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Dynamics and regulation at the tip : a high resolution view on microtubule assembly

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PROPOSITIONS (STELLINGEN)
accompanying the thesis
Dynamics and regulation at the tip:
A high resolution view on microtubule assembly

1. The optical tweezers technique described in this thesis allows us to unravel molecular details of the microtubule assembly process and how this process is altered, on a molecular scale, by microtubule associated proteins (MAPs). (*chapters 3, 5, and 6*)
2. An *in vitro* approach is necessary when trying to understand the effect of individual MAPs on microtubule dynamics. (*chapters 3-5, see also proposition 4*)
3. Mal3 is an autonomous microtubule tip-tracker: it recognizes a specific structure at the growing microtubule end. (*chapters 4 and 5*)
4. Surprisingly, Mal3 enhances microtubule catastrophes *in vitro* (*chapter 5*), as opposed to the *in vivo* observation. In cells, microtubule dynamics are regulated by the combined action of several MAPs.
5. Most microtubule plus-end-tracking proteins (+TIPs) bind tubulin weakly. Weak interactions together with close proximity of multiple binding sites might be a prerequisite to achieve specificity on a dynamic structure.
6. Care should be taken when generalizing results found in one model organism. For example, the end-tracking behaviors of CLIP170 homologs in fission and budding yeast are different (Busch et al (2004) *Curr Biol* **14**, Carvalho et al (2004) *Dev Cell* **6**).
7. Simple models are proposed to explain complex behaviors (e.g. interaction between MAPs and microtubules). Their value lies in understanding the behavior as a first approximation, but they should not be considered as a full description.
8. Which came first: the question or the answer? Novel experiments often require re-definition of the question upon initial results.
9. "Climbing can be a state of consciousness where there are no distractions or expectations, just the challenge" (*Lynn Hill*). Science would also benefit from such an attitude.
10. Electricity turns into a survival need for the modern *Homo sapiens*.
11. Living in a foreign culture teaches genuine tolerance.
12. Sure, the journey to the summit is more important than reaching the summit. It is then that one becomes a better and more skilled person. But, the journey should not replace the summit as a goal.