

## Year 3 project investigations PX3350 (30 credit), PX3315(20 credit)

- **Two semester modules**
- Module organiser (MO): Dr David Westwood ([westwood@cf.ac.uk](mailto:westwood@cf.ac.uk), WX2.10, xtn 74992)
- Deputy MOs: Prof S Giblin and Dr A Papageorgiou

### **This introduction to projects:**

- Introduction to the Project modules (DIW)
- Working through a project (LB)
- About science – and how it's done (DIW)

Please check project lists in LC: if you don't yet have a project or if there are mistakes please contact me asap

# Introduction to the Project modules

Dave Westwood

# Project organisation: The modules

## PX3350 (30 credit, triple module)

- Most students take this module.
- Split: 10 credits in autumn (~ 7 hrs/wk), 20 credits in spring (~14 hrs/wk).

## PX3315 (20 credit, double module)

- Taken by Joint Maths and Physics students (FG31)
- Split: 10 credits in autumn **and** spring (~ 7 hrs/wk)

The modules are described (almost) identically.

The distinction is mainly in the expectations of effort and outcomes.

# Project organisation

## “Paperwork”

- Project materials are in [Learning Central](#):  
Support material - in the “[General Support Module](#)”.  
Handbooks, project forms etc - in [PX3315](#) and [PX3350](#).  
Info will be in “[Learning Materials](#)”, Turnitin submissions in “[Assessment](#)”.

## Organisation

- The most important document is the “[Project handbook](#)”.
- Communication (from MO) will be via the project mailing lists/announcements.

## General Facilities

- N1.30 (“PC lab” is **available** for projects in 2022\_23).
- N2.26 (project lab) is available (a lab induction is necessary).

# Support for Students in Projects

## Supervisor

- Mostly through regular student-super interactions.
- +Supervisors are asked to provide ***once-only-per-task***, pre-submission feedback.

## Module Organiser

- (Email) for general advice on anything project related. Mondays 10.00-11.45 “drop in” sessions online, or face to face by appointment
- +Support sessions for report writing.

## Library (Jessica Emerton)

- Week 2 session on (searching) the scientific literature.
- +Support sessions for report writing.

## Computing (Andreas Papageorgiou)

- Mondays 14.00-15.45 “drop in” sessions online, or face to face by appointment

## Learning central (outside project module)

- All-year Support material - in **Organisations/UG General Support Module/Laboratories and Projects.**

## Project assessment and assessment criteria

Assessment	PX3350	PX3315	Deadline
• Interim Report+Viva	20 %	formative	rep aut wk 11, viva wk 12
• Oral Presentation	15 %	20%	spring (wk 10 or 11)
• Project Report	40 %	50%	spring week 12
• Super's Assessment	25 %	30%	(final diary - spr week 12)

- Pay close attention to the “**Task descriptions**” and guidance in **handbook**.
- “Performance of task” is judged against generic “decile level descriptors”.
- “Major lapses” identify what is important (e.g. an electronic diary)
- Together these are the **assessment criteria**.

Deadlines are strict.

**Plagiarism can be very costly.**

Watch out for (Turnitin) word limits.



Working through a project  
-Leo Beltrachini



# Working through a project: timeline

## Autumn 2022 (starting your project)

- Week 1: Make contact with supervisors.
- Week 2: **Library session (literature surveys)**  
**Submit original aims&objectives sfty and ethics**  
Address safety etc implications for your project

Start building/getting-into the project

- Week 6: 1<sup>st</sup> diary submission
- Week 11: submit **interim report** + diary
- Week 12 (after Christmas): **Viva voce** (oral) exam

Secure your understanding (don't forget the basics)

## Spring 2023 (completing your project)

- Receive feedback from interim report and viva
- Week 6: 3<sup>rd</sup> diary submission
- Week 9, 10 or 11: **Oral presentation**
- Week 12: Submit **final reports** and **diaries**

Use your understanding, look to influence the project/set objectives – even small is good (being “independent”)

From week 7 on “bring it home”: What have you got? What does it all mean?

# 1 Health, Safety and the Environment (HSE) and Ethics

**Q Who has responsibility for HSE and ethics? A We all do.**

- **In projects** the first action of the MO is to pass this on to the individual supervisors
- Students must then follow these systems.

**Be aware:**

- To work in **ANY laboratory** requires: **induction** into that lab environment; sign off against agreed **risk assessments**; +(sometimes) specific training.
- Working extensively with **computers** comes under “display screen equipment DSE” guidance.
- **Working with information gained from or associated with other people off-site or with children** requires formal **ethics** approval.
- **Once authorised** to perform a task you have responsibility: to yourself; to others; to the environment.

**Do not perform any work unless you are confident that:**

- The **required documentation** is in place.
- You can perform the activity safely and ethically.
- You **know what to do** if things go wrong.

With your supervisor complete your “**Original Aims and Objectives and Safety Overview**” document – and submit to Turnitin (deadline end of week 2, 14/10).

# Writing and getting approval for risk assessments and ethics documents

- Projects sometimes require students to generate such documents
- Learning how to write these is a valued skill
- The whole process – writing, seeking approval, re-writing – takes time (weeks)
- Corners cannot be cut as procedures must be safe and ethical

The approvals process is not the same:

- Risk assessments can be approved by a competent person – the process can usually be kept within a laboratory.
- Ethics approvals must be agreed by the School ethics panel – which leads to the need for strict deadlines to the process.

**Only with approval can students proceed – perform experiments, circulate surveys etc**

## Extra notes on Ethics

- If your project involves human data (surveys, imaging, etc.) you need ethics clearance
- If the project is new, a full submission is required. In this case, the supervisor must support it.
- Ethics submissions for the academic year are due on Friday week 11, Autumn.
- Engaging early with it is key!
- More information available in LC - [physics-ethics@cardiff.ac.uk](mailto:physics-ethics@cardiff.ac.uk)

## Week 1

- Contact your supervisor asap –email is good.
- Make arrangements to “meet” regularly (~weekly).
- With your supervisor complete your “[Original Aims and Objectives and Safety Overview](#)” document – and submit to Turnitin (deadline end of week 2).
- Start making electronic diary entries.

## Week 2 – Monday 10.00-13.00 (3 sessions)

Training and induction (ALL students)

- 1 hour Literature-search training session with Jessica Emerton (library).

Groupings (please try to attend as below)	Literature Searching (in N1.30, PC laboratory)
Surnames A-G	10.00 – 11.00
Surnames H-M	11.00 – 12.00
Surnames N-Z	12.00 – 13.00

## End Week 6

- Submit 1<sup>st</sup> version of your electronic diary (pdf).



# About science – and how it's done

## Dave Westwood



# What is science? What does it mean to “do science”/perform a scientific investigation?

Wikipedia says:

\***Science** (from Latin *scientia* 'knowledge')<sup>[1]</sup> is a systematic enterprise that builds and organizes knowledge in the form of testable explanations and predictions about the universe.<sup>[2][3][4]</sup>

Scientific  
knowledge

Well-known/accepted

Uncertain

Not-known



# What is science? What does it mean to “do science”/perform a scientific investigation?

- Scientists first build “personal knowledge” of existing “scientific knowledge”.
- Scientific knowledge is then used, challenged and extended.
- Outcomes should be scientific, not personal.
- Outcomes only convince others via evidence and reasoned explanation.



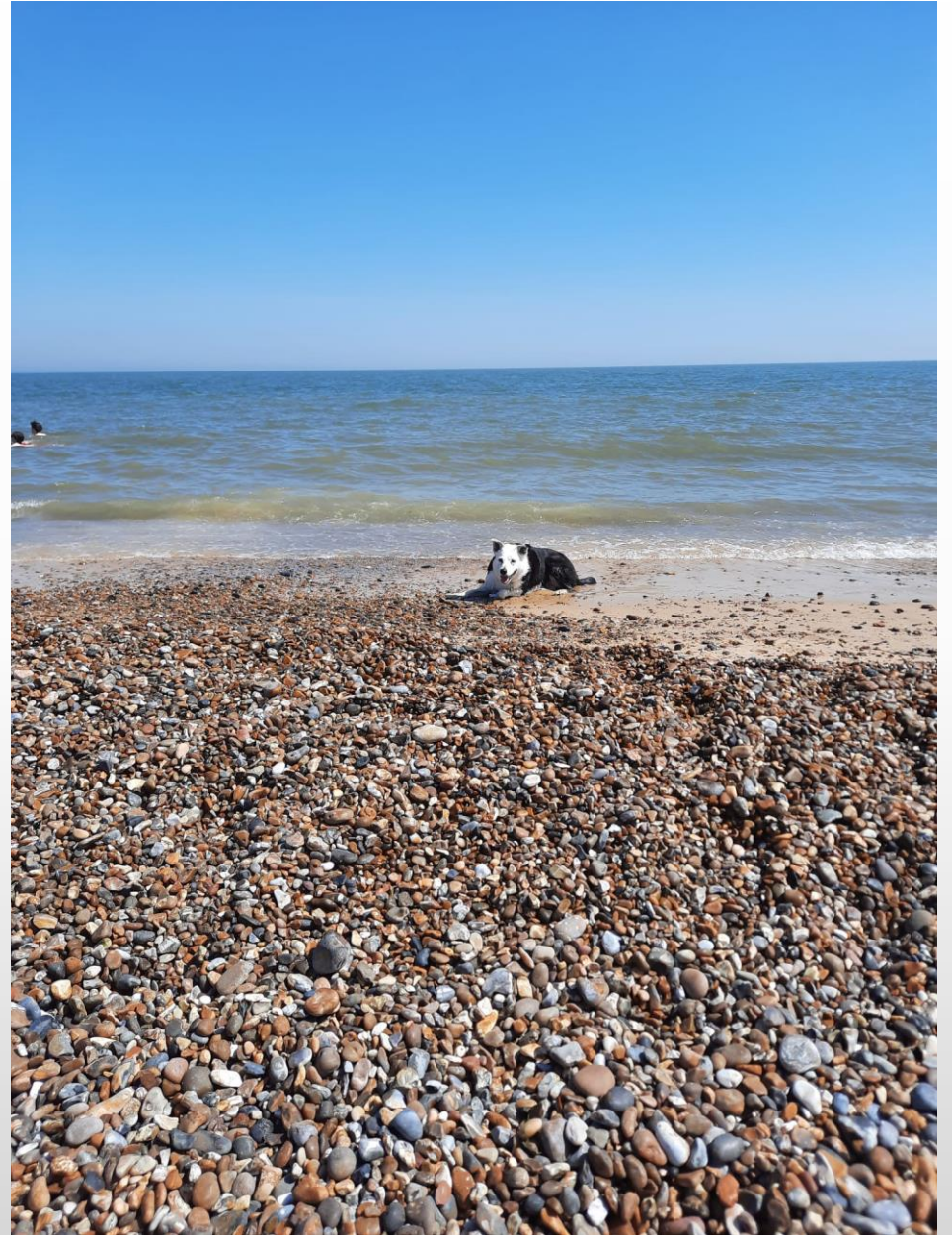
Scientific  
knowledge

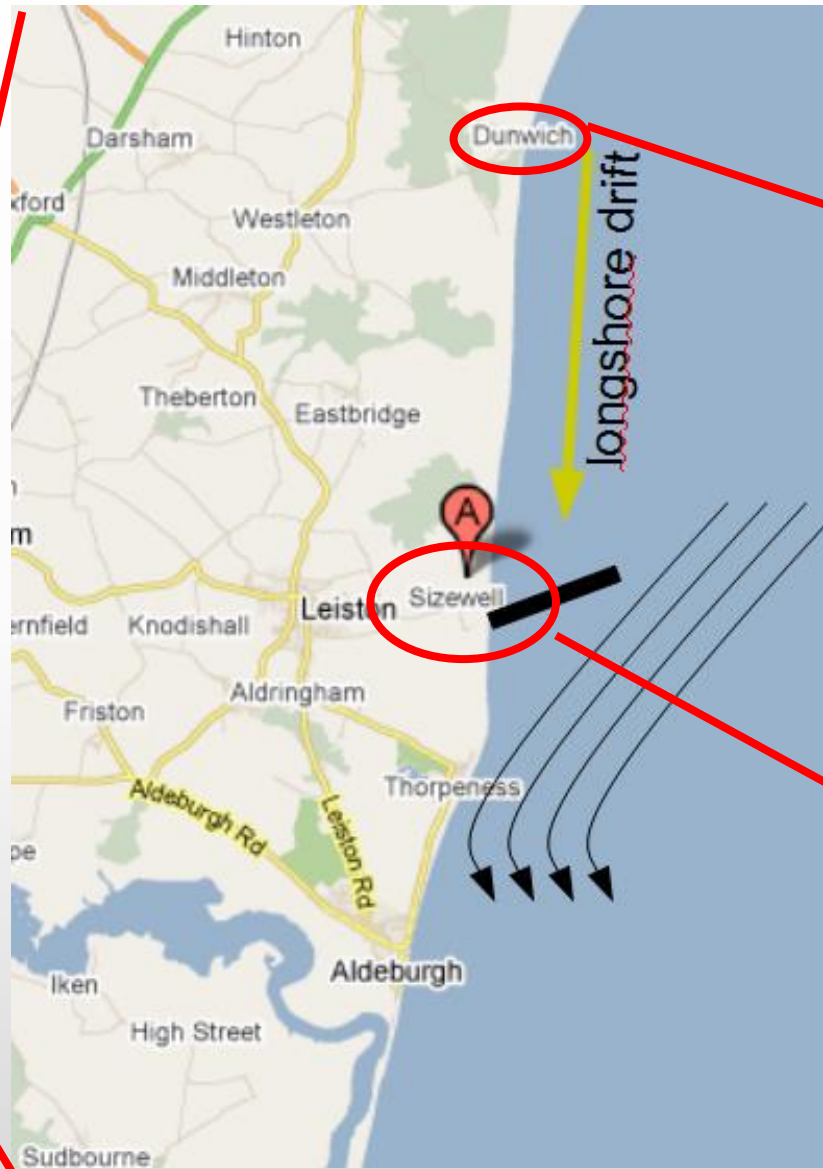
Well-known/accepted

Uncertain

Not-known

# Physics on the Beach (in the far East)





Science: on the  
Suffolk coast

The “lost city” of  
Dunwich:  
Is now a (dog  
friendly) beach

Sizewell:  
Home to A, B and  
maybe C

[Coastal Erosion at Sizewell | Peter Lux \(plux.co.uk\)](https://plux.co.uk)

# Elements of a scientific investigation

Training, Mon am Week 2

1 A literature survey

The elements overlap, but **projects vary** a lot.

2 The Project activities

There may be **opportunity for iteration**.

Yours may be one, linear, run through.

3 Raw outcomes (e.g. results)

New to students

- making use of the **academic literature** in building knowledge.

-developing knowledge and understanding **over an extended period**.

4 Analysis

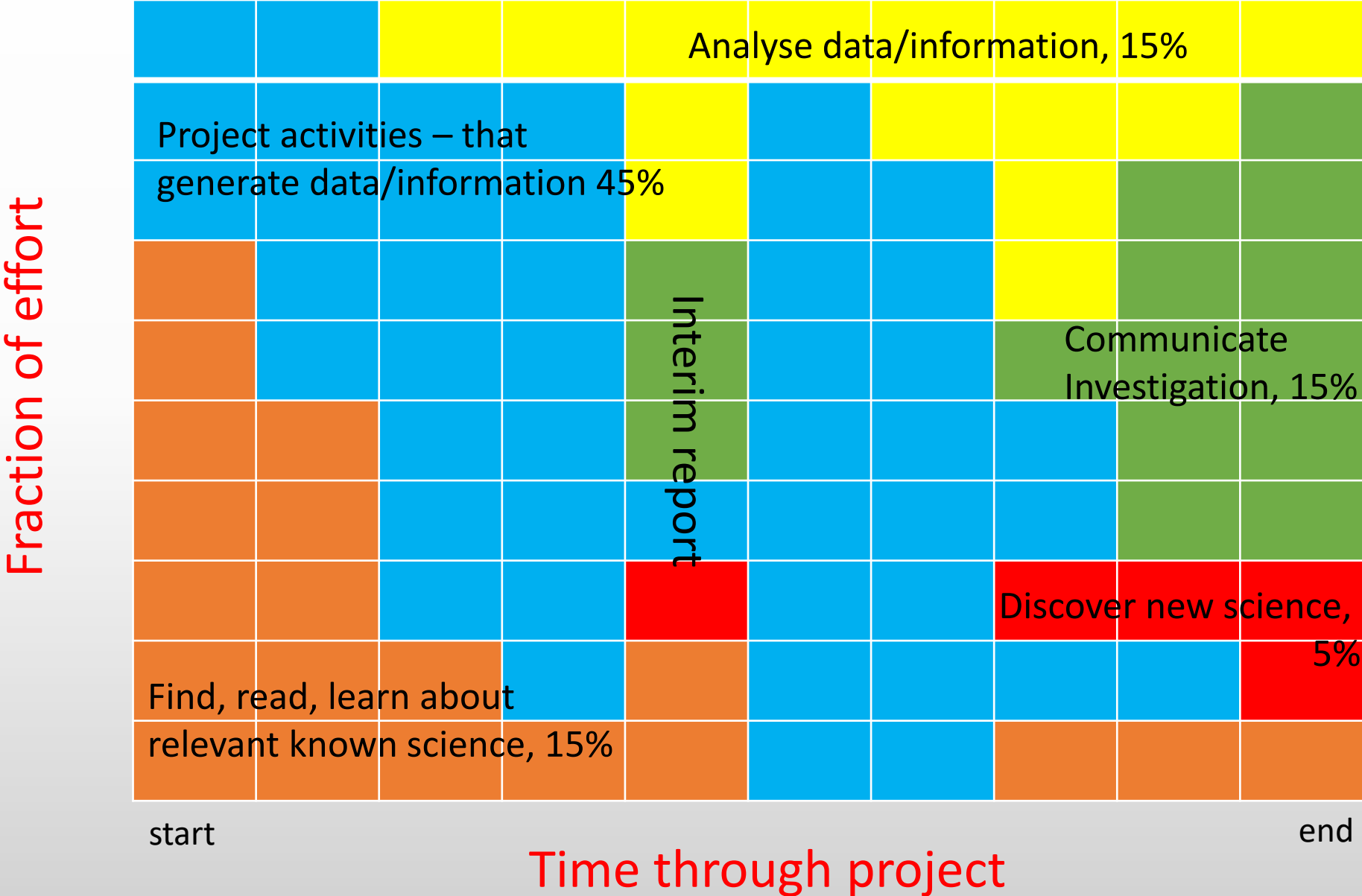
5 Final outcomes (scientific meaning)

6 Communication

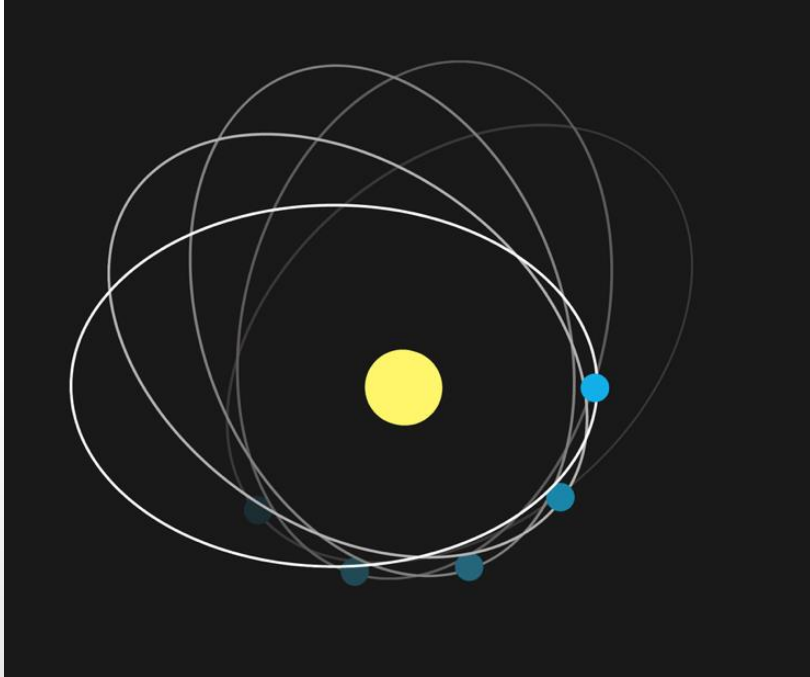
Explain, evidence and convince others of **your science** – why should we believe you?



# Variation in allocation of effort through project



# A scientific investigation: The perihelion of mercury (point of closest approach to the sun)



- **Measurements** showed the perihelion of mercury precesses at  $\sim 575$  arcseconds ( $0.159$  degrees) per Earth-century.
- “**Known theory**” (Newton’s) accounted for  $\sim 530$  arcsec/century.
- The remainder ( $\sim 45$  arcsec/century) is now attributed to general relativity, GR.
- **Predictions** of GR are now tested through precise measurement.