The impact of next-generation sequencing on bioinformatics in Australia

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What is “next gen seq”?  

- It's **not** just genome sequencing!  
- DNA-omes  
  - genomes, meta-genomes, cDNA  
- RNA-omes / transcriptomes  
  - mRNA-Seq, small RNAs, ncRNA, tag profiling  
- CHiP-Seq  
  - DNA-protein interactions, methylation, …  
- SNP/oligo chips  
  - May be considered “next gen”
What is bioinformatics?

- Computer science
- Software engineering
- Mathematics / statistics

• **Bioinformatics**

- Biological sciences
- Medical sciences
Where is .au poised?

- Sciences - we punch above our weight
- Funding
  - NCRIS, ARC, NHMRC
- Infrastructure
  - ARCS, ANDS, VLSCI, APAC
- Dedicated groups
  - QFAB, CCG, ABF, ARC CoE, VBC, WEHI
- On par with the big players?
Typical bioinformatician

• System administrator
  – Install and test software & databases

• Software engineer
  – Coding tools, writing scripts, services

• Statistician
  – Analysing data sets, gimme a p-value!

• Scientist (if any spare time!)
  – Tackling novel, useful research problems
NGS challenges (1)

- Hardware
  - Data storage
    - Archiving, distribution, meta-data, searching
  - Computation
    - CPU, GPU, Cloud, Grid, Cluster
  - Bandwidth (I/O speed)
    - disk, memory, network, fast interconnects

- Growing too slow?
- Bandwidth not keeping up with CPU & storage
NGS challenges (2)

• Algorithms
  – Prefer brains to brawn in the NGS battle
  – Reduce space complexity (fit in X Gb RAM)
  – Lower time complexity (finish in my lifetime)

• Tools
  – Empower the biologist wherever possible!
  – Share code, don’t re-invent wheels
  – Open source, multi-platform applications
NGS challenges (3)

• Current staff – self taught
  – Computing savvy biologists and medicos
  – “Reconfigured” computer scientists et al

• Future staff – trained?
  – Bioinformatics re-training options
  – University courses having bioinformatics
  – In-house, on-the-job training
  – Pair up non-bio newbie with biologist mentor
Contact us

http://bioinformatics.net.au/