



Scientific Enterprise and Enhancing the Student Learning Experience



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University of Durham**



School of Biological and Biomedical Science, University of Durham

Degree routes offered*:

Number of Students:

• Biology	50
• Cell biology	10
• MBB	20
• Plant sciences	3
• Zoology	40
• Ecology	15
• Biomedicine	57
Total:	195

*involving final year project



Final Year Projects

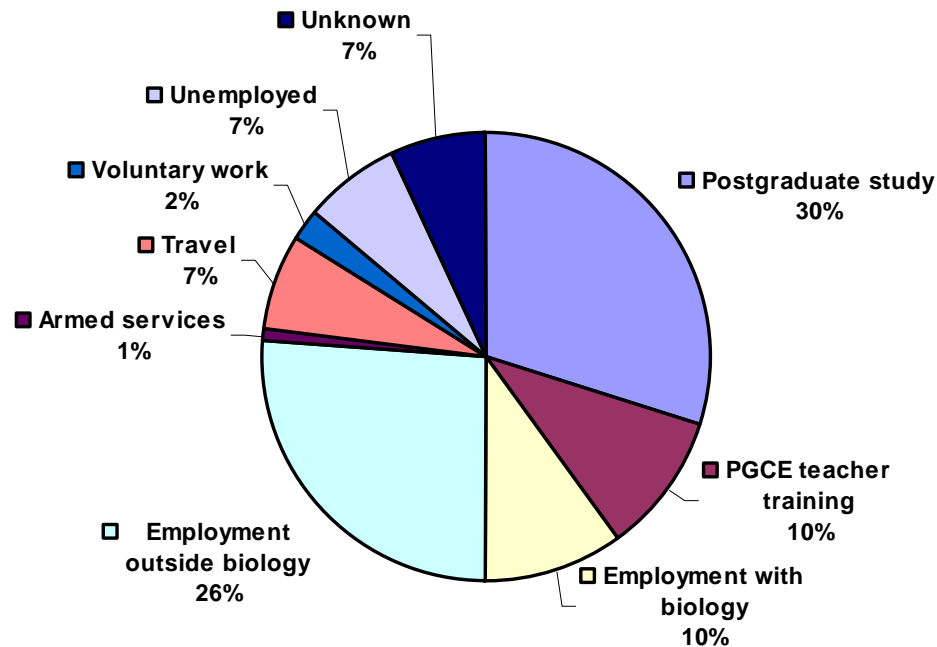
- **Laboratory-based projects aim to provide a high level of training in scientific approach and practical technique**
- **Such skills are especially useful for those wishing to pursue a career in science**
- **Practical training and laboratory skills are considered almost essential for those wishing to enter postgraduate study in biomedical research**
- **However, increased student numbers make it difficult to offer each student effective laboratory-based research projects**
- **Alternative methods to training in scientific technique?**



Do all students require hands-on experience and training in laboratory-based techniques during their final year project?

- It is clear that not all science undergraduates students follow a career in laboratory science...

Graduates
2002-2004:



School of Biological and Biomedical Science, University of Durham

Third Year Taught Programme:

Modular course

- Lectures
- Practicals
- Field course
- Literature review
- Lab-based project
- Biology Enterprise Elective

	Leader	Biology	Cell Biology	Ecology	MBB	Plant Sciences	Zoology	HNS Cell	HNS Whole	MSci Biol & Chem
Adv. Biochemistry	TF		C(L)		C(L)	C(L)				C
Contemporary Issues in Ecology	SWL			C(P)					C(P)	
Behav. & Evolutionary Ecology	ND			C			C		C	
Cell Signals & PT	MDW		C		C			C		C @ level 4
Conservation Biology	ARH	C		C		C	Opt.-Route A		C	
Crop Protection	JAG		C(L)		C(L)	C(L)				
Development 2	PNH	C (L)or(BE)	C(P)			C(P)	Opt.-Route B(L)	C(P)		
Exp. Cell and Mol. Biol.	RRDC									C
Field Course	Various	C		C		C	C			
Health & Environment	SWL	C(L)		C(L)			Opt.-Route A(L)			
Molecular & Cell Physiology	DH	C	C		C		Opt.-Route B	C		
Molecular Basis of Disease	MDW	C(P)	C(P)		C(P)		C(P)			C
Neurobiology	DH						C(L)			
Palaeoecology	BH			C(L)or (BE)		C(Lit)				

C:\Teaching\3H Module Composition 2004.htm

C = Core Opt = Optional *Students take two of the three optional modules.

Natural Science students will undertake a literature review and make a poster presentation

Single Honours students will undertake a literature review, project and make a poster presentation. Cell Biology will undertake two poster presentations.

(L) – Lab work module; (BE) – Biological Enterprise; (Lit) – Literature Search. No () also indicates Literature Search. These denote how these modules will be assessed.



Biology Enterprise Elective

Collaborative venture between the School of Biological and Biomedical Science and the Durham Business School

Aims:

- **To study in depth a chosen topic in biological science**
- **To introduce science students to the key processes of business start-up**
- **To enhance students' enterprising skills and behaviours**



Biology Enterprise Elective

- **The Business Elective offers an alternative to the traditional laboratory-based project**
- **The module is partly project orientated and runs throughout the final year**
- **A structured lecture course is delivered throughout terms 1 and 2**
- **Involves both group work and independent learning activities**
- **Includes both group and individual assessments**



Biology Enterprise Elective

Outcomes:

By the end of the module, students should be able to:

- **Discuss in depth a chosen topic in biological science**
- **Understand how to plan for the launch of a new business venture**
- **Be aware of the challenges encountered in the launch process**
- **Demonstrate an understanding of the responses and strategies used to overcome these challenges**
- **Have developed / improved their enterprising skills, behaviours and attitudes**

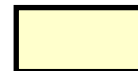


What is involved?

- **Students generate an idea for a business opportunity that is based on a scientific discovery**
- **Students apply their knowledge and understanding of science to develop and research their idea into a technology that can be readily commercialised**
- **The Business School teaches students the necessary skills and knowledge required to develop their idea into a successful business**



School of Biological Science



Business School



What are students required to produce?

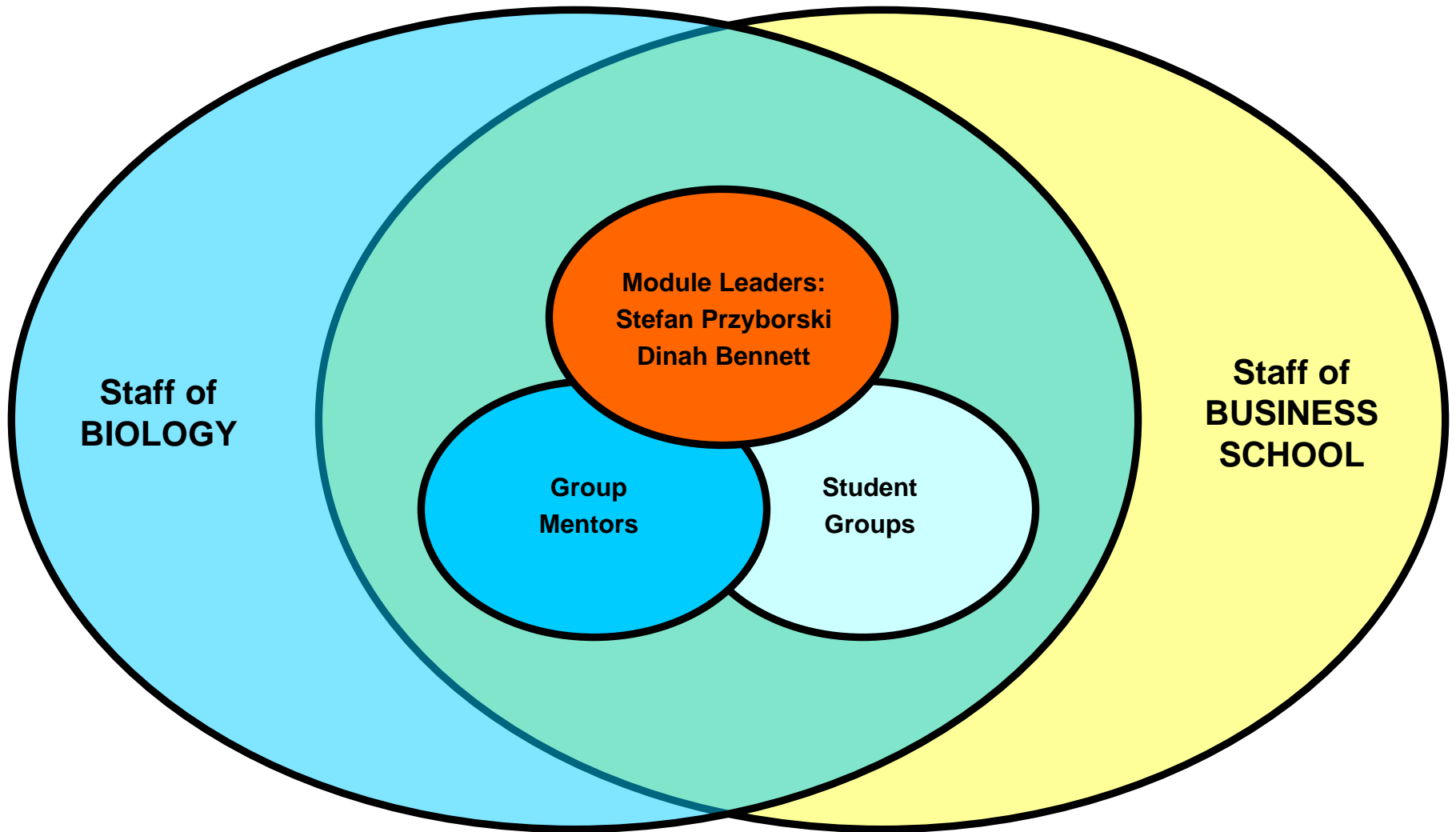
**Produce a
business plan**

**Write an
extended essay**

**Prepare a
presentation**



Team work



Team work

- **Students form self selecting groups of between 5 and 6 people**
- **Group formation partly dependent on degree route, student relationships, and results from personality assessment**
- **Each group is assigned two mentors, one from Biology the other and from the Business School**

For 2004/5:

Business School:

Mr Alaric Fairbanks

and

Mr Nik Grewer

and

Mr Keith Herrmann

and

Mr John O'Brien

and

Ms Rachael Orange

and

Mrs Krista Roberts

and

Mr Jeremy Wright

and

Biological Sciences:

Dr Martin Watson

Dr Chris Thomas

Dr Stefan Przyborski

Dr David Hyde

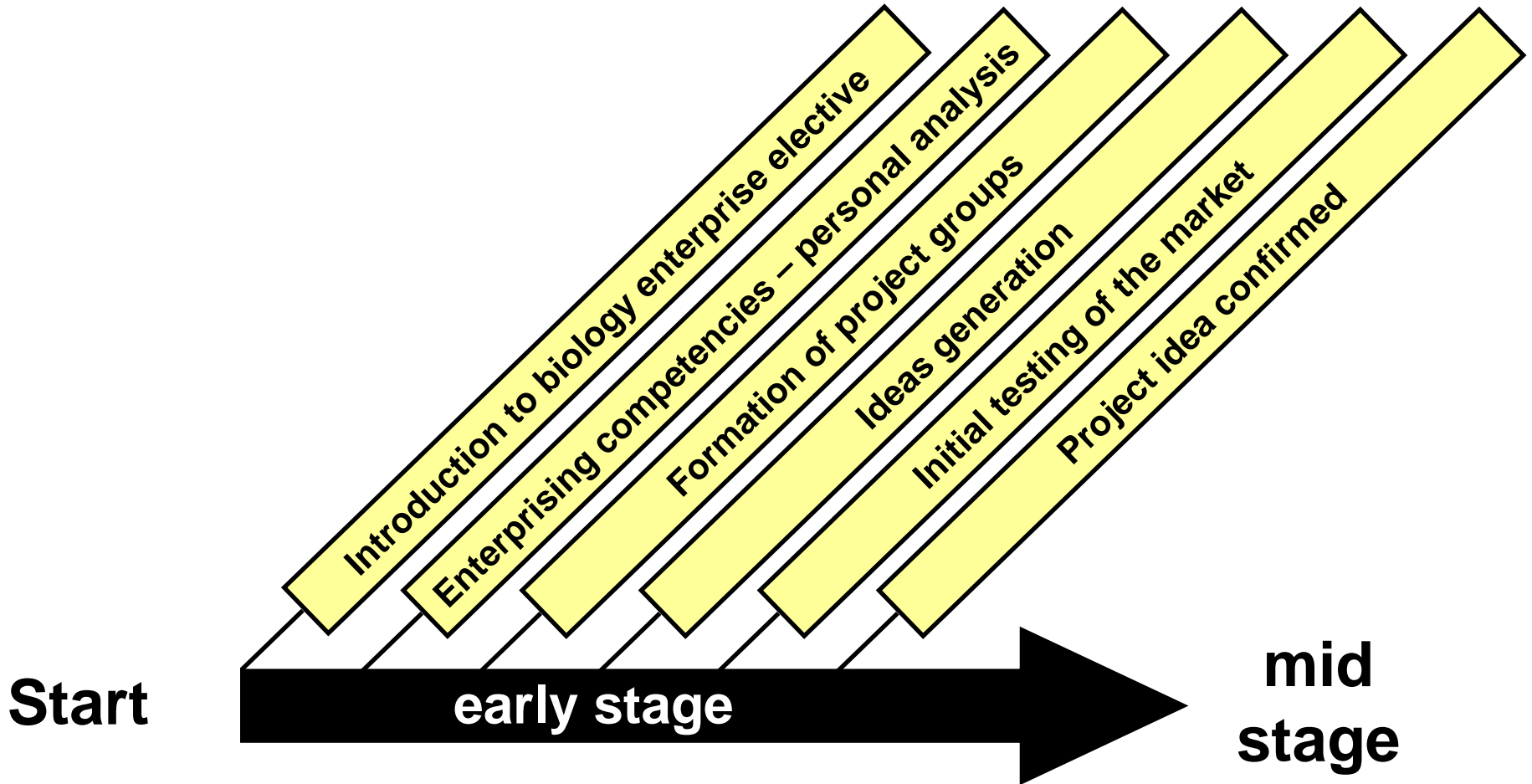
Dr Arto Maatta

Dr Susan Pyner

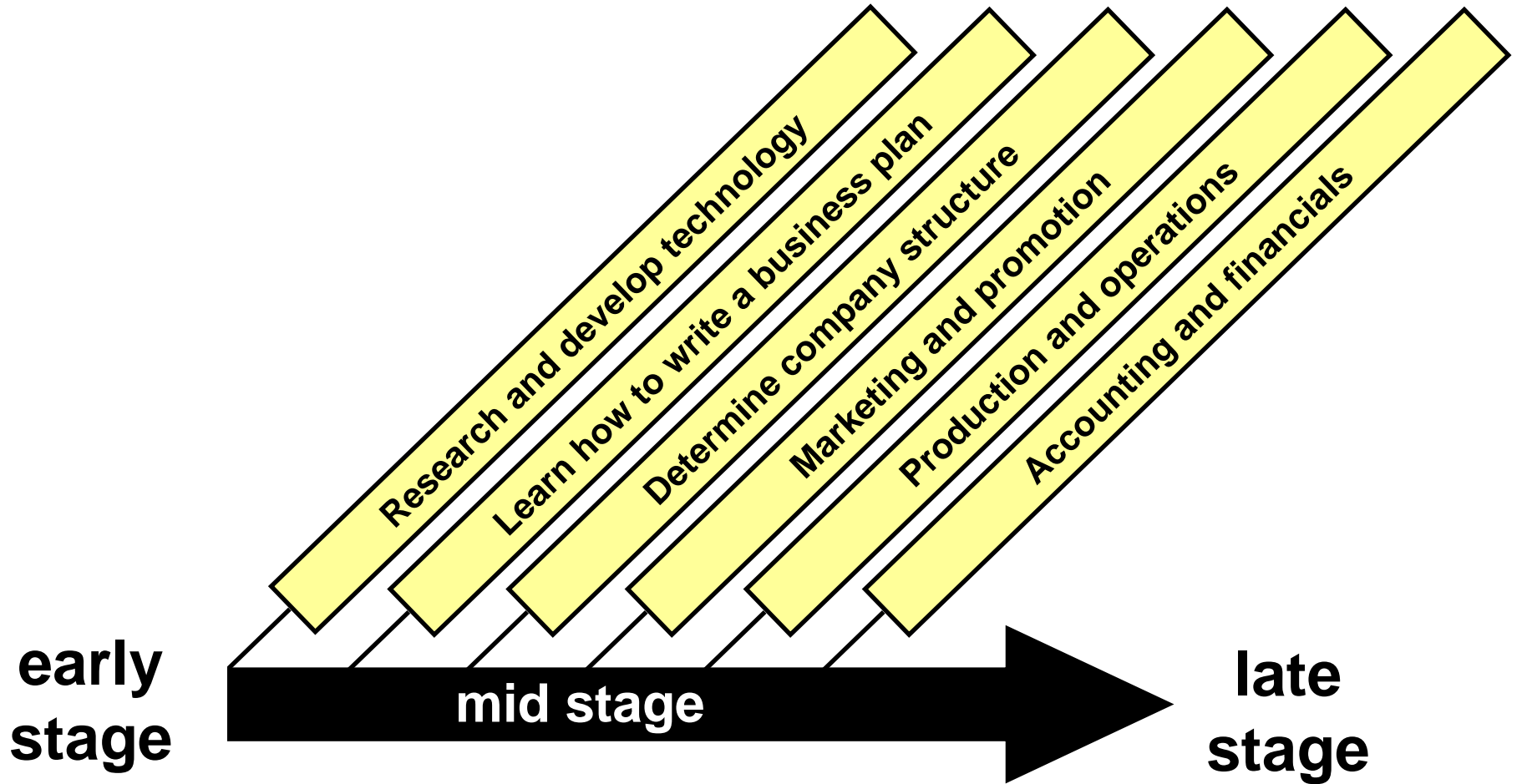
Dr Tony Fawcett



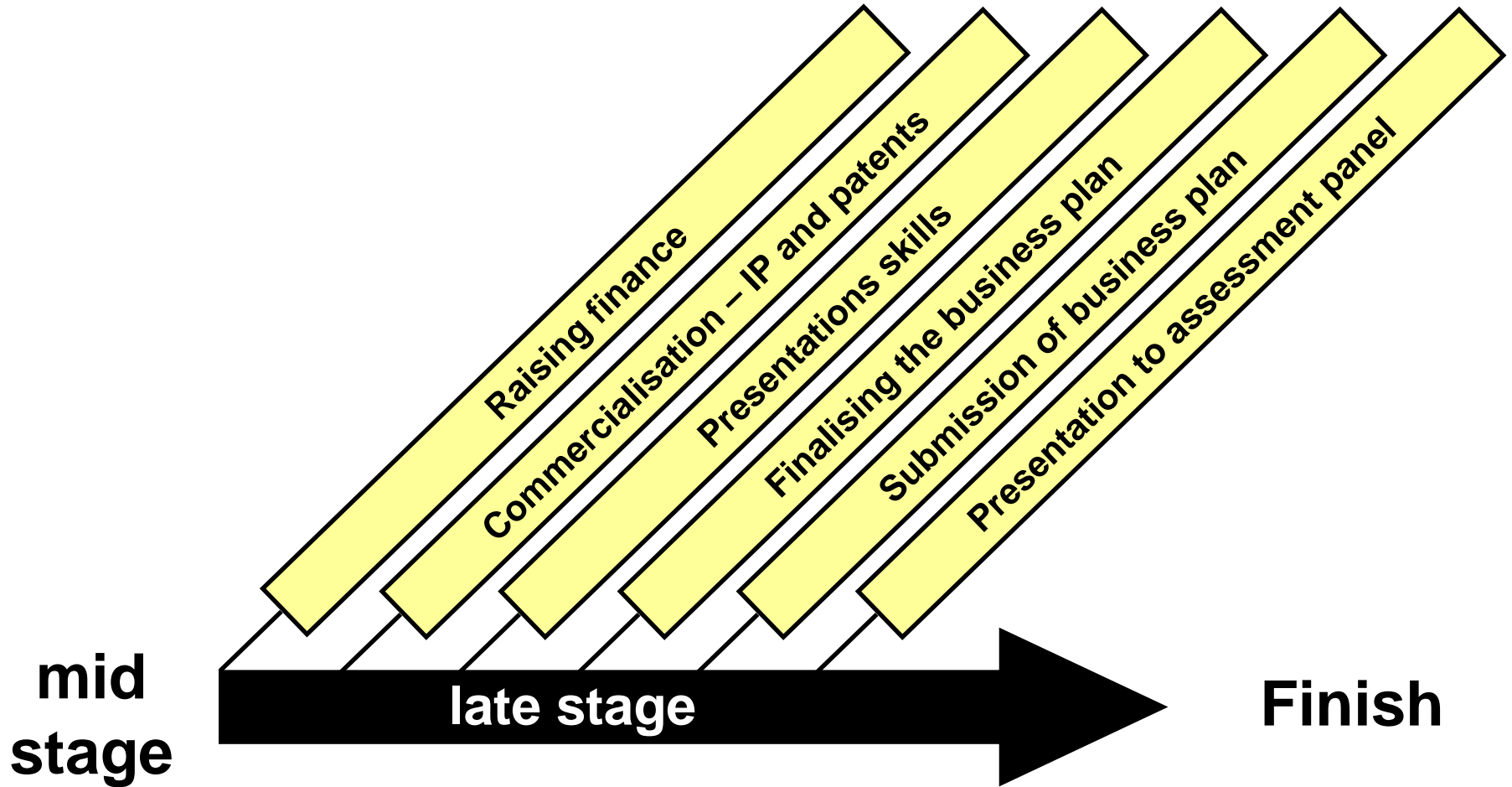
Course content: early stage – weeks 1 to 5



Course content: mid stage – weeks 6 to 16



Course content: late stage – weeks 17 to 22



Timetable

Term and Dates	Time	Workshop and Seminar Stream Themes	Outputs	Content of Session	Staff	Duration
Term 1						
18.10.04	1515 - 1715	1. Small Business and Enterprise: An Overview <ul style="list-style-type: none"> ▪ Elective Introduction ▪ The business start-up process ▪ Enterprising Competencies: personal and team analysis tools (Belbin, Myers-Briggs) 	<ul style="list-style-type: none"> ▪ Provisional project groups formed ▪ 2 analysis tools completed ▪ Students able to use idea generation/creativity techniques 	Overview of elective Distribution of MBTI and Belbin questionnaires and the Business Start up Process	DB	2 hours
25.10.04	1515 - 1715	2. Interpretation of Myers-Briggs results <ul style="list-style-type: none"> ▪ Formation of Project groups 	<ul style="list-style-type: none"> ▪ Project groups established ▪ Individual understanding of analysis tools results ▪ Initial project idea outlined 	Analysis of MBTI and Belbin team roles Individual awareness of personal characteristics and preferred team roles	DB	2 hours
01.11.04	1515 - 1715	3. Ideas generation	<ul style="list-style-type: none"> ▪ Initial project idea outlined Project groups established 	Tools and techniques used to generate business ideas	WP	2 hours
08.11.04	1515 - 1715	4. Testing the Market: How Do You Know There Is A Market For Your Idea?	<ul style="list-style-type: none"> ▪ Understanding of different ways to research a market ▪ Ability to use market segmentation tools 	Market research techniques	JW	2 hour
15.11.04	1515 - 1715	5. Meeting With Your Mentors <ul style="list-style-type: none"> ▪ Personal and team SWOT Analysis 	<ul style="list-style-type: none"> ▪ Project idea confirmed ▪ Resource requirements for task completion clarified 	Discussion with Mentors concerning nature of the proposal and scientific basis of the project	All tutors	2 hours
22.11.04	1515 - 1715	6. The World of the Small Business (1): Insight from an Entrepreneur	<ul style="list-style-type: none"> ▪ Contextualisation of projects in the commercial world ▪ Insight into motivations of entrepreneur 	Input and discussion with owner-manager	Ron Batty/ RO	2 hour

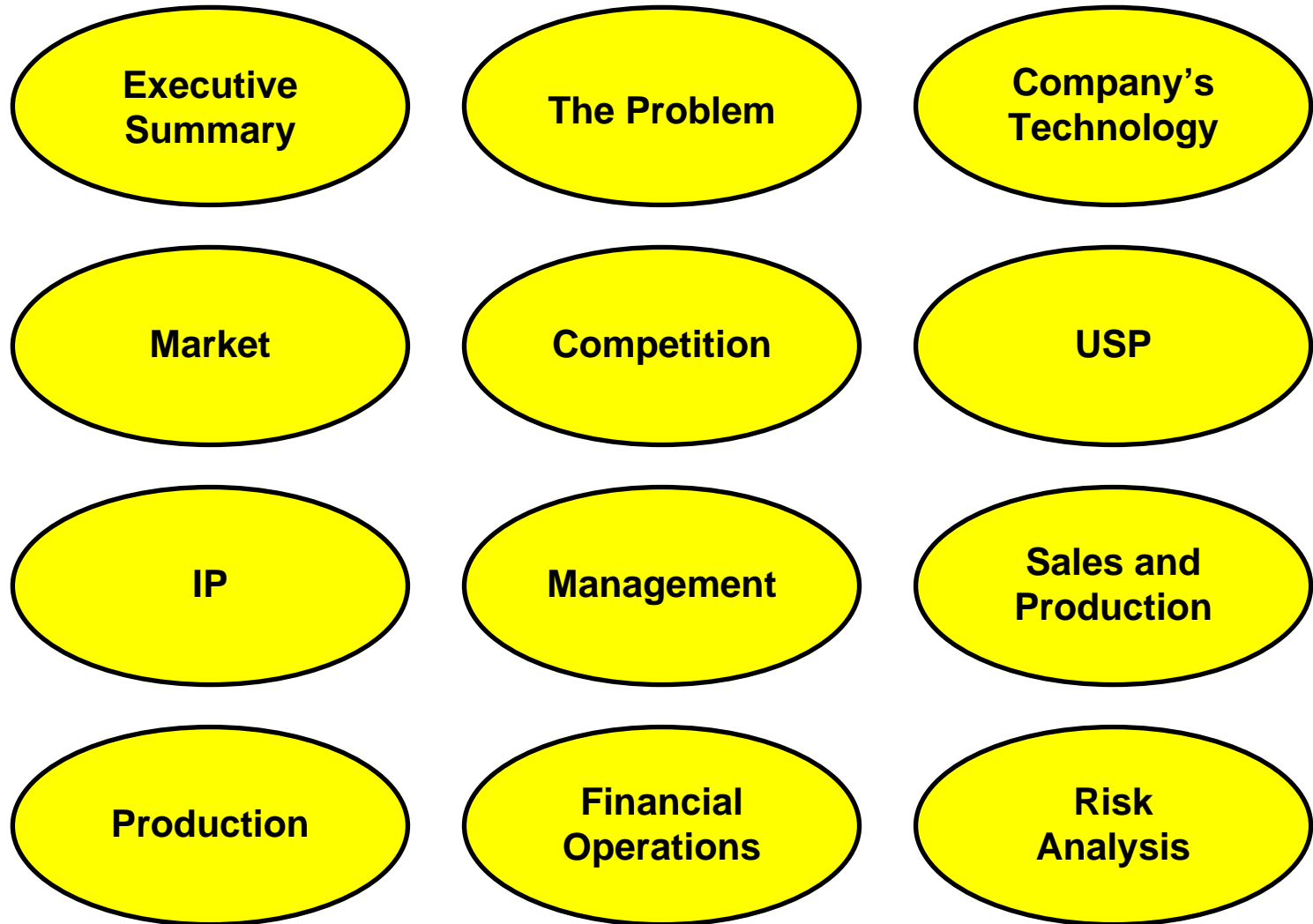


Additional Support

- **Reading lists & recommended texts**
- **Durham University Online**
- **Web links and online sources**
- **External speakers**
- **Main University and Business School libraries**
- **Technology transfer office**
- **Enterprising academics (Spinout Companies)**



Business Plan



Presentation



Investment Panel

- **Panel membership**
- **All students contribute**
- **Individual and group assessment**



Example Businesses

- **FIRST DIAGNOSTICS** **cholesterol self testing kit**
- **MORAPEL** **oral insect repellent**
- **LEDRELL INNOVATIONS** **diabetes breath tester**
- **BIOCLEAN TECH LTD** **biodegradable chewing gum**
- **DIAGNOSTIC INNOVATIONS LTD** **rapid chlamydia test**
- **VIT-A-MAX LTD** **vitamin and mineral assay kit**
- **TISSUE TECHNOLOGIES** **stem cell banking**



Case Study:

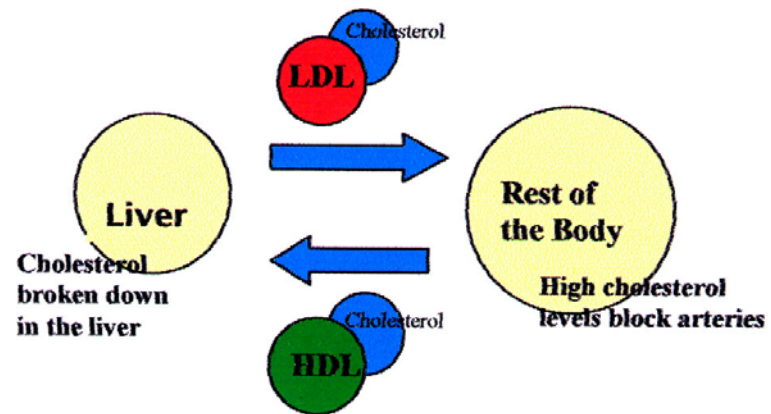
FIRST DIAGNOSTICS



Coronary
heart disease

Levels of
cholesterol

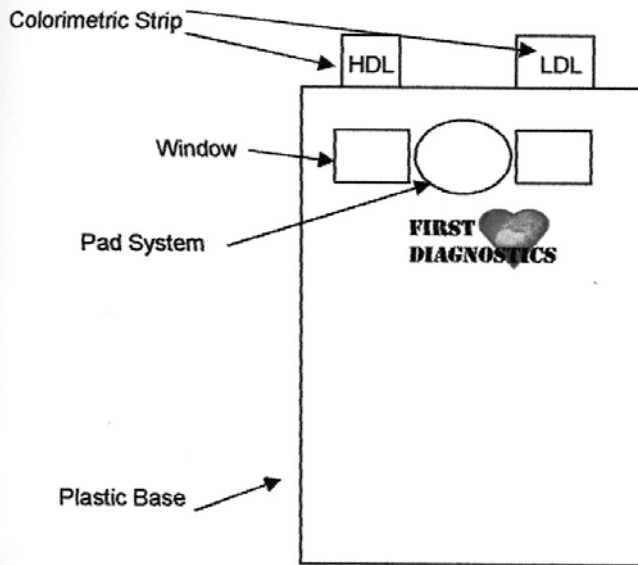
LDL : HDL
ratio



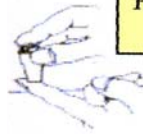
FIRST DIAGNOSTICS

Cholesterol self test kit

Front view of Cholest-a-Test™



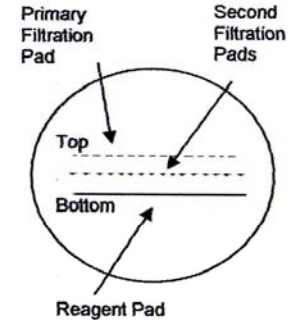
Prick finger with lancet and completely cover pad system with blood



Leave for 3 minutes

During this 3 minutes blood soaks through 3 filters⁵:

1. Primary filter removes erythrocytes
2. Secondary filter removes everything apart from HDL and LDL
3. Reagent pad produces two colour changes. One is proportional to the concentration of HDL and one is proportional to the concentration of LDL

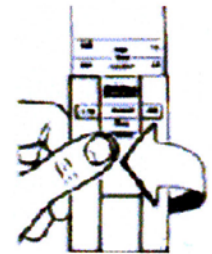


The colour of the two halves of the pad system will change

By moving the colorimetric strips, match the colour of the pad system with a colour on the colorimetric strip in the window

Turn over the test kit and read the level of HDL and LDL in the two windows

Use table in instruction booklet to calculate a person's risk of developing CHD⁶



FIRST DIAGNOSTICS

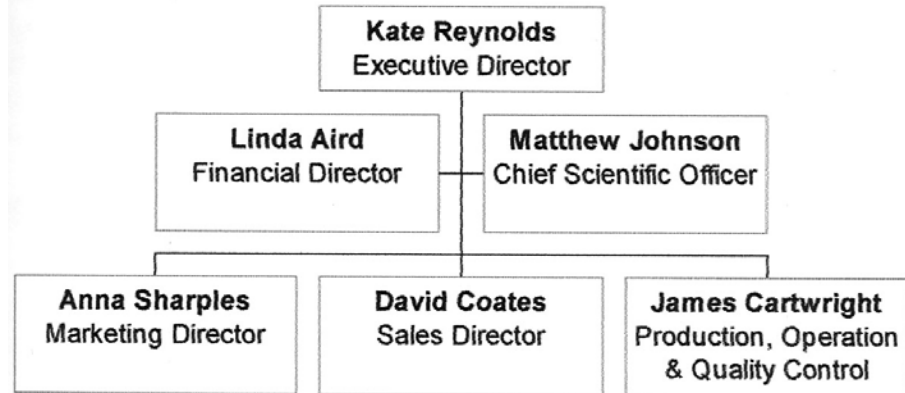


Assessed the
competition

Market
research

Sales and
Promotion

Financial
Operations



- **Patented & proven technology**
- **Developed by leading academic**
- **Established trails**
- **Breakeven within 1-2 years**
- **Personal risk incurred**
- **Require £60,000 initial investment**



Summative Assessment

Business Plan

60%

Group assignment broken down into two components:

- 1) Scientific content (35%)
- 2) Business and finance (25%)

Individual Assignment

30%

Extended essay on a subject within the business plan

Presentation to the Panel

10%

Formal presentation to a panel of experts.

Both group and individual marks are awarded



Assessment of the Science

- **Priority**
- **Appropriate coverage**
- **Sound understanding**
- **Critical assessment**
- **Scientific writing**
- **Quality**

Class 00	Symbol	% Mark	Descriptor
I	A+	90-100	Brilliant. Exhaustive coverage, almost exclusively based on a body of primary literature that is selected with near- faultless judgement. Seamless structure to the entire piece that reflects a clear logic, very well written and presented.
		75-89	Outstanding. Near comprehensive coverage of the topic - minor gaps are permitted if justified elsewhere. All arguments supported by primary references, almost all selected with a critical appreciation of their significance. Secondary references used for background information only. Logical structure and clearly written.
	A	70-74	Excellent. Broad coverage of the topic. Clear evidence of critical judgement in selection and evaluation of primary literature. Well written with good structure.
II(i)	B++	65-69	Very Good. Good coverage of the topic. Evidence of critical assessment of the primary literature. Secondary sources are used only infrequently to support major points. Clear structure to the dissertation.
	B+	60-64	Good Reasonably good coverage of the topic. Some evidence of critical selection of primary literature.
II(ii)	B	55-59	Satisfactory All key points of the topic included. References are used appropriately. Dissertation must retain structure and relevance throughout.
	B-	50-54	Fair All Key points of the topic included, but one of the following defects may be present 1. Some supporting references are inappropriate. 2. Lacks clarity; does not retain relevance to the topic throughout 3. Rather thin, which may be evidenced by repetition
III	C+	45-49	Mediocre Either more than one of the defects listed above or one of the following 1. Some Key points missing 2. Supporting references poor 3. Significant errors of fact or understanding 4. Muddled; lacking cohesion and direction
	C	40-44	Poor More than one of the above defects.
Pass	D	35-39	Very Poor. A very thin submission that contains some work relevant to the topic under study, but with a large amount of irrelevant padding
Fail	E	0-34	Fail. Marks in this region are awarded on a sliding scale. At the upper end scripts barely fail to meet the criteria set for D (above), ranging to zero when the work contains nothing of relevance. Marks are awarded within this range for overall presentation, the odd relevant sentence in context, but little or nothing else to suggest knowledge or understanding.



Personal Development

Development of skills:

- **Communication**
- **Presentation**
- **Team work**
- **Management**
- **Role play**
- **Organisation**



Development of the Business Elective

- **Feedback**
- **Reflective practice**
- **Promotion and recruitment**
- **Future expansion**

