Why core competencies?

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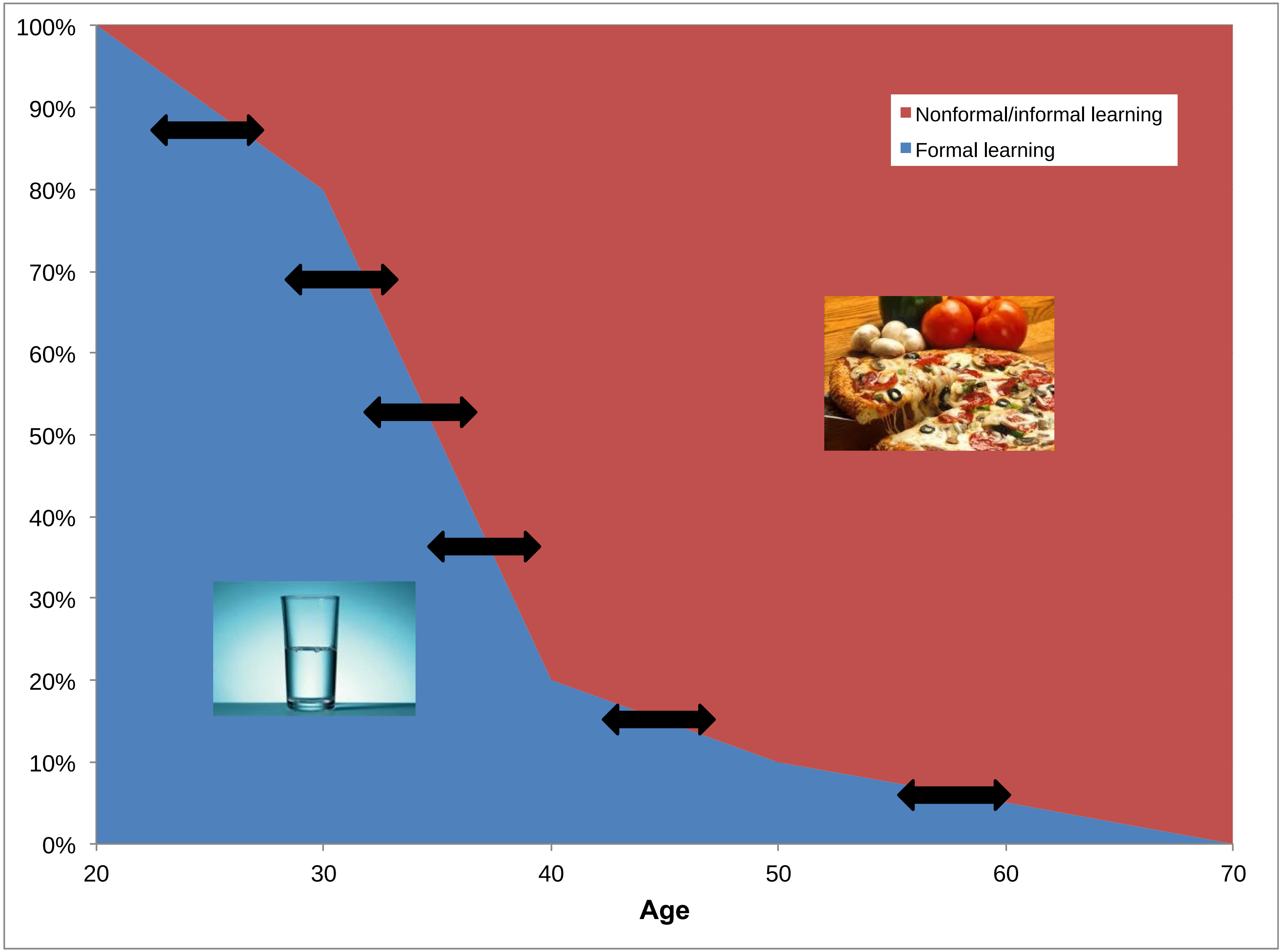
A journey through lifelong learning



Competency

Competency is ‘an observable ability of any professional, integrating multiple components such as knowledge, skills, values and attitudes’.

- Acquisition can be validated objectively.
- Shared ‘currency’ applicable to learning of all types and at all career stages

Competency profile

- Defines the competencies required to fulfil a particular role
- Typically defined by professional bodies / learned societies in collaboration with employers

The ISCB Curriculum Taskforce's approach

Survey

- Core Facility Directors
- Career opportunities
- Existing Curricula

Compile

- Welch, L. et al. (2014) *PLoS Comp. Biol.* **10**: e1003496 (DOI: 10.1371/journal.pcbi.1003496)

Consult

- What's missing? What needs fixing?
- Can we use the profiles to develop new training and improve existing training?

We are here!

Refine

- Regular updates based on the reiteration of this cycle
- Openly available 'living document'

INTERNATIONAL SOCIETY FOR COMPUTATIONAL BIOLOGY

Current draft

Competency	Bioinformatics user	Bioinformatics scientist	Boinformatics engineer
Examples of professionals in this role	Biocurator, physician, lab technician, ethicist	Computational biologist; molecular life scientist	Software developer, software engineer
Apply knowledge of computing appropriate to the discipline (e.g., effectively utilize bioinformatics tools).	Awareness	Awareness to working knowledge	Awareness to specialist knowledge
Apply knowledge of biology appropriate to the discipline.	Working knowledge to specialist knowledge	Awareness to working knowledge	Awareness to working knowledge
Analyze a problem and identify and define the computing requirements appropriate to its solution (e.g., define algorithmic time and space complexities and hardware resources required to solve a problem).	Awareness	Awareness to working knowledge	Awareness to working knowledge
Use a computer-based system, process, component, or program to meet desired needs in scientific environments.	Working knowledge	Working knowledge	Working knowledge
Design and implement a computer-based system, process, component, or program to meet desired needs in scientific environments.	N/A	N/A	Working knowledge
Evaluate the abiliity of a computer-based system, process, component, or	N/A	Working knowledge	Awareness

Clinical bioinformatics competency framework (a work in progress…)

NHS Health Education England

	Role	Clinical bioinformatician	Other bioinformatician	Specialist clinician with genetics/genomics expertise	Other specialist clinician	Other clinician	Clinical genetic Scientist	Other healthcare scientist	Specialist nurse/counsellor	Nurses and other allied health professionals	IT specialist	Data specialist
	No. responses	11	6	5	5	6	8	6	6	5	7	7
	Example	NHS diagnostic bioinformatician [1]	Academic bioinformatician, industry bioinformatician	Clinical geneticist or pathologist, haematologist, microbiologist with leadership responsibility in clinical lab	Cardiologist, neurologist, oncologist, paediatrician	General Practitioner	NHS diagnostic clinical scientist, microbiologist, statistical/analytical epidemiologistt	Genetic technologist, Immunologist, epidemiologist	Genetic counsellor; Preimplantation genetic diagnosis nurse; clinical nurse specialist in surgery or oncology; Genetic Diabetes Nurse	Non-specialist nurse; physiotherapist	Systems administrator	Curator, data scientist
Competency	Write computer programmes and algorithms that can analyse data	Specialist knowledge	Specialist knowledge	No knowledge required	No knowledge required	No knowledge required	Awareness	No knowledge required	No knowledge required	No knowledge required	No knowledge required	Specialist knowledge
	Analyse genomics data using pre-existing software, including linking genotype to phenotype/microbial strain comparisons	Specialist knowledge	Specialist knowledge	Specialist knowledge[2]	Awareness	No knowledge required	Specialist knowledge	Awareness	No knowledge required[3]	No knowledge required	Awareness	Working knowledge
	Employ good software development practice	Working knowledge	Specialist knowledge	No knowledge required	No knowledge required	No knowledge required	No knowledge required	No knowledge required	No knowledge required	No knowledge required	Working knowledge	Specialist knowledge
	Apply computer science theory to computer system design	Working knowledge	Working knowledge	No knowledge required	No knowledge required	No knowledge required	No knowledge required	No knowledge required	No knowledge required	No knowledge required	Specialist knowledge	Working knowledge
	Manage and organise genomics data and results	Specialist knowledge	Specialist knowledge	Awareness[2]	No knowledge required	No knowledge required	Working knowledge	Awareness	Awareness[3]	No knowledge required	Awareness	Specialist knowledge
	Apply statistical research methods to genomics, medical, and population genetics	Working knowledge	Specialist knowledge	Working knowledge	No knowledge required	No knowledge required	Awareness[4]	Awareness	No knowledge required	No knowledge required	Awareness	Awareness
	Use health informatics systems and understand their relevance to clinical genomics	Working knowledge	Awareness	Specialist knowledge	Awareness	Awareness	Awareness	Awareness	Working knowledge	No knowledge required	Working knowledge	Specialist knowledge
	Principles of genetics, genomics and genome-sequencing technology	Specialist knowledge	Specialist knowledge	Specialist knowledge	Awareness	Awareness	Specialist knowledge	Working knowledge	Specialist knowledge	Awareness	No knowledge required	Awareness
	Principles of genetic disease	Working knowledge	Working knowledge	Specialist knowledge	Working knowledge	Working knowledge	Specialist knowledge	Working knowledge	Specialist knowledge	Awareness	No knowledge required	No knowledge required
	Principles of systems biology	Working knowledge	Working knowledge	Awareness	No knowledge required	Awareness	Awareness	Awareness	No knowledge required	Awareness	No knowledge required	No knowledge required
	Principles of next-generation sequencing	Specialist knowledge	Specialist knowledge	Awareness	Awareness	Awareness	Specialist knowledge	Awareness[6]	Awareness	No knowledge required	No knowledge required	Awareness
	Ethical, legal and social implications of clinical use of genomic data (including issues surrounding identification of patients, clinical benefits and risks, patient consent, incidental findings and ethical implications of unexpected clinically actionable findings	Working knowledge	Working knowledge	Specialist knowledge	Working knowledge	Working knowledge	Specialist knowledge	Awareness	Specialist knowledge	Awareness	Awareness	Awareness
	Interpret genetic variation in a clinical context, including understanding limitations of analysis, assessing quality and evidence for clinical interpretation	Specialist knowledge	Working knowledge	Specialist knowledge	Working knowledge	Awareness	Specialist knowledge	Awareness[5]	Specialist knowledge	No knowledge required	No knowledge required	No knowledge required
	The role of various types of healthcare professional in genomic medicine	Working knowledge	Awareness	Specialist knowledge	Working knowledge	Working knowledge	Working knowledge	Awareness	Specialist knowledge	Awareness	Working knowledge	Awareness
	The scientific discovery process and of the role of bioinformatics in it	Specialist knowledge	Specialist knowledge	Working knowledge	Awareness	No knowledge required	Working knowledge	Awareness	Awareness	No knowledge required	No knowledge required	Awareness
	The risks (and benefits) to patients and their families arising from the prediction of causal variants	Specialist knowledge	Awareness	Specialist knowledge	Working knowledge	Working knowledge	Specialist knowledge	Awareness	Specialist knowledge	Awareness	No knowledge required	Awareness
	Integrate and jointly analyse genomic and other data						[7]	[7]				

LifeTrain's collection of competency profiles

www.lifetrain.eu

LifeTrain
Driving lifelong learning for biomedical professionals

Different phases of competency

N/A
- No competency in this area required

Awareness
- The professional appreciates what is possible in this area and how the area impacts on their own work

Working knowledge
- The professional has a firm underpinning knowledgebase in this area and applies it effectively in his or her day-to-day work

Specialist knowledge
- The professional actively contributes to advancement of the area, generating new understanding or new technology

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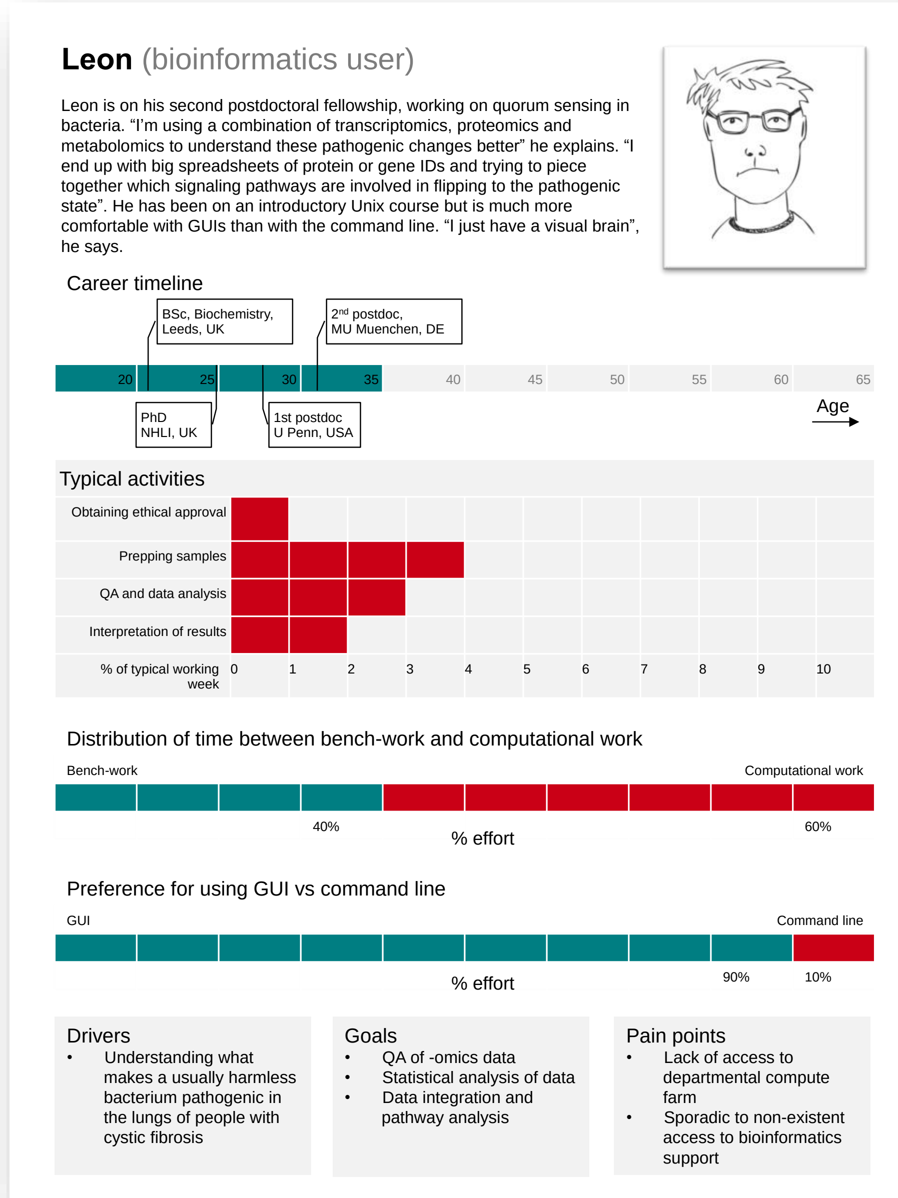
Bioinformatics user

- Access data resources and bioinformatics tools to perform job duties in specific application domains:
  - Biocurator
  - Cytogeneticist
  - Genetic counsellor
  - Ethicist



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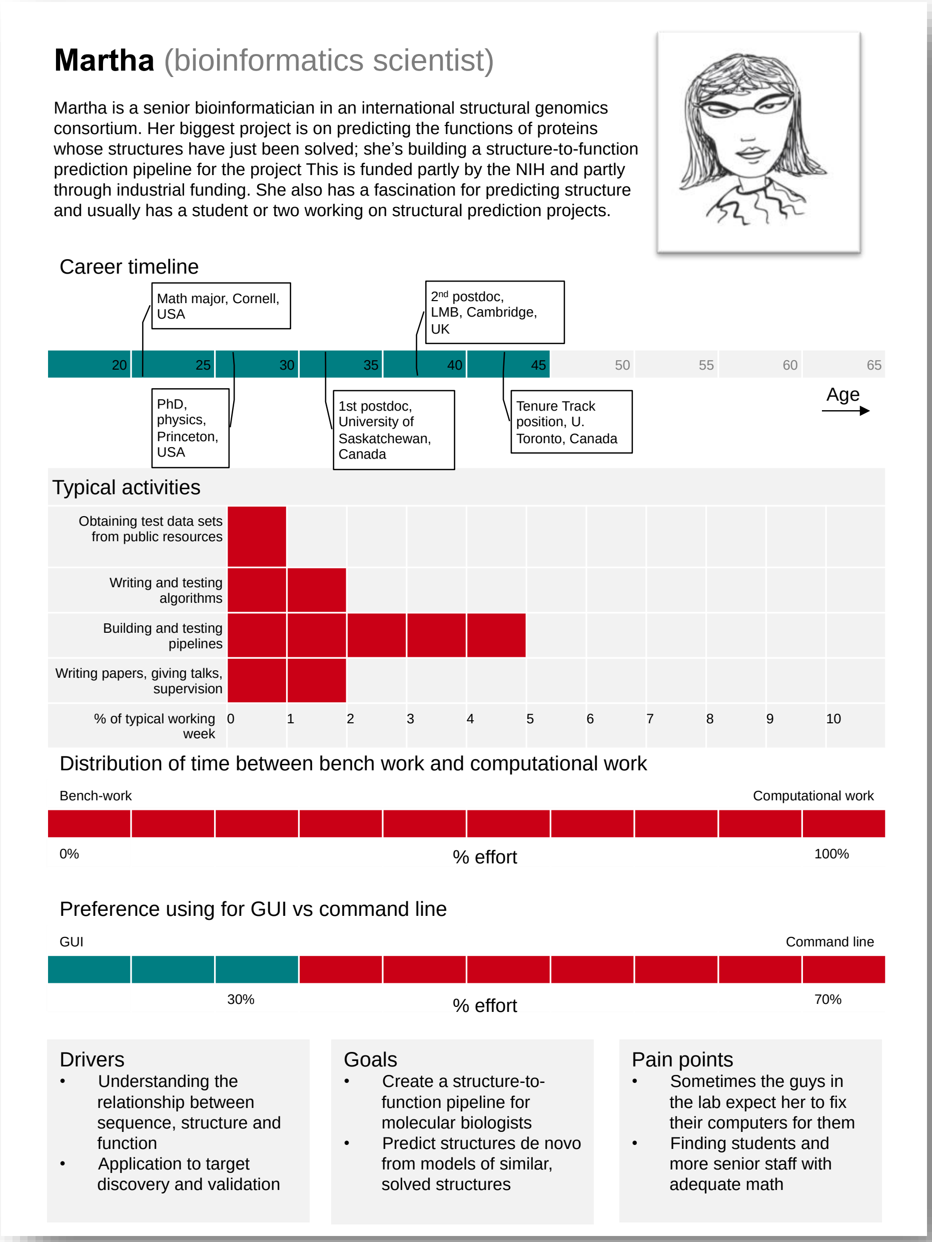
Bioinformatics scientist

- Employ computational methods in order to advance the scientific understanding of living systems:
  - Research scientist (purely computational or computational and lab-based)
  - Bioinformatician (e.g. in a core facility or supporting an experimental group or department)



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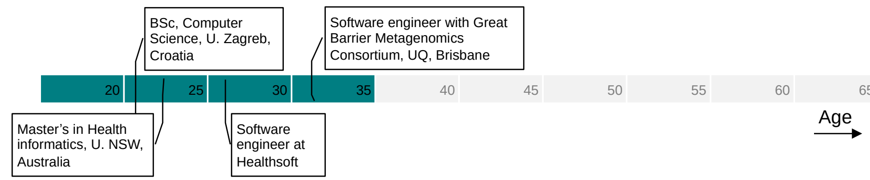
Bioinformatics engineer

- Create novel computational methods needed by bioinformatics users and scientists
  - Software developer
  - Software engineer

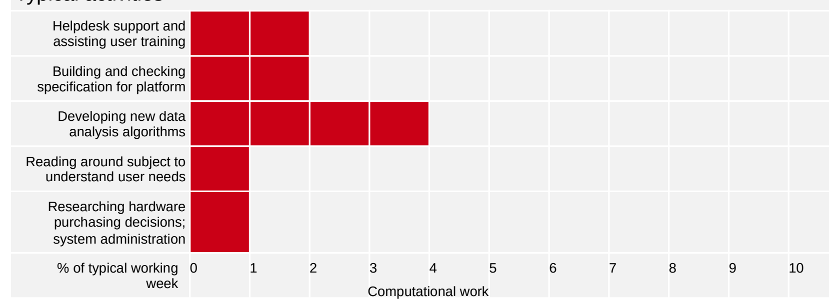
Ivan (bioinformatics engineer)

Ivan has just started a new support role in a bioinformatics core facility after working for an electronic health records company for four years. His main project is to develop a major new data integration platform for metagenomics data from coral reefs, but he also has to take his share of helpdesk queries on other projects. "I come from a computer science background, so talking the same language as the guys analysing the data is a bit of a challenge," he says. "I also didn't really figure that I'd be working on the GUI as well as the code – in my last job we had design folks to take care of that".

Career timeline

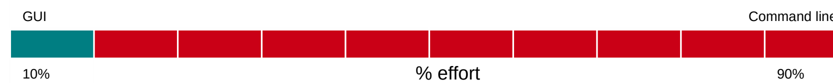


Typical activities



Distribution of time between bench-work and computational work

Preference for using GUI vs command line



Drivers

- Writing algorithms and developing a platform to support novel research
- Supporting other research projects in a busy academic department

Goals

- Define a spec that meets the needs of his users
- Prototype and build part of the platform
- Make sure his part of the project complements others

Pain points

- Has to work with another software engineer who isn't a team player
- Sometimes struggles to interpret what his users want

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How can **you** use the competency profiles?

- Think about which persona best matches the people you want to train; if none of them ring true, consider developing your own personas
- Think about which competencies your trainees need to develop
- Find courses or materials that have similar aims: you might be able to make use of these

Acknowledgements

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Breakouts

Group 1: User

Leads

- Celia
- Michelle

Group 2: Scientist

Leads

- Nicky
- Fran

Group 3: Engineer

Leads

- Pedro
- Patricia

Group 4: Mystery

Leads

- ???

Scenarios for breakouts

- Each breakout group will choose one scenario; we should ensure that we cover all three types of professional, but depending on the preferences of the audience we've got a bit of wiggle room.

- We have preselected leads for each group, and each group will need to select a scribe and a rapporteur.

Questions to address during breakouts

- Which competencies are needed for the scenario considered?

- What are the **three** most important competencies?

- Are you aware of/can you find appropriate training materials or courses from www.mygoblet.org/training-portal (or any other sources of bioinformatics training that you are aware of) that would meet these competency requirements?

- Is there anything that could be done to make the competency profiles more useful?

Reporting back

- The rapporteur has five minutes in which to report back to the group
- Tell us which scenario you chose and why
- Use slides, any other electronic means or flipcharts as audivisual cues to address each of the questions.
- The lead for each breakout has been given a copy of these slides
- You will all be given a briefing document, including a blank competency profile