The researcher development framework

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Goal of this talk

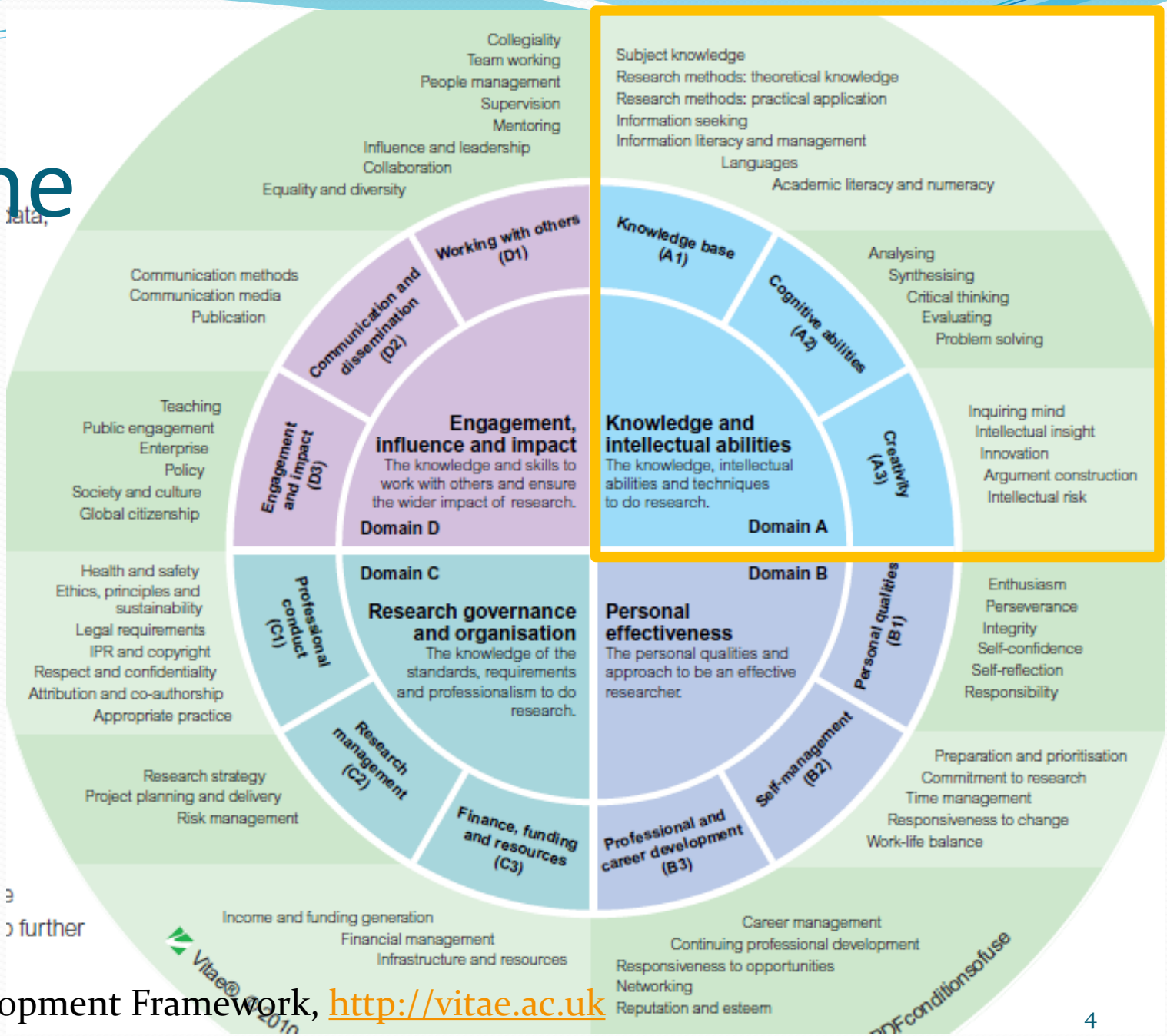
- Make you aware of the variety of skills present in a successful researcher
- Make you think about your development in a more structured way:
  - Personal
  - Professional
  - Career development
- Prompt action on items you identify as requiring further attention

Caveat emptor!

- I'm not an expert in this area
- I'm just a little bit more experienced ➔ "senior advice"

- The framework is vast – picked up some items I thought typically not addressed
- Most of the ideas picked up from stated references.

Outline



Researcher Development Framework, http://vitae.ac.uk

Domain A: Knowledge and intellectual abilities

- Sub-domain A1 "Knowledge Base"
- Descriptors "1.Subject knowledge"; "2. Research methods: theory"; "3. Research methods" – cf. school.
  - N.B.: descriptors have different phases (depths), cf. example below for descriptor "1. Subject knowledge".
  - Exercise: In which phase do you stand?

PhD → **Advanced PhD** → **Postdoc** → …

Sub-domains and descriptors	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5
A1 Knowledge base					
1. Subject knowledge	Has, at least, core knowledge and basic understanding of key concepts, issues and history of thought. Knows of recent advances within own research area and in related areas. (A3)* Is working towards making an original contribution to knowledge. Is developing a broader awareness of international and non-academic aspects of knowledge creation.	Develops detailed and thorough knowledge/understanding of own and related subject areas – and becomes familiar with associated areas in other disciplines/research areas. Demonstrates link between own research and real world affairs. Situates knowledge in international context.		Stimulates new knowledge; may make outstanding breakthroughs. Considers multiple perspectives. Has deep and holistic understanding of strategic direction and intellectual developments of discipline/research area and its inter-relatedness with other disciplines/research areas. Uses this knowledge to enrich own discipline/research area. Contributes to the integrity and future vibrancy of the discipline/research area. Exercises international influence.	

Domain A: Knowledge and intellectual abilities

- Sub-domain A1 “Knowledge Base”
- Descriptors: “4. Information seeking”; “5. Information literacy and management”

Full Journal Title	Total Cites	Journal Impact Factor (2014)
Annual Review of Astronomy and Astrophysics	8 462	33,35
ASTRONOMY AND ASTROPHYSICS REVIEW	1 209	17,74
Living Reviews in Solar Physics	840	17,64
ASTROPHYSICAL JOURNAL SUPPLEMENT SERIES	23 963	11,22
Annual Review of Earth and Planetary Sciences	5 801	8,58
Physics of the Dark Universe	324	8,57
NEW ASTRONOMY REVIEWS	865	6,43
SPACE SCIENCE REVIEWS	7 430	6,28
ASTROPHYSICAL JOURNAL	**195 795**	5,99
JOURNAL OF COSMOLOGY AND ASTROPARTICLE PHYSICS	17 560	5,81
Astrophysical Journal Letters	**44 743**	5,34
MONTHLY NOTICES OF THE ROYAL ASTRONOMICAL SOCIETY	**109 141**	5,11
PHYSICAL REVIEW D	143 353	4,64
ASTRONOMY & ASTROPHYSICS	**101 265**	4,38
SOLAR PHYSICS	10 016	4,04
ASTRONOMICAL JOURNAL	**32 068**	4,02

I&A only, cf. Optics

- Bibliometrics, citations, impact factors
  - Where should you publish?
  - Maximize impact: quality, title & abstract

  marketing (mailing lists, talks, posters), availability (astroph, research gate)…
  - Scopus, Web of Science, Google schoolar
- Reference manage software: https://www.mendeley.com/
- To know more
  - Ochsner A, 2013, Introduction to Scientific Publishing

Domain A: Knowledge and intellectual abilities

- Sub-domain A1 “Knowledge Base”
- Descriptors: “6. Languages”, “7. Academic literacy and Numeracy”
- Is your written English good enough to write a paper, report?
  - Good enough: the reviewers focus on content and not on grammar/syntax?
- How about your oral English?
  - Discussion, talks, job interviews…

- To know more
  - http://www.aanda.org/doc_journal/instructions/aa_english_guide.pdf
  - http://ntrs.nasa.gov/search.jsp?R=19900017394
  - More at: http://kmh-lanl.hansonhub.com/techwriting.html

Domain A: Knowledge and intellectual abilities

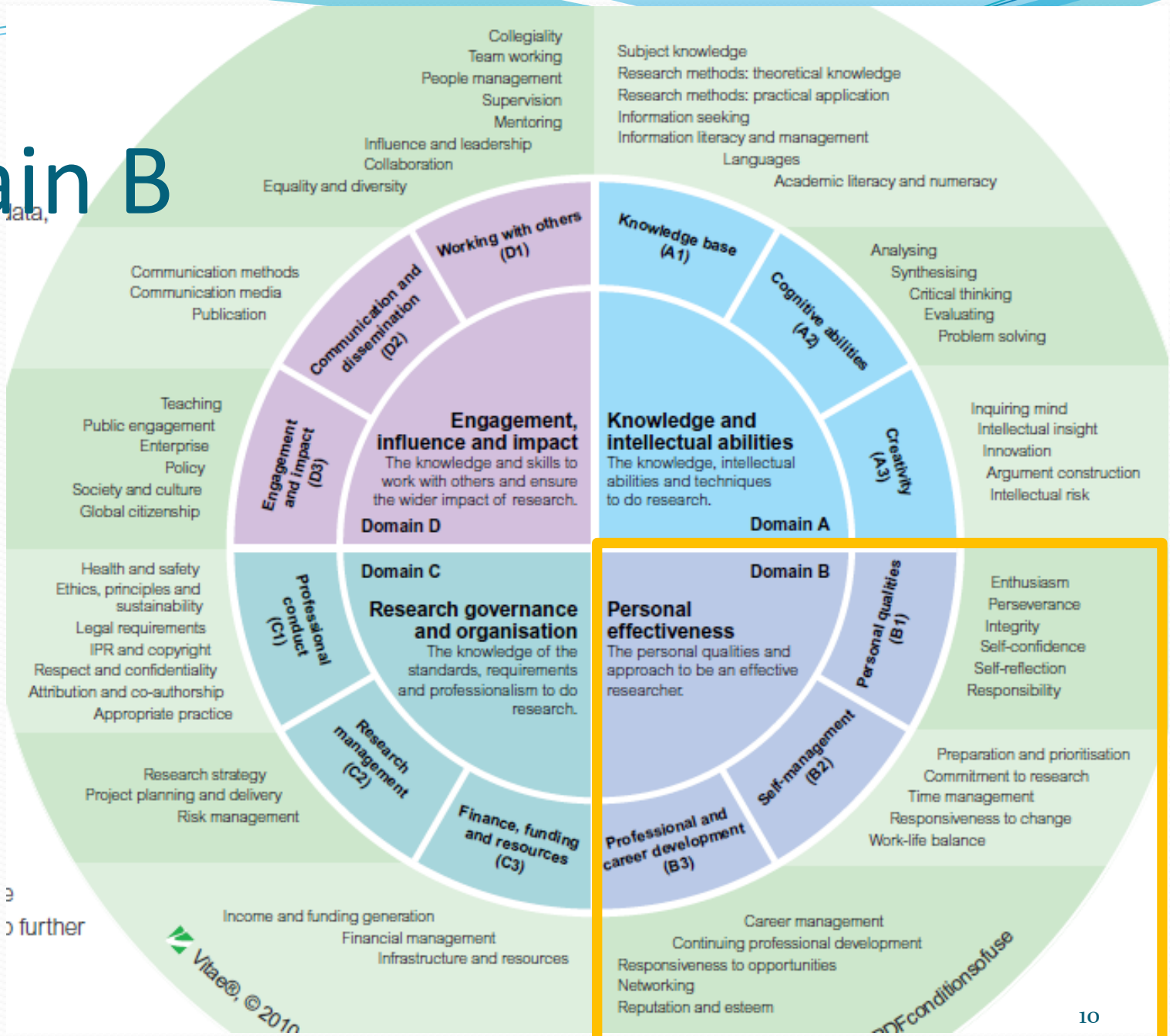
- Sub-domain A2 “Cognitive abilities”
- Descriptors “1. Analysing”; “2. Synthesizing”; “3. Critical thinking”; “5. Problem solving”

- Descriptor “4. Evaluating”
- Can you provide and accept criticism?
- Do you regularly do self-criticism? (variety of contexts: from paper writing to inter-personal relations)
- Can you manage and devise action to overcome limitations identified in the criticism?
- ➔ Do you read the evaluators guide, in proposals and applications?

Domain A: Knowledge and intellectual abilities

- Sub-domain A3 “Creativity”
  - Descriptors “1. Inquiring mind”; “2. Intellectual insight”; “3. Innovation”; “5. Intellectual risk”
  - Descriptor “4. Argument construction”
  - How good are you at arguments?
  - To know more
    - Weston, A., 2000, A Rulebook for Arguments (short)
    - Govier, T., 2010, A Practical Study of Argument (long)

Domain B


Collegiality
Team working
People management
Supervision
Mentoring
Influence and leadership
Collaboration
Equality and diversity
Subject knowledge
Research methods: theoretical knowledge
Research methods: practical application
Information seeking
Information literacy and management
Languages
Academic literacy and numeracy
Working with others (D1)
Communication and dissemination (D2)
Engagement and impact (D3)
Knowledge base (A1)
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Creativity (A3)
Communication methods
Communication media
Publication
Analysing
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Engagement, influence and impact
The knowledge and skills to work with others and ensure the wider impact of research.
Domain D
Knowledge and intellectual abilities
The knowledge, intellectual abilities and techniques to do research.
Domain A
Teaching
Public engagement
Enterprise
Policy
Society and culture
Global citizenship
Inquiring mind
Intellectual insight
Innovation
Argument construction
Intellectual risk
Health and safety
Ethics, principles and sustainability
Legal requirements
IPR and copyright
Respect and confidentiality
Attribution and co-authorship
Appropriate practice
Professional conduct (C1)
Research management (C2)
Finance, funding and resources (C3)
Domain C
Research governance and organisation
The knowledge of the standards, requirements and professionalism to do research.
Domain B
Personal effectiveness
The personal qualities and approach to be an effective researcher.
Personal qualities (B1)
Self-management (B2)
Professional and career development (B3)
Enthusiasm
Perseverance
Integrity
Self-confidence
Self-reflection
Responsibility
Research strategy
Project planning and delivery
Risk management
Preparation and prioritisation
Commitment to research
Time management
Responsiveness to change
Work-life balance
Income and funding generation
Financial management
Infrastructure and resources
Career management
Continuing professional development
Responsiveness to opportunities
Networking
Reputation and esteem
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Domain B: Personal effectiveness

- Sub-domain B1 “Personal qualities”
  - Descriptors “1. Enthusiasm”; “2. Perseverance”; “3. Integrity”; “4. Self-confidence”; “5. Self-reflexion”; “6. Responsibility”.
  - What about empathy?

Domain B: Personal effectiveness

- Sub-domain B2 “Self-management“
  - Descriptors “1. Preparation and prioritisation”; “2. Commitment to research”; “4. Responsiveness to change”;
  - Descriptor “3. Time management”
    - Pearls of wisdom
    - Avoid excessive observing/schools/conferences
    - Stay fairly close to your area of expertise
      - But don’t continually repeat the same research
      - Before starting a new project ask, “Do I have the skills, time and energy to do a good job?”; Remember the 10.000 hours rule.
    - Do your duties/charges, but don’t let them overrun your research
    - To know more: Chapter 2 “Efficiency” of Wankat & Oreovicz,
    - https://engineering.purdue.edu/ChE/AboutUs/Publications/TeachingEng/index.html

Domain B: Personal effectiveness

- Sub-domain B2 “Self-management“
- Descriptor “5. Work-life balance”

- Burnout cycle is a runaway process
  - Overworking
  - Loss in efficiency
  - Loss in debit
  - Compensate by Over-overworking
  - Loss in efficiency
  - Loss in debit
  - Compensate by Over-overworking
  - …
  - Depression, burnout

- Avoiding burnout
  - Personal life
  - Learn to say No!

Domain B: Personal effectiveness

- Sub-domain B3 “Professional and career development”
- Descriptor “1. Career management”

- What’s your PhD good for?
  - 3+ year work experience in research environment
  - Certification of proficiency and autonomy in a given field of science
    - Critical for life long learning
  - Certification of achievement
    - Your PhD is a personal achievement
  - Use your PhD experience to decide if you want to stay in science
    - Do you like the profession?
    - Do you like the life your supervisor/postdocs are having?
  - Do you fill that a career in science will develop you as a person?
  - Will I stay in science? You should be able to answer this question at the end of your PhD
    - Don’t decide in the middle of your PhD “depression”
    - Nor just after your PhD defense…

Domain B: Personal effectiveness

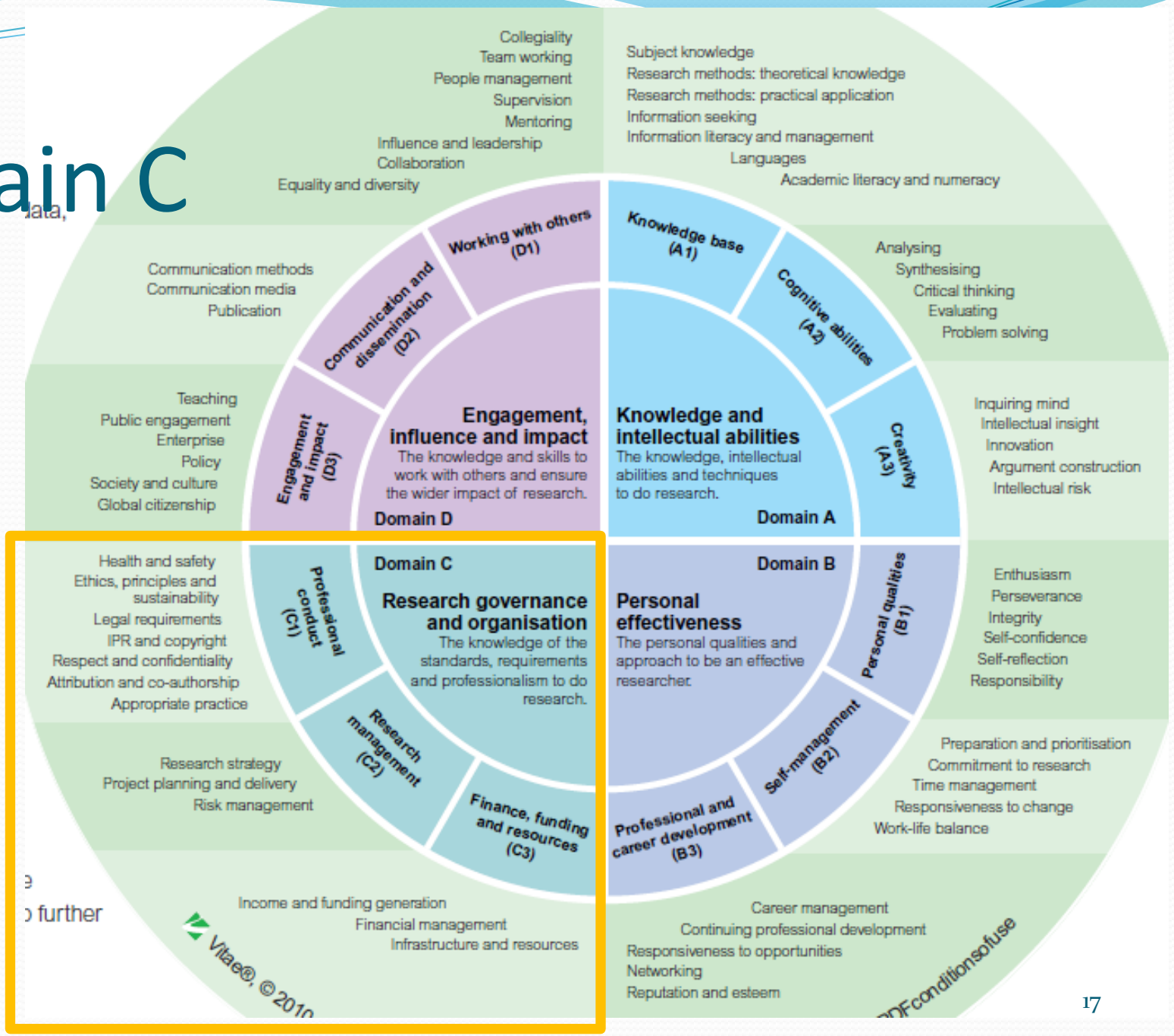
- (cont.) Job hunting
  - What is your portfolio? a) Technical expertise; b) Ideas and goals for projects; c) Your network (persons and organizations)
  - Requires: a) time; b) knowledge of the system; c) preparation; d) a systematic approach.
  - Use your PhD skills and researcher development framework to job hunt.
  - Beware of mythology and extrovert loosers/paranoids
  - 1st postdoc almost certain, life gets thought after (but still OK)
  - Investigate past history of next appointment host/team; if in a large team identify your place/differentiation
  - Mobility, competition, micro-marketing (LinkedIn/webpresence)
  - Check AAS Job register (N.B.: announcements have a strong peak -- find the month at : https://jobregister.aas.org/)
  - See also: http://dantzig.mechanical.illinois.edu/ACAJOB/index.html
  - Most jobs are outside academia ➔ Portfolio relevant outside academia

Domain B: Personal effectiveness

- (cont.) Sub-domain B3 “Professional and career development”

- Descriptors “2. Continuing professional Development”; “3. Responsiveness to opportunities”; “4. Networking”; “5. Reputation and esteem”.

Domain C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Domain C: Professional conduct

- Sub-domain C1 “Professional conduct”
- Descriptors “1. Health and safety”; “3. Legal requirements”; “4. IPR and copyright”; “5. Respect and confidentiality”; “6. Attribution and co-authorship”; “7. Appropriate practice”

- Descriptor “2. Ethics, principles and sustainability”;
  - Pearls of wisdom
    - Discuss ethical situations with colleagues you respect
    - Learn how to protect yourself from unethical behavior
    - Learn how to act when facing unethical behavior
  - To know more
    - On being a scientist: http://www.nap.edu/download.php?record_id=12192
    - Paul Kalas course: “Ethics for astronomers” http://w.astro.berkeley.edu/~kalas/ethics/
    - Salpeter, Fallacies in astronomy and medicine http://iopscience.iop.org/article/10.1088/0034-4885/68/12/R02/

Domain C: Professional conduct

- Sub-domain C2 “Research management”
- Descriptors “1. Research strategy”; “3. Risk management”;

- Descriptor “2. Project planning and delivery”;
- Applies effective project management:
  - setting of research goals, intermediate milestones and prioritization of activities. (C1)*
- Acts on decisions agreed with supervisor and delivers results.

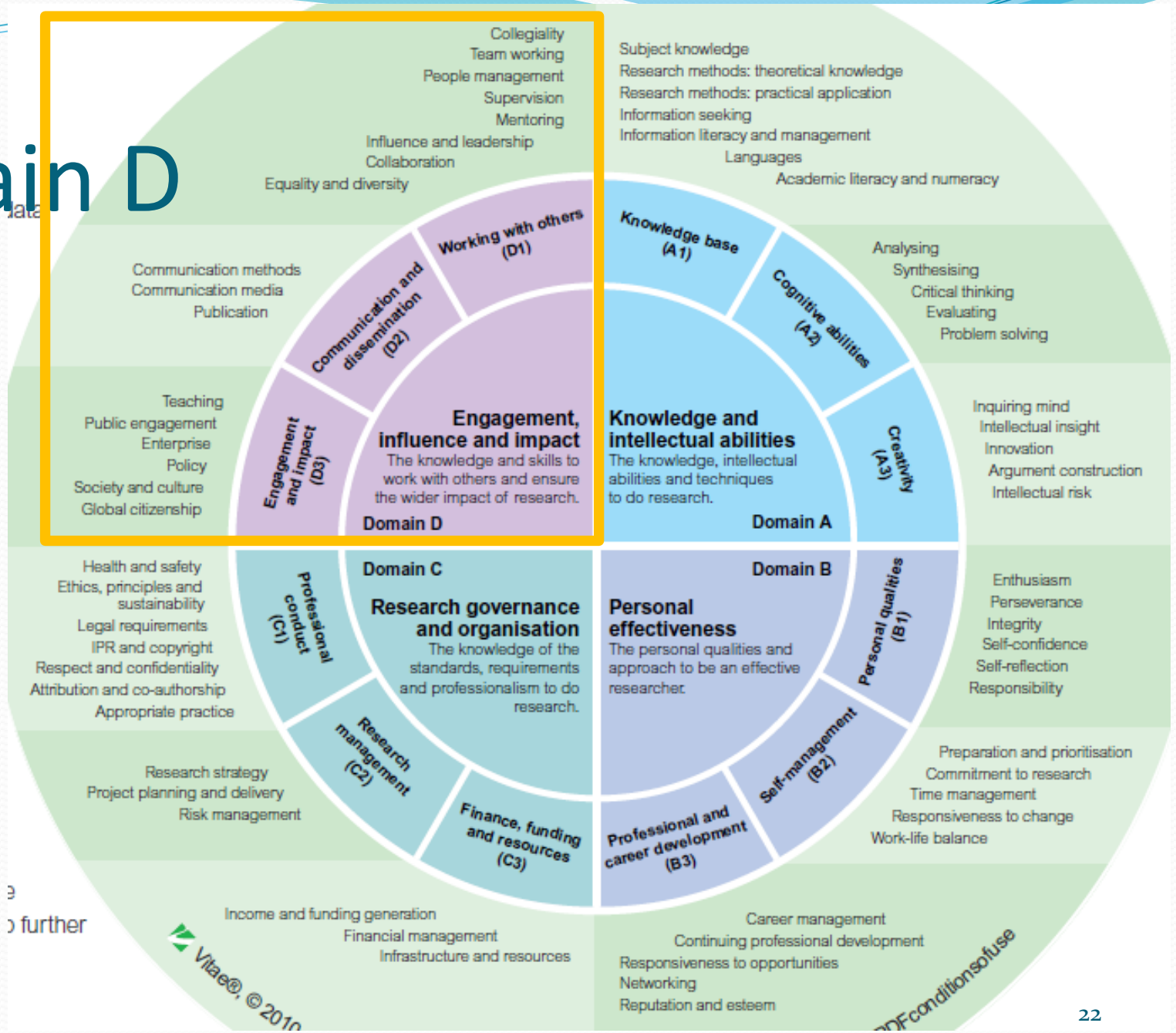
Domain C: Professional conduct

- Sub-domain C3 “Finance, funding and resources”
- Descriptor “1. Income and funding generation”;
  - Develop a grant and call awareness
    - What calls are available?
    - Which resources do they fund?
    - What requirements do they have?
    - What are the success rates?
    - Redundancy
  - Define the call to answer
  - Once a call is defined
    - Define: a) project general goals (a few lines); b) team and host; c) required resources.
    - Read very carefully: a) All documentation of the call; b) Including the evaluators guide; c) Do you have access to previous successful application? ➔If yes read it carefully;
    - Double check ➔ is this the good call of your project?
    - Do you have support (including administrative) from the host organization?
    - Plan the writing until several days before the deadline including contingency
  - When writing please note that your are **not** writing a paper…

Domain C: Professional conduct

- (cont.)
- Sub-domain C3 “Finance, funding and resources”
- Descriptors “2. Financial management”; “3. Infrastructure and resources”;

Domain D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Domain D: Engagement, influence and impact

- Sub-domain D1 “Working with others”
- Descriptors “1. Collegiality”; “2. Team working”; “3. People management”; “4. Supervision”; “5. Mentoring”; “6. Influence and leadership”; “7. Collaboration”; “8. Equality and diversity”;

- Pearls of wisdom
  - Learn to manage your supervisor;
  - Your today’s collaborators are your tomorrows competitors
  - Your today’s competitors are your tomorrow collaborators
  - Respect them if you want to be respected
  - But be aware of unethical behavior
    - protect yourself
    - do not become a paranoid

Domain D: Engagement, influence and impact

- Sub-domain D2 “Communication and dissemination”
- Descriptors “; 1. Communication methods”; “2. Communication media”; “3. Publication”;
- Pearls of wisdom
- Media micro-marketing: LinkedIn, web-presence.
- Presentations
  - Goal of a presentation is to transmit information (not skills or attitude)
  - It is not the goal of a presentation to show that you are extremely clever and a master of power-point tricks
- Ask for your talks to be recorded in video an watch them with colleagues – criticize and correct; Seek professional advice.
- To know more
  - Advice on giving a talk by D. Kurtz, 2006, In Astrophysics of Variable stars, ASP Conf. Series v.349, Eds. Sterken & Aerts
  - What's The Use of Lectures? by Donald A. Bligh, 2000

Scientific writing: pearls of wisdom

- "Publish or perish" is true, but you don't die.
- "*If the reader is to grasp what the writer means, the writer must understand what the reader needs*" Gopen & Swan
- Papers:
  - Do not underestimate the time from writing to acceptance (>1 yr for your 1st paper)
  - Start early with "Methods" section (once data secured), once data is reduced go to "Results", leave "Introduction" to the end.
  - Refereeing takes time
  - Referee is nice be nice with the referee
- Thesis manuscript
  - Highly dependent on country of origin
  - If full manuscript is required, start early (after 1st paper)
  - Copyright (Cf. C1.4)

Domain D: Engagement, influence and impact

- Sub-domain D3 “Engagement and impact”
- Descriptors “1. Teaching”; “2. Public engagement”; “3. Enterprise”; “4. Policy”; “5. Society and culture”; “6. Global citizenship”

- Pearls of wisdom
  - Develop a balanced engagement portfolio, without putting your PhD at risk
  - Engagement makes you value more your work, there is a lot of positive feedback from it

Epilogue: The making of an expert

- Also applies also outside academia, where most of you will find a job.

- Scientific evidence shows that experts are made and not born.
  - Talent has limited effect on superior performance, main variable is hard work.
  - Phase transition between non-expert and expert performance takes around 10 years ~ 10.000 hours of "deliberate practice"

- To know more:
  - Ericsson, A., 2007, The Making of an Expert, Harvard Business Review (short)
  - Ericsson, A., 2007, Giftedness and evidence for reproducibly superior performance, High Ability Studies (long)

- Pearl of wisdom: beware of burnout, work-life balance, …

Future directions

- General bibliography (must read for PhD students)
  - Researcher Development Framework
    - https://www.vitae.ac.uk/researchers-professional-development/about-the-vitae-researcher-development-framework
  - Feibelman, P. , 2011, A PhD Is Not Enough! A Guide to Survival in Science
  - Phillips, E., 2005, How to get a PhD: A handbook for students and their supervisors
- If you are on your tenure (track) faculty position (some sections good for postdocs)
  - Teaching engineering, Wankat & Oreovicz
    - https://engineering.purdue.edu/ChE/AboutUs/Publications/TeachingEng/index.html
- Dedicated courses
  - School: Scientific writing for young astronomers http://www.swya.org/
  - School: Navigating your career (for PhD students and Postdocs) http://www.unica-network.eu/event/coimbra-group-unica-joint-training
- Fill your slot in the PhD Tree: http://phdtree.org/ !