

# NSG

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# Project Management for Doctoral Students

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# Agenda

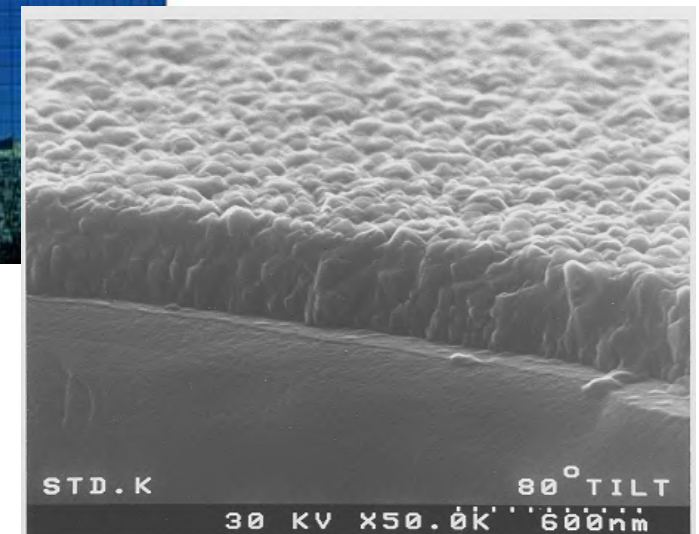


- What does NSG do?
- What is a project?
- Why do we need to manage projects?
- Project Management for Industrial work
- Project Management for D. Phil studies

# Buildings - outside

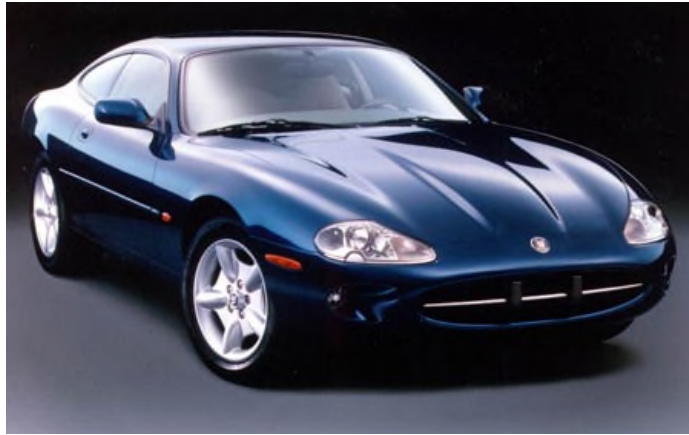


Beijing Global Trade Centre  
55,000m<sup>2</sup> Pilkington Arctic Blue Eclipse Advantage



# Transport

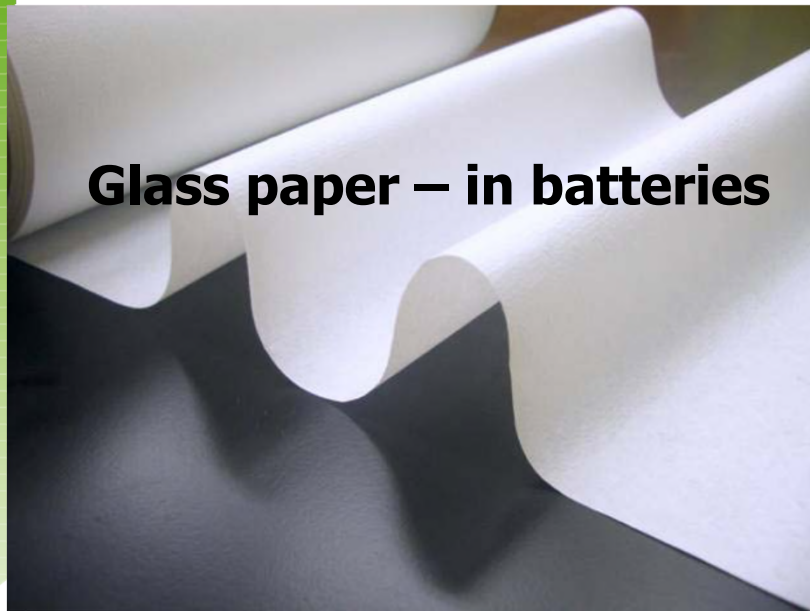
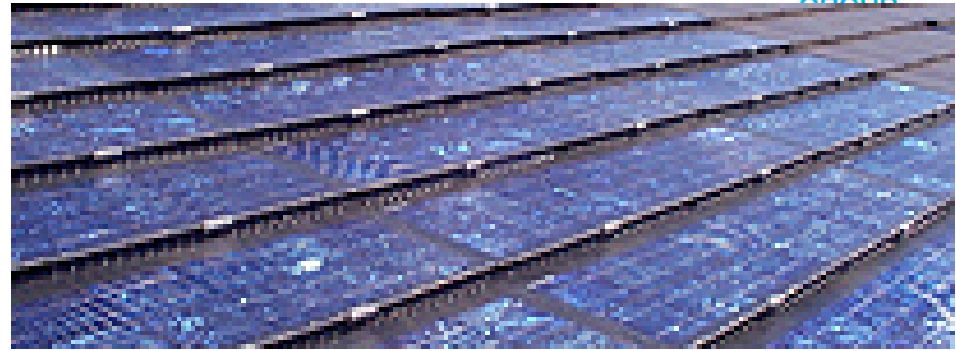
NSG



Switchable rooflight – Sundym Select™  
Based on Suspended Particle Device technology

# Power and light generation.....

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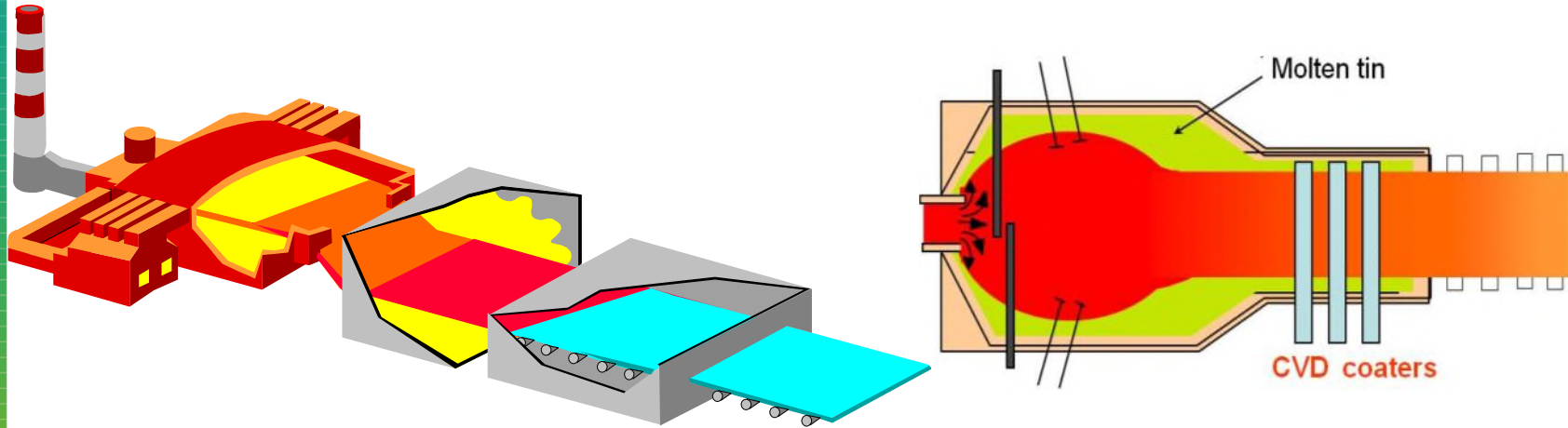


**Glass paper – in batteries**



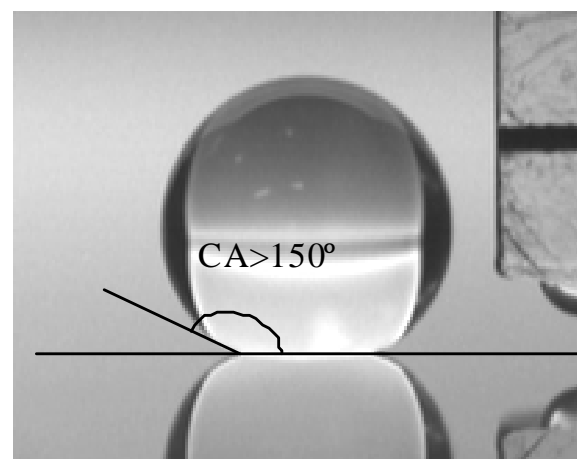
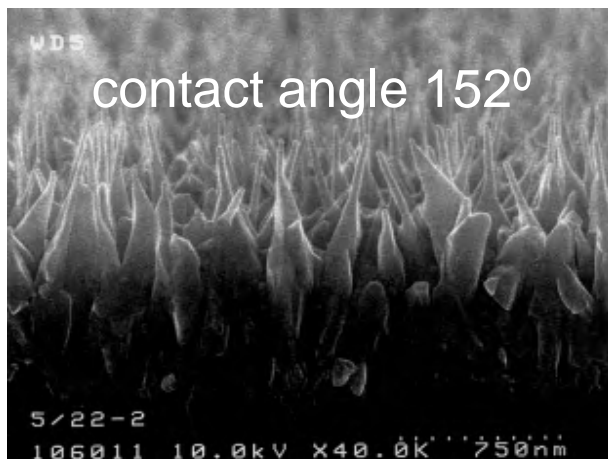
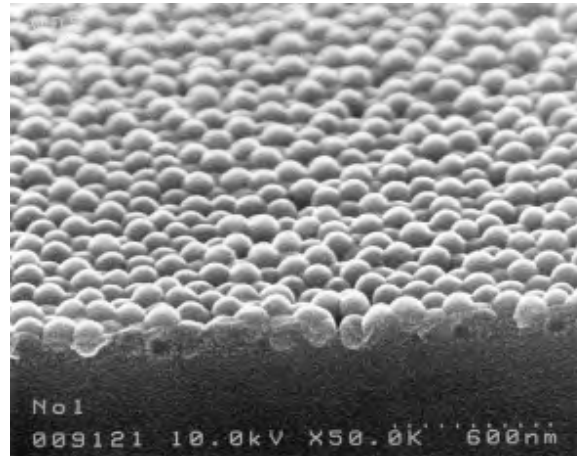
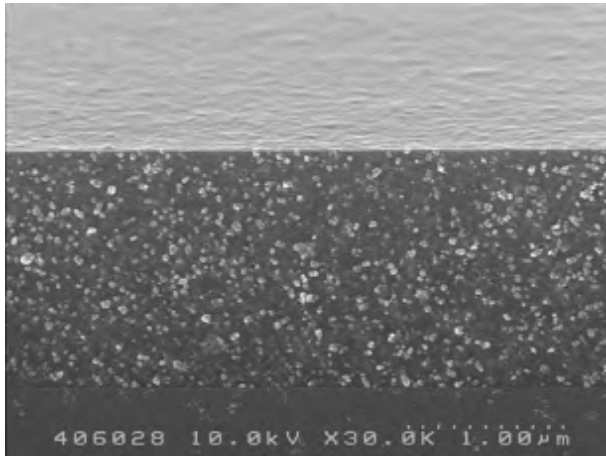
**Glass flakes – paint  
and lipstick**

# Coating technologies – CVD, PVD



# Sol-Gel, 'wet chemistry'

Wide range of target morphologies possible



- Sol gel coatings for a number of applications
- Liquid applied by roller or spray then cured
- Unique coating microstructures and properties



# Some comments....

- Prediction is very difficult, especially about the future.  
*(Neils Bohr)*
- It's not the plan that is important, it's the planning.  
*(Dr Graeme Edwards)*
- Planning is an unnatural process; it is much more fun to do something. The nicest thing about not planning is that failure comes as a complete surprise, rather than being preceded by a period of worry and depression. *(Sir John Harvey-Jones)*
- Trying to predict the future is like trying to drive down a country road at night with no lights while looking out the back window.  
*(Peter Drucker)*

# What is a project?

- A project is a human activity that achieves a stated objective against a time scale
- Usually....
  - a definable start and end point
  - a clear objective
  - a fixed time scale
  - requires resources
  - a team of people, but one person is responsible
  - little opportunity for practice/rehearsal
  - involves change

# When should a project be planned?

- Always - no matter how small or unpredictable
- A successful project will always allow time for planning - at the start and through the project
- Unsuccessful projects leave the planning until things start to go wrong
- Plans need to be appropriate to the size of the project

# Key components of a plan

- (i) Why are you doing the work? (ii) Who is the work for?
- (iii) Consideration of Time/Cost/Quality
- (iv) How do you know how well the work is going?
- (v) What if the work doesn't go to plan?

## (i) Why are you doing the work?

- Because it's a new product you'll be able to sell
- Because it's an improvement to your existing processes
- Because it's an exciting piece of new science
- Because you want your D.Phil degree

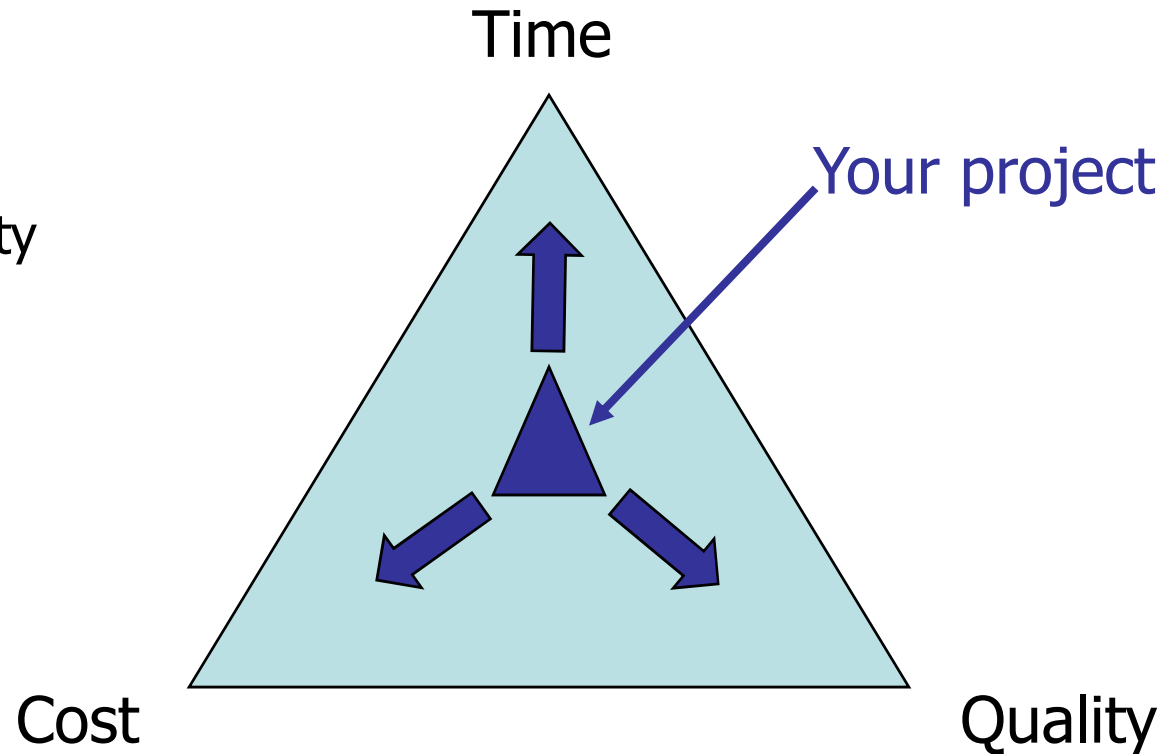
## (ii) Who are you doing the work for?

- Concept of stakeholders - projects have various 'interested parties'....
- Sponsor
- Gatekeepers
- Project Manager
- Project Team Members
- Who are your stakeholders? Yourself, your Supervisor, the Department....?

## (iii) Time/Cost/Quality

### Ideal

- On Time
- Under Budget
- Acceptable Quality



“Fast, Cheap, and Good...pick two. If it's fast and cheap it won't be good. If it's cheap and good it won't be fast. If it's fast and good it won't be cheap.”

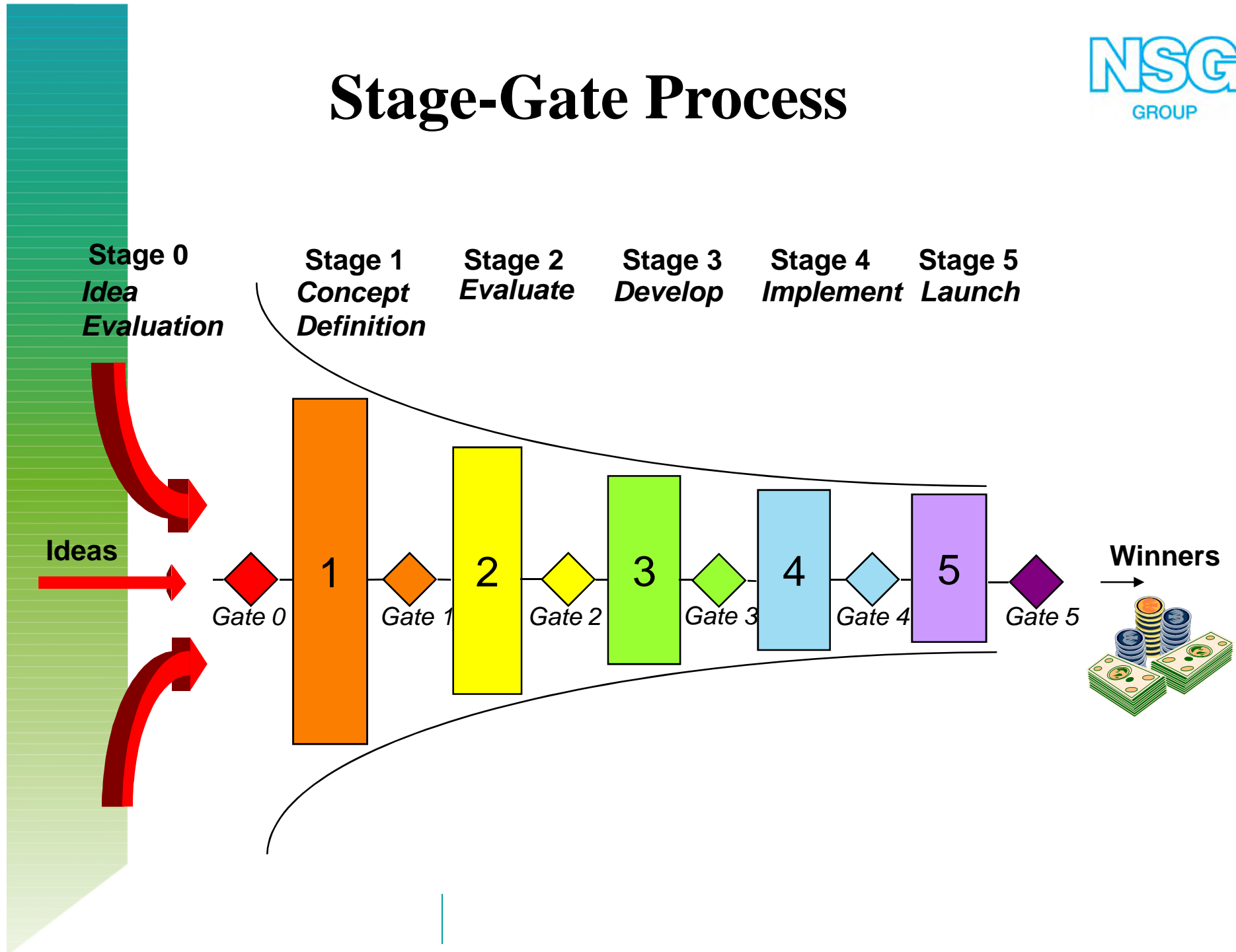
Fast, cheap, and good...pick (2) words to live by.  
(Jim Jarmusch)

## (iv, v) Milestones/Quality

- How do you know how well the project is going?
- Set 'Milestones' - intermediate targets that need to be met before further progress can be made
- How do you know whether a target has been met?
- You need some measurement of 'Quality'



# Stage-Gate Process



# What things does industry consider?

- **Market Analysis**
  - Customer need/benefit, Preliminary product/process description
  - Initial cost benefit analysis (sales/volume, existing product impact etc)
  - Competitor position/response
- **Technical Analysis**
  - Preliminary product/process specification, Technical feasibility & risk analysis
  - Patent issues, Alternative technologies/options (JV, licensing etc.)
  - HS&E assessment
- **Manufacturing Analysis**
  - Potential manufacturing location(s), Compatibility with existing processes
  - Impact on existing capacity, Logistics (Raw Material -> customer delivery)
- **Financial Analysis**
  - Development Costs, Capital Costs
  - Product/Process costs, Cost of manufacture, Average price/profit/return on sales

# Some Project Tools

- Work Breakdown Structures
- Gantt Charts
- Critical Path Analysis (PERT Charts)
- Contingency Planning
- Failure Mode Effects Analysis
- Pareto Charts

# Work Breakdown Structure



- Consists of....

*One* high-level Objective

*Some* Work Packages

*Lots* of Tasks

**Work Package    Work Package    Work Package**

Tasks

Tasks

Tasks

→ **Objective**

Tasks

Tasks

Tasks

**Work Package    Work Package    Work Package**

**Work  
Breakdown  
Structure**



# Gantt Charts

- Similar information to a Work Breakdown Structure
- Crucial difference is the addition of a *timeframe*
- No time-dependencies shown - so direct Critical Path Analysis cannot be computed.
- No direct consideration of Quality

# Gantt Charts

|                       |  | Week 1 | Week 2 | Week 3 | Week 4 | Week 5 | Week 6 |
|-----------------------|--|--------|--------|--------|--------|--------|--------|
| <b>Work Packages</b>  |  |        |        |        |        |        |        |
| <b>Tasks</b>          |  |        |        |        |        |        |        |
|                       |  |        |        |        |        |        |        |
| <b>Work Package 1</b> |  |        |        |        |        |        |        |
| Task 1                |  |        |        |        |        |        |        |
| Task 2                |  |        |        |        |        |        |        |
| Task 3                |  |        |        |        |        |        |        |
| Task 4                |  |        |        |        |        |        |        |
|                       |  |        |        |        |        |        |        |
| <b>Work Package 2</b> |  |        |        |        |        |        |        |
| Task 1                |  |        |        |        |        |        |        |
| Task 2                |  |        |        |        |        |        |        |
| Task 3                |  |        |        |        |        |        |        |
|                       |  |        |        |        |        |        |        |
| <b>Work Package 3</b> |  |        |        |        |        |        |        |
| Task 1                |  |        |        |        |        |        |        |
| Task 2                |  |        |        |        |        |        |        |

# Contingency Planning



- What do you do if your supervisor crashes his glider into a tree and is off for a while?
- What do you do if your samples don't arrive on time?
- What do you do if the equipment you want to use is not available (*either* not working *or* heavily booked) for some time?
- How will you finance yourself if you don't finish in 3.5 years?



# Exercises 1, 2

- Construct (i) a Work Breakdown Structure, and (ii) a Gantt chart, for:

## **'Getting a good literature review handed in by 30<sup>th</sup> September 2019'**

- Some points to consider: - Supervisor availability in summer 2019? - Mastery of electronic searching, What information already exists in your research group? etc etc
- For the purpose of *this* exercise – treat the topic as the Objective itself. So – 1 Objective, a couple of Work Packages, a few Tasks under each Work Package heading.

# Example - My D.Phil project

- *Objective - Get my D.Phil qualification*
- *Thesis title - 'An investigation of the relationship between the electrical and mechanical properties of non-metals'*
- *Work Packages – generic (for an experimental project)*
  - (a) Literature review
  - (b) Specimen Preparation/Experimental techniques  
(In my case - X-ray diffraction, cutting, polishing, indentation, dislocation velocity measurement)
  - (c) Specific scientific work packages here***
  - (d) Produce thesis, attend viva

# Example - My D.Phil project

- *Work Packages - specific scientific*
  - (1) Indentation of  $\{001\}$ ,  $\{111\}$  faces of GaAs as a function of temperature, using Knoop and Vickers indenters
  - (2) Measure dislocation velocities
  - (3) Interpretation of dislocation velocity measurements - and hence....
  - (4) Interpretation of indentation results

# Example - My D.Phil project

- *Work Package (2) - Dislocation velocity measurements*

## *Tasks*

- (i) Production of dislocation sources in samples - small-scale scratches at high temperature
- (ii) Mechanical loading of samples at high temperatures - design of apparatus
- (iii) Measurement of velocity

# Example - My D.Phil project



- *Work Package (3) - Dislocation velocity interpretation*

## *Tasks*

- (i) Which types (screw,  $60^\circ$ ,  $\alpha$ ,  $\beta$ ) of dislocation loop have I produced?
- (ii) How will surface-nucleated dislocation loops behave under the stress field that I've applied?
- (iii) Differences in dislocation motion for N-type, intrinsic, P-type GaAs - interpretation in terms of electronic properties,
- (iv) How do dislocations of different type (and hence velocity) move under/around indenter?

**Sample Preparation**

X-ray diffraction

Crystal cutting

Crystal polishing

Crystal etching

**Dislocation velocity measurements**

Dislocation production

Stressing dislocations

Velocity measurements

**Interpretation**

Tasks

Tasks

**Viva**

**Health and Safety**



**Obtain Thesis**

Internet

Indentation

Co-workers

Library

Dislocation Velocity

Tasks

Tasks

**Literature Review**

**Experimental Techniques**

**Indentation measurements**

**Write-up**

**Work Breakdown Structure**

# Summary

- Project Management is something you need to do - whether you intend to work in industry or service industries or to remain in academic life.
- The level of Project Management/Planning needs to be appropriate to the tasks.
- There are plenty of tools available to assist you.  
Work Breakdown Structures and Gantt Charts are probably most appropriate for D. Phil work.
- Use Milestones/Quality measurements to assess progress.
- The Project Plan can be changed!





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