveNWASP
Rate Expression	$\text{kf} * \text{NWASP} * \text{NckSH3} - \text{kr} * \text{ActiveNWASP}$
Parameters	$\text{kf} = 3.7 \mu\text{M}^{-1} \text{s}^{-1}$ , $\text{kr} = 0.3 \text{s}^{-1}$
Notes	This reaction assumes that a single NckSH3 binds and activates a single N-WASp.

Name	NWASP binds NckSH3 (4:2:1)
Formula	2 NckSH3 + NWASP_WIP $\rightarrow$ ActiveNWASP

Rate Expression	$\text{MaxNckDensity} \cdot (3/2) \cdot k_f \cdot \text{NWASP} \cdot (\text{NckSH3}/\text{MaxNckDensity})^2 \cdot (1/(1 - 3 \cdot (\text{ActiveArp23}/\text{MaxNckDensity}) - (\text{ActiveNWASP}/\text{MaxNckDensity}))) - k_r \cdot \text{ActiveNWASP}$
Parameters	$k = 3.7 \mu\text{M}^{-1} \text{s}^{-1}$ , $k_r = 0.3 \text{s}^{-1}$
Notes	This reaction describes a dimer of NckSH3 binding and activating a single WIP-N-WASP. MaxNckDensity is the density of NckSH3 within an aggregate. MaxNckDensity = TotalLatticeSites.

Name	Gt nucleates branch on Fi
Formula	$\text{ActiveArp23} + 2 \text{Gt} + \text{Fi} \rightarrow \text{BarbT} + \text{BranchI} + \text{ActiveNWASP}$
Rate Expression	$k_{\text{branch}} \cdot \text{Fi} \cdot \text{Gt}^2 \cdot \text{ActiveArp23}$
Parameters	$k_{\text{branch}} = 5.4\text{E-}4 \mu\text{M}^{-3} \text{s}^{-1}$
Notes	All branching reactions have the same rate constant.

Name	Gt nucleates branch on Fd
Formula	$\text{ActiveArp23} + 2 \text{Gt} + \text{Fd} \rightarrow \text{BarbT} + \text{BranchD} + \text{ActiveNWASP}$
Rate Expression	$k_{\text{branch}} \cdot \text{Fd} \cdot \text{Gt}^2 \cdot \text{ActiveArp23}$
Parameters	$k_{\text{branch}} = 5.4\text{E-}4 \mu\text{M}^{-3} \text{s}^{-1}$
Notes	All branching reactions have the same rate constant.

Name	ProfGt nucleates branch on Fi
Formula	$\text{ActiveArp23} + 2 \text{ProfGt} + \text{Fi} \rightarrow \text{BarbT} + \text{BranchI} + \text{ActiveNWASP} + 2 \text{Prof}$
Rate Expression	$k_{\text{branch}} \cdot \text{Fi} \cdot \text{ProfGt}^2 \cdot \text{ActiveArp23}$
Parameters	$k_{\text{branch}} = 5.4\text{E-}4 \mu\text{M}^{-3} \text{s}^{-1}$
Notes	All branching reactions have the same rate constant.

Name	ProfGt nucleates branch on Fd
Formula	$\text{ActiveArp23} + 2 \text{ProfGt} + \text{Fd} \rightarrow \text{BarbT} + \text{BranchD} + \text{ActiveNWASP} + 2 \text{Prof}$
Rate Expression	$k_{\text{branch}} \cdot \text{Fd} \cdot \text{ProfGt}^2 \cdot \text{ActiveArp23}$
Parameters	$k_{\text{branch}} = 5.4\text{E-}4 \mu\text{M}^{-3} \text{s}^{-1}$
Notes	All branching reactions have the same rate constant.

## F-actin reactions (severing/annealing)

Name	F-actin Pi release
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Formula	$F_i \rightarrow F_d$
Rate Expression	$k_{F\_DI} * F_i - k_{F\_ID} * P_i * F_d$
Parameters	$k_{F\_DI} = 0.0026 \text{ s}^{-1}$ , $k_{F\_ID} = 5.2E-6 \text{ } \mu\text{M}^{-1} \text{ s}^{-1}$
Notes	

Name	BarbT and PointT anneal
Formula	$\text{BarbT} + \text{PointT} \rightarrow 2 F_i$
Rate Expression	$k_{\text{anneal}} * \text{BarbT} * \text{PointT} * (1-\text{BrF})/L - [k1_{\text{sever}} * \text{AllFactin} + k2_{\text{sever}} * \text{AllFactin}^2] * [F_i/(F_i+F_d)] * [\text{PointT}/(\text{PointT}+\text{PointI})]$
Parameters	$k_{\text{anneal}} = 300 \text{ } \mu\text{M}^{-1} \text{ s}^{-1}$  $k1_{\text{sever}} = 1.1E-8 \text{ s}^{-1}$ , $k2_{\text{sever}} = 1.8E-8 \text{ } \mu\text{M}^{-1} \text{ s}^{-1}$
Notes	The annealing rate scales inversely with the local mean filament length. It is also weighted by (1-BrF), which picks out the fraction of filaments that is detached from the actin network.  The severing rate has terms linear and quadratic in the total amount of F-actin. The severing of 2 Fi's is weighted by the local fraction of F-actin in the ATP or ADP-Pi state. The probability of exposing a new BarbT and PointT is proportional to the local fraction of pointed ends in the ATP state compared with the total in either the ATP or ADP-Pi state.

Name	BarbT and PointI anneal
Formula	$\text{BarbT} + \text{PointI} \rightarrow 2 F_i$
Rate Expression	$k_{\text{anneal}} * \text{BarbT} * \text{PointI} * (1-\text{BrF})/L$
Parameters	$k_{\text{anneal}} = 300 \text{ } \mu\text{M}^{-1} \text{ s}^{-1}$
Notes	The annealing rate scales inversely with the local mean filament length. It is also weighted by (1-BrF), which picks out the fraction of filaments that is detached from the actin network.  It is assumed that only a small fraction of ADP-Pi F-actin subunits neighbor an ATP F-actin subunit, so this severing reaction can be ignored.

Name	BarbT and PointD anneal
Formula	$\text{BarbT} + \text{PointD} \rightarrow F_i + F_d$
Rate Expression	$k_{\text{anneal}} * \text{BarbT} * \text{PointD} * (1-\text{BrF})/L$
Parameters	$k_{\text{anneal}} = 300 \text{ } \mu\text{M}^{-1} \text{ s}^{-1}$
Notes	The annealing rate scales inversely with the local mean filament length. It is also weighted by (1-BrF), which picks out the fraction of filaments that is detached from the actin network.



	It is assumed that only a small fraction of ADP F-actin subunits neighbor an ATP F-actin subunit, so this severing reaction can be ignored.
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Name	Barbl and PointT anneal
Formula	Barbl + PointT → 2 Fi
Rate Expression	$k\_anneal * Barbl * PointT * (1-BrF)/L$
Parameters	$k\_anneal = 300 \mu M^{-1} s^{-1}$
Notes	<p>The annealing rate scales inversely with the local mean filament length. It is also weighted by (1-BrF), which picks out the fraction of filaments that is detached from the actin network.</p> <p>It is assumed that only a small fraction of ADP-Pi F-actin subunits neighbor an ATP F-actin subunit, so this severing reaction can be ignored.</p>

Name	Barbl and Pointl anneal
Formula	Barbl + Pointl → 2 Fi
Rate Expression	$k\_anneal * Barbl * Pointl * (1-BrF)/L - [k1\_sever * AllFactin + k2\_sever * AllFactin^2] * [Fi/(Fi+Fd)] * [Pointl/(PointT+Pointl)]$
Parameters	$k\_anneal = 300 \mu M^{-1} s^{-1}$
Notes	<p>The annealing rate scales inversely with the local mean filament length. It is also weighted by (1-BrF), which picks out the fraction of filaments that is detached from the actin network.</p> <p>The severing rate has terms linear and quadratic in the total amount of F-actin. The severing of two Fi's is weighted by the local fraction of F-actin in the ATP or ADP-Pi state. The probability of exposing a new Barbl and Pointl is proportional to the local fraction of pointed ends in the ATP state compared with the total in either the ATP or ADP-Pi state.</p>

Name	Barbl and PointD anneal
Formula	Barbl + PointD → Fi + Fd
Rate Expression	$k\_anneal * Barbl * PointD * (1-BrF)/L$
Parameters	$k\_anneal = 300 \mu M^{-1} s^{-1}$
Notes	<p>The annealing rate scales inversely with the local mean filament length. It is also weighted by (1-BrF), which picks out the fraction of filaments that is detached from the actin network.</p> <p>It is assumed that only a small fraction of ADP F-actin subunits neighbor an ADP-Pi F-actin subunit, so this severing reaction can be ignored.</p>

Name	BarbD and PointT anneal
Formula	BarbD + PointT → Fi + Fd
Rate Expression	$k_{\text{anneal}} * \text{BarbD} * \text{PointT} * (1-\text{BrF})/L$
Parameters	$k_{\text{anneal}} = 300 \mu\text{M}^{-1} \text{s}^{-1}$
Notes	<p>The annealing rate scales inversely with the local mean filament length. It is also weighted by (1-BrF), which picks out the fraction of filaments that is detached from the actin network.</p> <p>It is assumed that only a small fraction of ATP F-actin subunits neighbor an ADP F-actin subunit, so this severing reaction can be ignored.</p>

Name	BarbD and PointI anneal
Formula	BarbD + PointI → Fi + Fd
Rate Expression	$k_{\text{anneal}} * \text{BarbD} * \text{PointI} * (1-\text{BrF})/L$
Parameters	$k_{\text{anneal}} = 300 \mu\text{M}^{-1} \text{s}^{-1}$
Notes	<p>The annealing rate scales inversely with the local mean filament length. It is also weighted by (1-BrF), which picks out the fraction of filaments that is detached from the actin network.</p> <p>It is assumed that only a small fraction of ADP-Pi F-actin subunits neighbor an ADP F-actin subunit, so this severing reaction can be ignored.</p>

Name	BarbD and PointD anneal
Formula	BarbD + PointD → 2 Fd
Rate Expression	$k_{\text{anneal}} * \text{BarbD} * \text{PointD} * (1-\text{BrF})/L - [k1_{\text{sever}} * \text{AllFactin} + k2_{\text{sever}} * \text{AllFactin}^2] * [\text{Fd}/(\text{Fi}+\text{Fd})]$
Parameters	$k_{\text{anneal}} = 300 \mu\text{M}^{-1} \text{s}^{-1}$
Notes	<p>The annealing rate scales inversely with the local mean filament length. It is also weighted by (1-BrF), which picks out the fraction of filaments that is detached from the actin network.</p> <p>The severing rate has terms linear and quadratic in the total amount of F-actin. The severing of two Fd's is weighted by the local fraction of F-actin in the ADP state.</p>

## Cofilin-mediated severing reactions

Name	Cofilin binds Fi, releases phosphate to give CofFd
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Formula	$Fi + Cof \rightarrow CofFd$
Rate Expression	$kon\_cofl\_eff * Cof * Fi - koff\_cofl\_eff * Pi * CofFd$
Parameters	$kon\_cofl\_eff = kon\_cofl * [kcof\_DI / (koff\_cofl + kcof\_DI)]$ $koff\_cofl\_eff = kcof\_ID * [koff\_cofl / (koff\_cofl + kcof\_DI)]$ $kon\_cofl = 1 \mu M^{-1} s^{-1}, kcof\_DI = 0.04 s^{-1}$ $koff\_cofl = 20 s^{-1}, kcof\_ID = 5.2E-6 \mu M^{-1} s^{-1}$
Notes	This single reaction combines two steps: cofilin binding to an Fi subunit and the cofilin-induced Pi release to give a cofilin-bound Fd subunit.

Name	Cofilin binds to Fd
Formula	$Fd + Cof \rightarrow CofFd$
Rate Expression	$kon\_cofD * Cof * Fd - koff\_cofD * CofFd$
Parameters	$kon\_cofD = 0.0085 \mu M^{-1} s^{-1}, koff\_cofD = 0.0050 s^{-1}$
Notes	

Name	Second cofilin binds next to CofFd
Formula	$Fd + Cof + CofFd \rightarrow CofFd2$
Rate Expression	$kon\_cofD2 * Cof * CofFd * Fd\_stability - koff\_cofD2 * CofFd2$
Parameters	$kon\_cofD2 = 0.075 \mu M^{-1} s^{-1}, koff\_cofD2 = 0.0050 s^{-1}$
Notes	

Name	Cofilin-mediated severing
Formula	$CofFd2 \rightarrow 2 Cof + PointD + BarbD$
Rate Expression	$kcut * CofFd2$
Parameters	$kcut = 0.012 s^{-1}$
Notes	It is assumed that severing occurs between two neighboring cofilin-bound subunits.

Name	Adjacent cofilins sever
Formula	$2 Fd \rightarrow PointD + BarbD$
Rate Expression	$kcut\_eff * Cof * CofFd2 * Fd\_stability$
Parameters	$kcut\_eff = kcut * kon\_cofD2 / (koff\_cofD + 2 * kcut)$ $kcut = 0.012 s^{-1}$ $kon\_cofD2 = 0.075 \mu M^{-1} s^{-1}, koff\_cofD = 0.0050 s^{-1}$

Notes	The original model contained a species, CofFADcounter, which counted all F-actin sections with more than two adjacent cofilin bound subunits. This species can sever, releasing two cofilins and creating new barbed and pointed ends. The counter species is eliminated in the simplified model, and the reduced reaction scheme describes two F-actin subunits next two cofilin-bound F-actin subunits severing via a cofilin-mediated mechanism.
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## Cytosolic reactions

Name	Nucleotide exchange on G-actin
Formula	Gd $\rightarrow$ Gt
Rate Expression	$kG\_TD\_eff * Gd - kG\_DT * Gt$
Parameters	$kG\_TD\_eff = kG\_TD * [cytQ\_DI / (cytQ\_DI + cytQ\_ID)]$ $kG\_TD = kG\_FD * [kG\_TF / (kG\_DF + kG\_TF)]$ $kG\_DT = kG\_FT * [kG\_DF / (kG\_DF + kG\_TF)]$ $kG\_DF = 0.9 \mu M^{-1} s^{-1} * [ADP], kG\_FD = 0.071 s^{-1}$ $kG\_TF = 1.7 \mu M^{-1} s^{-1} * [ATP], kG\_FT = 0.011 s^{-1}$
Notes	This single reaction describes the two step process of ADP dissociation from G-actin and ATP association with G-actin.

Name	Nucleotide exchange on Prof-G-actin complex
Formula	ProfGd $\rightarrow$ ProfGt
Rate Expression	$kprof\_TD\_eff * ProfGd - kprof\_DT * ProfGt$
Parameters	$kprof\_TD\_eff = kprof\_TD * [cytJ\_DI / (cytJ\_DI + cytJ\_ID)]$ $kprof\_TD = kprof\_FD * [kprof\_TF / (kprof\_DF + kprof\_TF)]$ $kprof\_DT = kprof\_FT * [kprof\_DF / (kprof\_DF + kprof\_TF)]$ $kprof\_DF = 1.2 \mu M^{-1} s^{-1} * [ADP], kprof\_FD = 8 s^{-1}$ $kprof\_TF = 3.0 \mu M^{-1} s^{-1} * [ATP], kprof\_FT = 0.3 s^{-1}$
Notes	This single reaction describes the two step process of ADP dissociation from profilin-G-actin and ATP association with profilin-G-actin.

Name	Bthymosin bind Gt to form Bthymosin-Gt complex
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Formula	Bthy + Gt → BthyGt
Rate Expression	kon_bthyT * Bthy * Gt - koff_bthyT * BthyGt
Parameters	kon_bthyT = 1.0 μM <sup>-1</sup> s <sup>-1</sup> , koff_bthyT = 0.9 s <sup>-1</sup>
Notes	

Name	Bthymosin bind Gd to form Bthymosin–Gd complex
Formula	Bthy + Gd → BthyGd
Rate Expression	kon_bthyD_eff * Bthy * Gd - koff_bthyD_eff * BthyGd
Parameters	$\text{kon\_bthyD\_eff} = (\text{kon\_bthyD} * \text{cytQ\_DI} + \text{kon\_bthyl} * \text{cytQ\_ID}) / (\text{cytQ\_ID} + \text{cytQ\_DI})$ $\text{koff\_bthyD\_eff} = (\text{koff\_bthyD} * \text{cytR\_DI} + \text{koff\_bthyl} * \text{cytR\_ID}) / (\text{cytR\_ID} + \text{cytR\_DI})$ $\text{kon\_bthyl} = 1.0 \mu\text{M}^{-1} \text{s}^{-1}, \text{koff\_bthyl} = 0.9 \text{s}^{-1}$ $\text{kon\_bthyD} = 1.0 \mu\text{M}^{-1} \text{s}^{-1}, \text{koff\_bthyD} = 100 \text{s}^{-1}$
Notes	We assume that the ADP-Pi G-actin monomer reacts as the ATP-G-actin monomer.

Name	Profilin binds Gt to form ProfGt complex
Formula	Prof + Gt → ProfGt
Rate Expression	kon_profT * Prof * Gt - koff_profT * ProfGt
Parameters	kon_bthyT = 14.0 μM <sup>-1</sup> s <sup>-1</sup> , koff_bthyT = 1.3 s <sup>-1</sup>
Notes	

Name	Profilin binds Gd to form ProfGd complex
Formula	Prof + Gd → ProfGd
Rate Expression	kon_profD_eff * Prof * Gd - koff_profD_eff * ProfGd
Parameters	$\text{kon\_profD\_eff} = (\text{kon\_profD} * \text{cytQ\_DI} + \text{kon\_profil} * \text{cytQ\_ID}) / (\text{cytQ\_ID} + \text{cytQ\_DI})$ $\text{koff\_profD\_eff} = (\text{koff\_profD} * \text{cytJ\_DI} + \text{koff\_profil} * \text{cytJ\_ID}) / (\text{cytJ\_ID} + \text{cytJ\_DI})$ $\text{kon\_profil} = 14.0 \mu\text{M}^{-1} \text{s}^{-1}, \text{koff\_profil} = 1.3 \text{s}^{-1}$ $\text{kon\_profD} = 15.6 \mu\text{M}^{-1} \text{s}^{-1}, \text{koff\_profD} = 2.6 \text{s}^{-1}$
Notes	We assume that the ADP-Pi G-actin monomer reacts as the ATP–G-actin monomer.