



CENTRE FOR

bioscience



Creativity and Research-led Teaching in Science

David J. Adams

HEA Centre for Bioscience

and

Faculty of Biological Sciences, University of Leeds

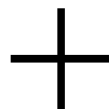
Supporting teaching in higher education to improve student learning across the Biosciences



'Whole brain thinking'

CONVERGENT
or 'LEFT BRAIN'
THINKING

Logical
Rational
Selection
Evaluation

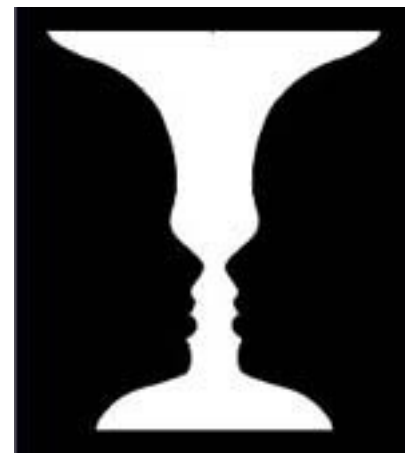


DIVERGENT
or 'RIGHT BRAIN' or
'KALEIDOSCOPE'
THINKING

Intuition
Imagination
Questioning
Re-arranging
New perspectives



New perspectives?





Creativity and Research-led Teaching website

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Creativity in the Biosciences



Workflow ...

- Step 1 [Introduction](#)
- Step 2 [Inspirational Researchers](#)
- Step 3 [Creative Approaches](#)
- Step 4 [Idea Incubation](#)
- Step 5 [Submitting Ideas](#)
- Step 6 [Group Sessions](#)

group chat

There are currently 1 [active users](#).

Go to the [Introduction](#)

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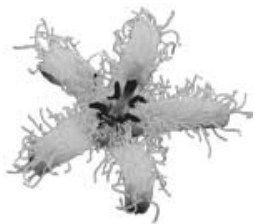


Creativity and Research-led Teaching website

- Cutting edge research (short films)
- Promotion of creativity in individuals
- ‘Group chat’ and ‘Fridge magnets’
- Structured group sessions



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Promoting creativity in individuals

Analogies

Brainstorming and mind-mapping

Challenging assumptions

Clichés and proverbs

Curiosity

Google-storming

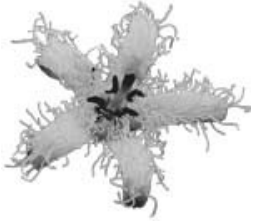
Idea dump

Importance of a fresh eye

Personal analogy

Relational words

Two words



Curiosity/inspiration from the unusual



'Chance favours only the prepared mind'
Louis Pasteur



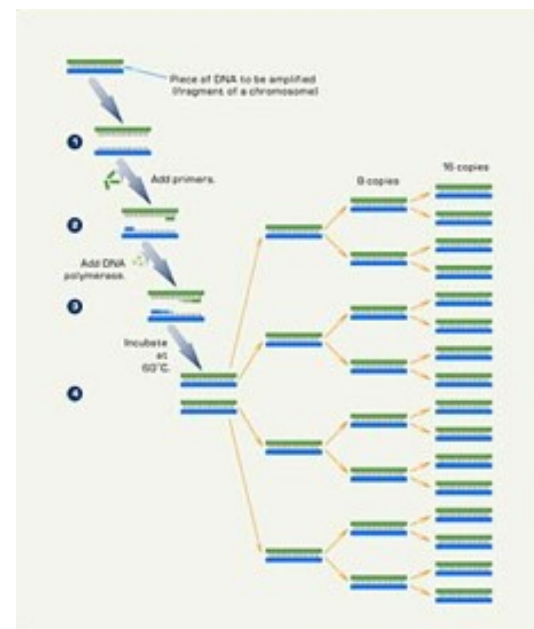
Challenging assumptions



Dyson



iMac



Polymerase Chain Reaction



Challenging assumptions

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Creativity in the Biosciences: Creative Approaches


Challenging Assumptions

When to use this: Try this when you think you have exhausted your initial thoughts and ideas and feel the need to adopt a new approach to the problem.

Why: In our initial consideration of a problem we make a number of assumptions about the nature of the task facing us. When attempting creative approaches to problem solving it frequently helps to challenge these assumptions. This strategy has proved highly successful in creative companies like Dyson. Disappointed by the inefficiency of the conventional vacuum cleaner, James Dyson questioned the assumption that these machines should suck air through bags and filters that rapidly become blocked. As an alternative he designed the highly original and efficient dual cyclone machine that spins dust out of the airstream in transparent bins that allow the user to see when the container is full. Clearly, when assumptions are cast aside, new ideas can begin to emerge.

Before moving on try a small test that highlights how we can cling to assumptions

9 Dots



Here is a pattern of dots. Your task is to link up all nine dots using no more than four straight lines and without lifting pen from paper or retracing the lines.

Use the mouse to draw.

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Creative Approaches

- [Analogies](#)
- [Brainstorming & Mindmapping](#)
- [Challenging Assumptions](#)
- [Cliches and Proverbs](#)
- [Curiosity](#)
- [Googlestorming](#)
- [Idea Dump](#)
- [Importance of a Fresh Eye](#)
- [Personal Analogy](#)
- [Relational Words](#)
- [Two Words](#)

My Notes



Challenging assumptions

‘THINKING OUTSIDE THE BOX’

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Challenging Assumptions

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Before moving on try a small test that highlights how we can cling to assumptions

9 Dots

Most people assume that the lines must not extend beyond the boundaries set by the outer dots. However, this assumption was not part of the original problem! If one discards the assumption, then the problem may be solved in a number of ways

Show me Clear

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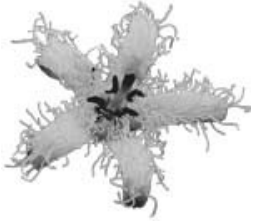
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Creative Approaches

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My Notes



Analogy



Hubble telescope



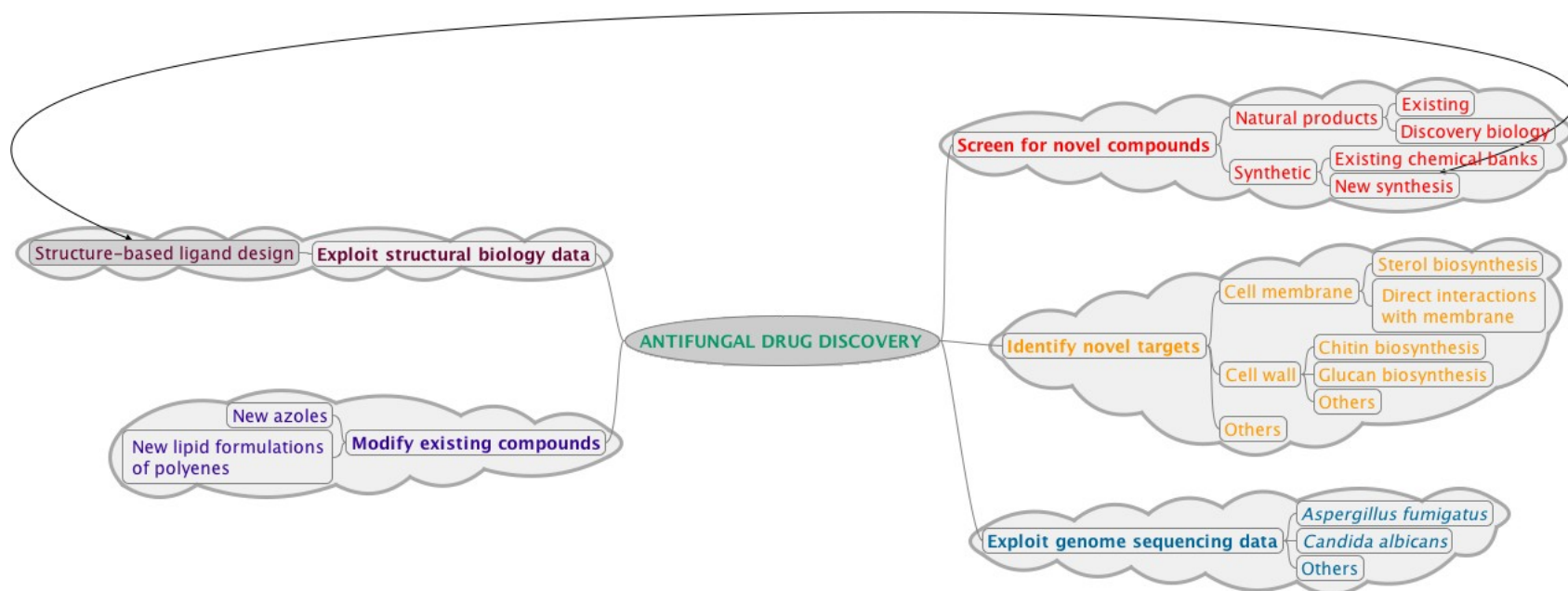
Showerhead

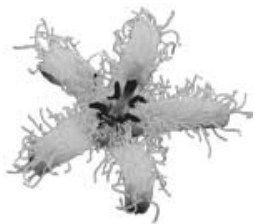
Analogy: bio-inspiration





Brainstorming and mindmapping





Incubate and communicate

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Creativity in the Biosciences: Idea Incubation

- Research scientists and other problem-solvers frequently begin to identify solutions to problems at times and locations remote from those normally associated with the laboratory and workplace. Periods of 'relaxed attention' in the shower, during sports or other recreational activities, or even during sleep appear invaluable in allowing individuals to sub-consciously consider the problem in hand.



- Try thinking about your problem as you drift off to sleep; solutions may occur to you during the night or in the morning. Whenever possible, it's also worth leaving a gap of a few days between the occasion when you were first made aware of a task and the next session when you will consider the problem, perhaps as a member of a group or team. Inspiration may arrive at any time, day or night so be sure to carry a



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My Notes





Group chat and 'Fridge magnets'

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Grid | Randomize

- test idea for freemind
- Creativity and postgraduates
- Collaborations with school teachers
- Cross-talk between artists and scientists
- Creativity and industrialists
- Incorporate 'enterprise' exercises



Submitting ideas/ 'Fridge magnets'



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Promoting creativity in groups

- Group brainstorming
- Lotus blossom
- Six Thinking Hats



Promoting creativity in groups: Six Thinking Hats

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Creativity in the Biosciences: Group Sessions

Six Hats


In group sessions, confrontations inevitably arise as individuals with different thinking styles discuss how they wish to approach a particular problem. The 'Six Thinking Hats' method is a 'parallel thinking' process that minimises conflict by ensuring that everyone is focused in the same direction. Furthermore it ensures that each team member considers a problem from a wide range of perspectives and encourages the participation of otherwise reticent members of the group. With the exception of the group leader/chair person (see below), each member of the team wears the same colour of metaphorical thinking hat at the same time:




Red Hat Thinking
Allow your heart and hunches to lead. Do you 'feel' your approach will work?




White Hat Thinking
Take an objective look at the data as they are presented. Focus on facts and fill-in any gaps.




Black Hat Thinking
The hat of caution and criticism. Take the 'devil's advocate' view.



Yellow Hat Thinking
Look logically at the



Green Hat Thinking
Take a creative and novel



Blue Hat Thinking
Thinking about thinking:

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Group Sessions

- [Brainstorming](#)
- [Lotus Blossom](#)
- [Six Hats](#)

My Notes



Creativity and Research-led Teaching website

- Applications in other disciplines
- Inter-disciplinary collaborations

THE SITE IS AVAILABLE TO USERS OUTSIDE LEEDS:

<http://www.fbs.leeds.ac.uk/creativity/>



Acknowledgements

Many thanks to:

Paul Grimshaw

Steve Paxton



Promoting creativity in groups: Lotus Blossom

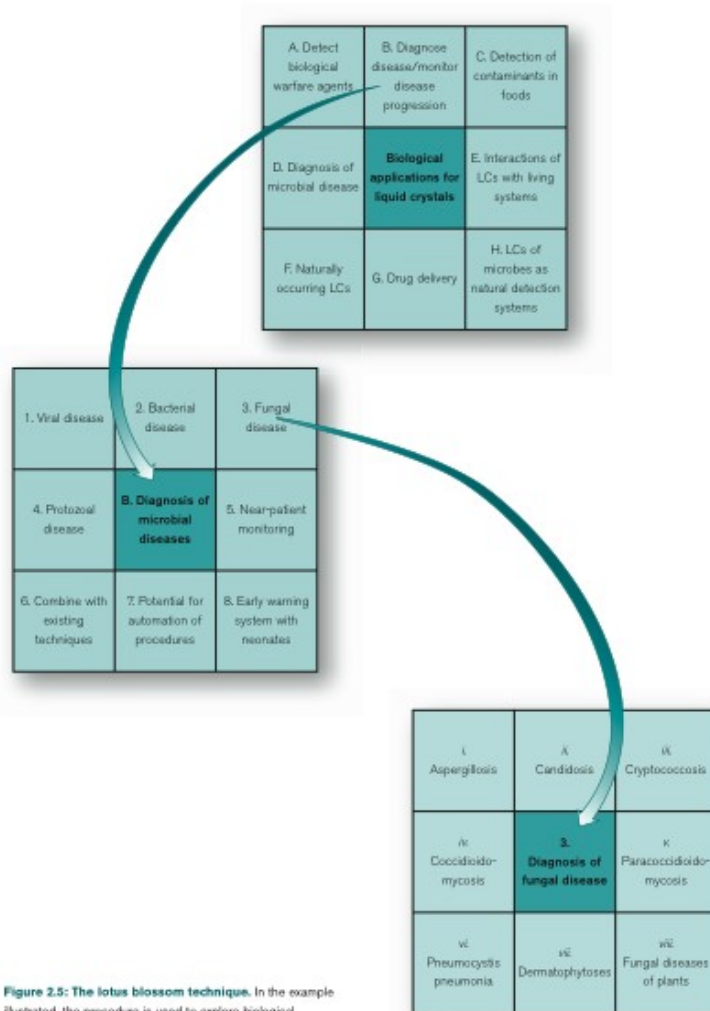


Figure 2.5: The lotus blossom technique. In the example illustrated, the procedure is used to explore biological applications for liquid crystals. ◀