**Short Guidelines on Scientific Writing**

**Becker's Summary**

**Abstract**

* 1st phrase: scope, field of investigation, e.g.:   
  “Reliable precipitation measurements are paramount to improve rainfall prediction models used for flood forecasting in small catchments.”
* 2nd phrase: gap, need (“However …”), e.g.:   
  “However the spatial scales of the rain gauge measurement network often does not match the spatial scale of the underlying precipitation processes such as convective rainfall events.”
* 3rd phrase: own suggestion for mitigation/solution, own contributions (“Therefore …”), e.g.:   
  “To meet the spatial requirements we suggest an improved cost effective wireless sensor network based on distributed tipping bucket rain gauges together with long range wireless data transmission.”
* Other phrases …

**Introduction**

* The 'why': Motivation, why are you doing this work? Why is it important? What is the relevance of your work? Intention?
* What is your approach? Formulate a working hypothesis if you can.
* Embed your own work in the larger context of the scientific community: What are others doing? This is one of the places you cite other literature! How is your work related to the other groups' work? What is your contribution to solve the problem?
* If applicable: Physics of underlying process to be measured (e.g. meteorological phenomena)
* If applicable: Scales of underlying physical process
* Short outline of the article

**Methods and Materials**

* The 'how': explain your scientific approach
* Describe your experiments and methods in detail. The reader must be able to copy your research in his own lab!
* Detailed information on procedures that led you to the outcomes.  
  (What enables you to draw your final conclusions?)
* Physical principle of measuring device
* Specifications, data sheet interpretations/analysis,  
  e.g. max ratings, precision, accuracy (RTFM, 'F' = fine)
* Comparison of sensors used (or theoretical comparison with others on the market)
* Measurement grid (scale triplet must match process scales)  
  (Also applicable to domestic mesaurements: e.g. how to measure the representative room temperature?)
* Error estimation: Methods used to deal with measurement and model errors

**Results**

* The 'what': Describe the outcome, your findings.
* Data analysis, statistics
* No judgement, opinion or interpretation, only observation
* Purely descriptive conclusions
* Must not be isolated but related to previous chapters, i.e. Methods and Materials

**Discussion**

* Interpret your results
* Compare with results from other investigations (other groups)
* Clear answer to the hypothesis (remember the exposé should basically constantly focus on your hypothesis)

**Conclusion, Outlook**

* Lessons learnt: Summarize what you have done and found out.
* Did you achieve your goals? Could you clearly verify or falsify your hypothesis? Do not add any new aspect!
* Do not refer to anything you did not investigate in this research paper!
* Outlook: Which next steps do you suggest? What should be done to continue this investigation in future? Which are the open questions to be answered?

**Bibliography**

* Only use literature that you referred to in the text
* Preferably use Harvard citation style
* Refer to primary literature. Search the original literature. Avoid wikipedia. Follow the references to the original work and use that instead of the wikipedia article itself.
* Use a professional citation style with author-year-combination as citation keys such as the [Harvard citation style](http://www.citethisforme.com/harvard-referencing)   
  Examples:
  + “Young et al. (1996) found that homeopathic globules of concentration D12 are generally less explosive than dynamite.”
  + “It has been shown experimentally that the flux compensator is ten times slower than the worm hole accelerator (Abraham & Borowski, 2001)”

**Appendices**

* Empirical data or additional sources

**Practicalities**

* Length: Max. n pages substantial content per individual + title page + abstract + bibliography + appendix
* Style and form:
  + Arial 11pt for text body, 1.5 lines
  + Arial 10pt for captions of figs etc.