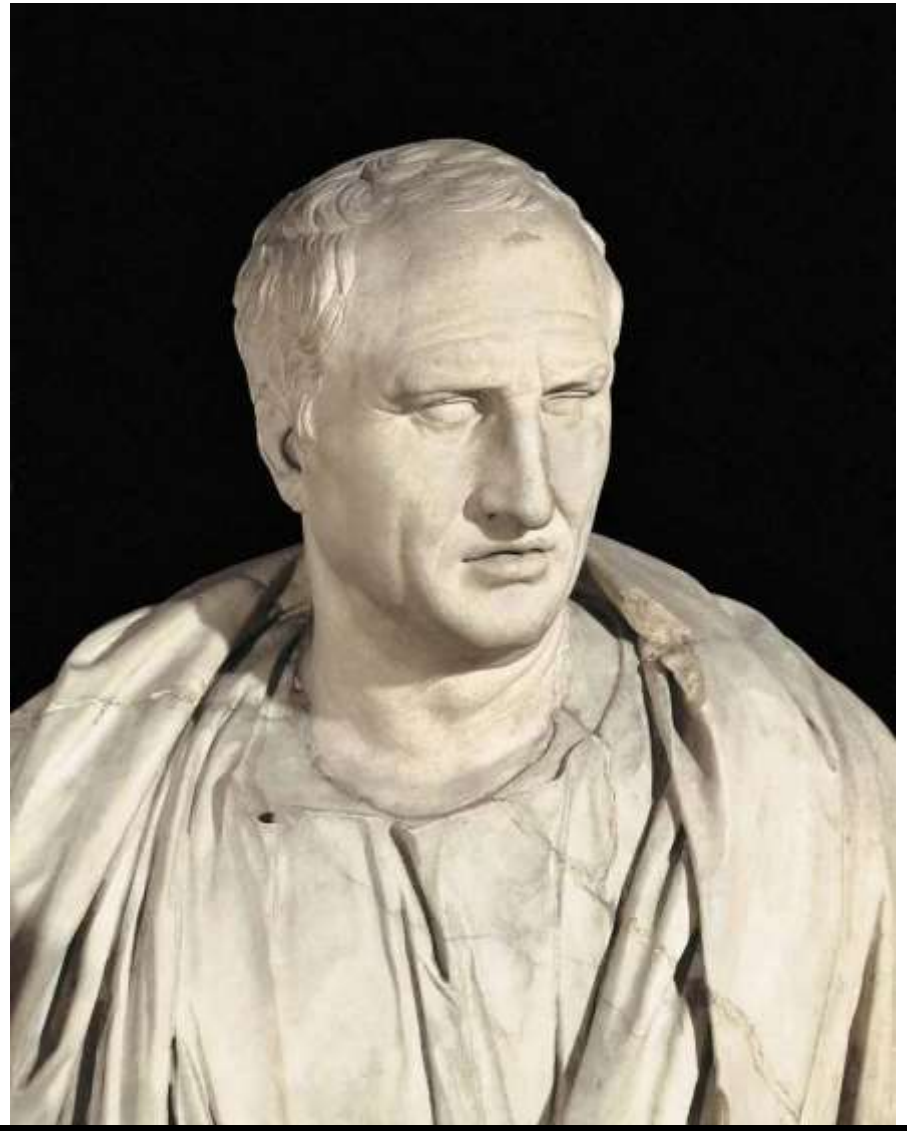
Transdisciplinary journeys; traversing interconnected pathways, within and without UCC

Edmond Byrne
Chair Professor of Process & Chemical Engineering, Environmental Research Institute/MaREI
University College Cork, R. Ireland

University College Cork, Ireland
Coláiste na hOllscoile Corcaigh

"OMNIA VIVVNT,
OMNIA INTER SE CONEXA"




UBC
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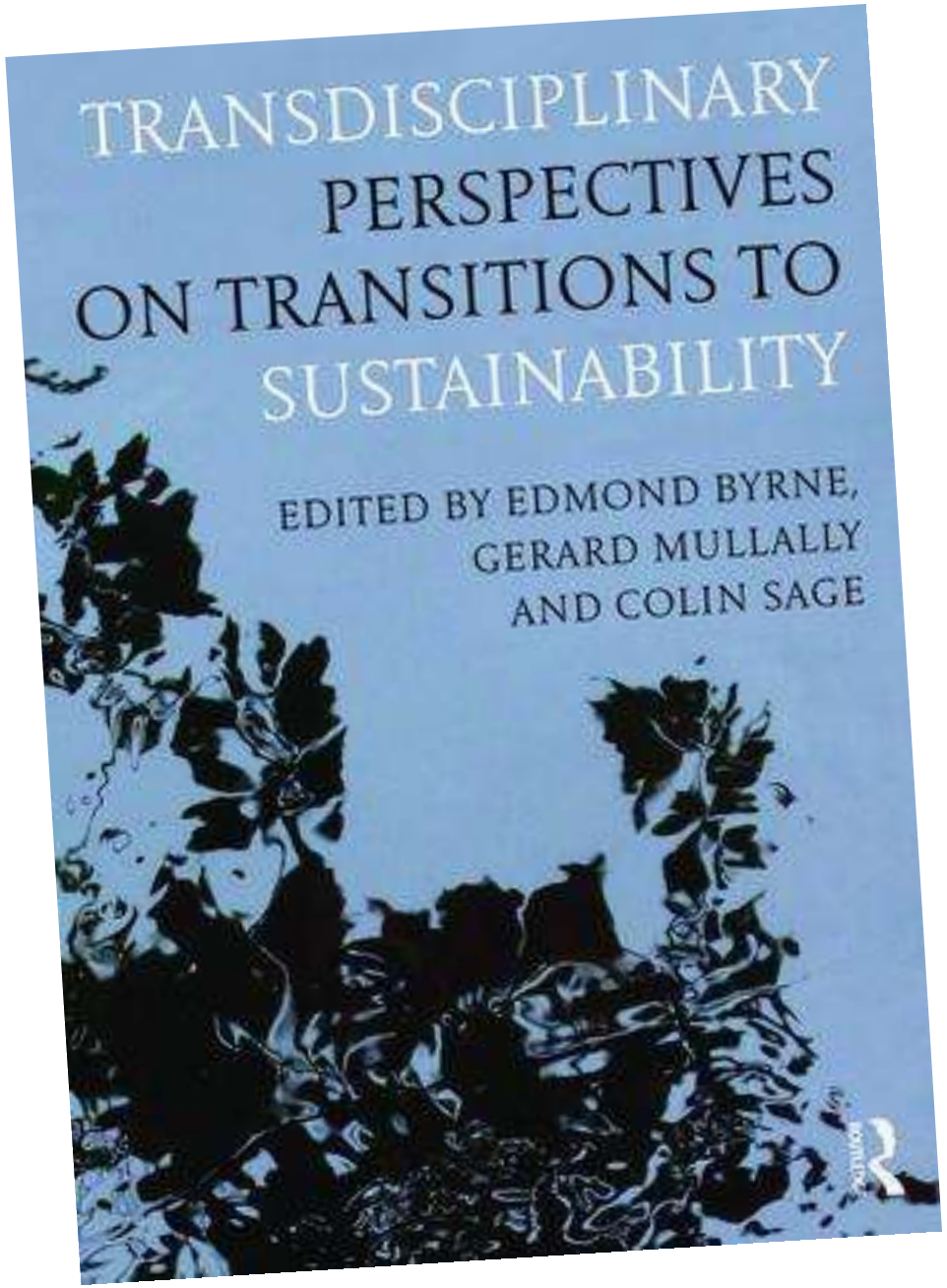
CANADA
Credit: ptra from Pixabay

Los Cuatro Postes, Ávila, Spain

Transdisciplinarity;
seeking ***emergent*** knowledge,
built on strong ***disciplinary*** pillars,
while ***transcending*** them


TRANSDISCIPLINARY
PERSPECTIVES
ON TRANSITIONS TO
SUSTAINABILITY
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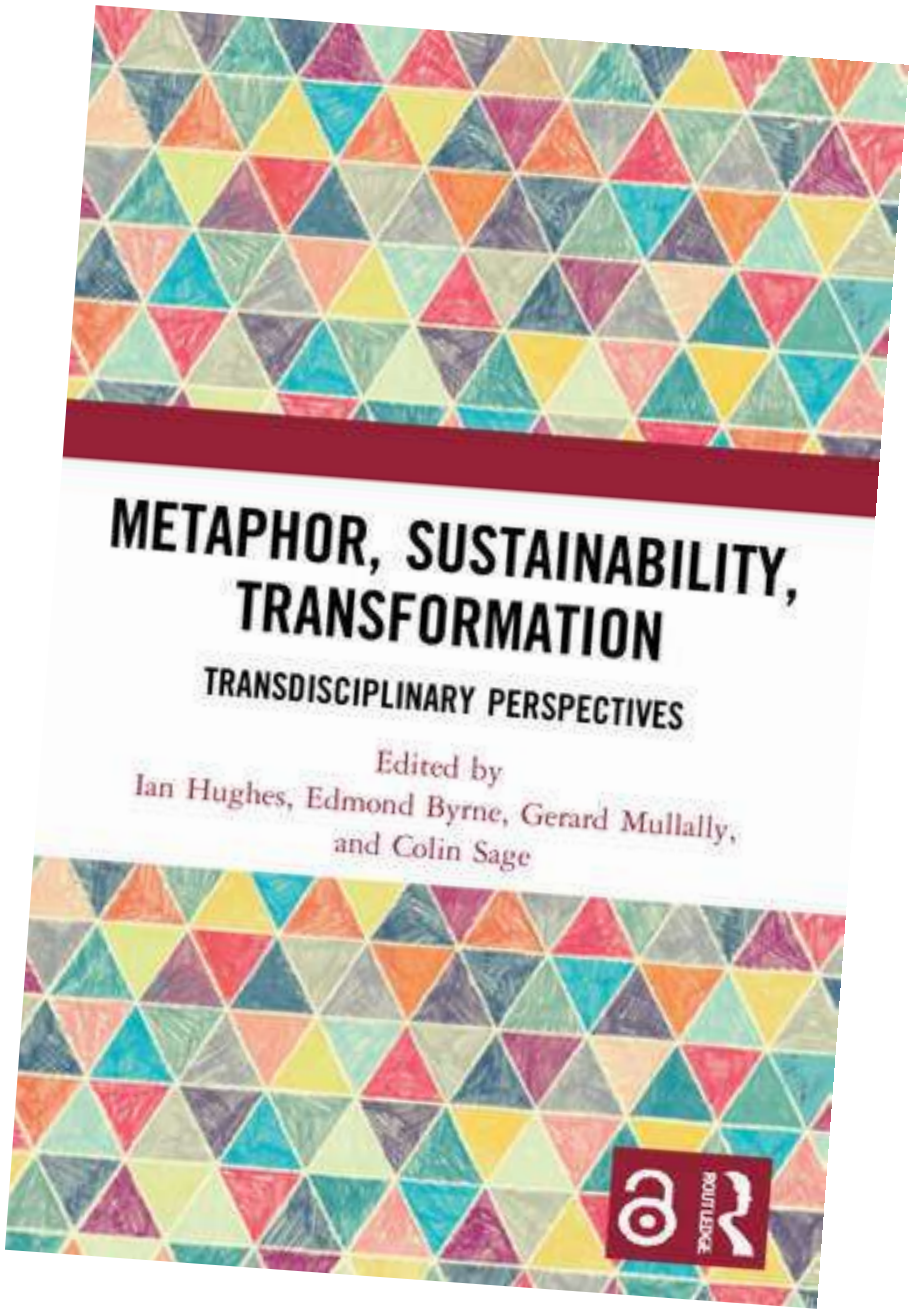
METAPHOR, SUSTAINABILITY,
TRANSFORMATION
TRANSDISCIPLINARY PERSPECTIVES
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Proceedings of the 3rd International Symposium for Engineering Education ISEE2010
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30th June – 2nd July 2010
ISEE 2010
Educating Engineers
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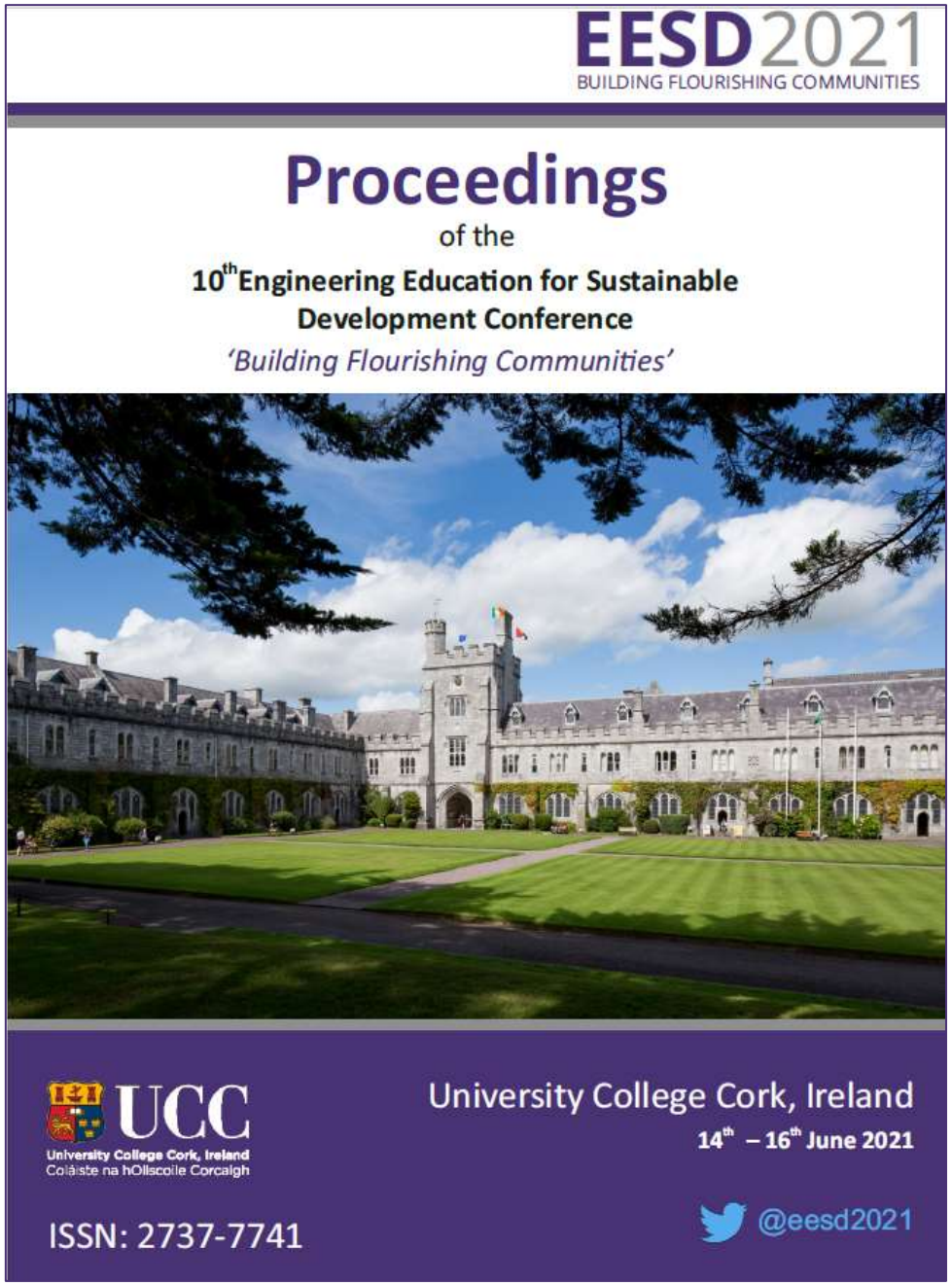
Leading transformation from an unsustainable global society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BUILDING FLOURISHING COMMUNITIES
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EESD15

The 7th International Conference on

Engineering Education for Sustainable Development

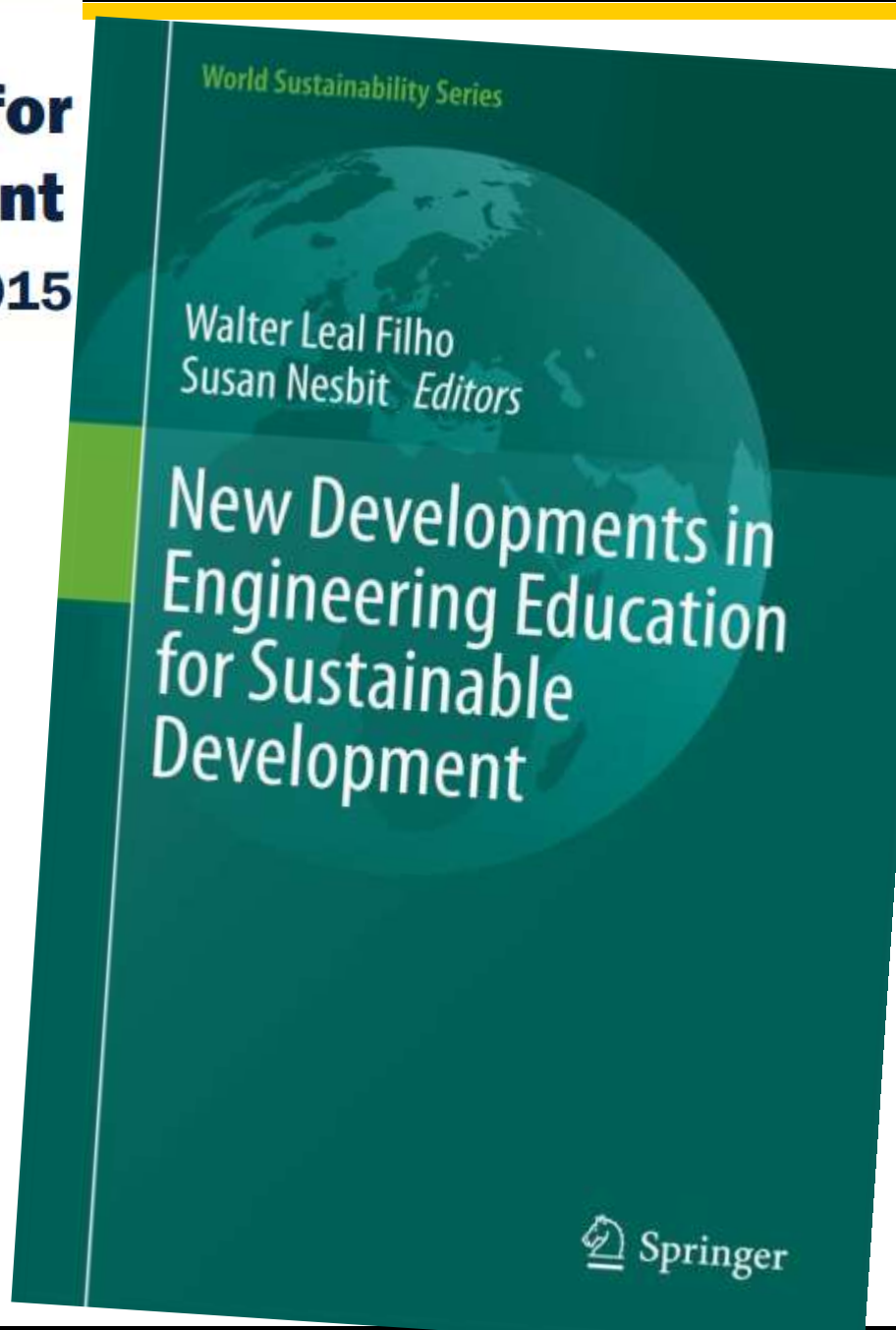
University of British Columbia, Vancouver, Canada, June 9-12, 2015

Seeing Beyond Silos: Transdisciplinary Approaches to Education as a Means of Addressing Sustainability Issues

Edmond P. Byrne and Gerard Mullally

Abstract

Sustainability is a normative topic framed by disciplinary perspectives. This can be problematic as the tools that are used and applied to meta-problems and 'grand challenges' associated with societal (un)sustainability, and which may result in proposed 'sustainable solutions', are framed through the lens of the 'object world' disciplinarian. Traditional engineering education and practice has tended to frame problems in narrow techno-economic terms, often neglecting broader social, environmental, ethical and political issues; or what might be termed the social complexities of problems (Bucciarelli 2008; Mulder et al. 2012). This reductionist approach has sought to close down risk and uncertainty through deterministic modelling and design, resulting in frameworks/models which provide an air of misplaced confidence but which are incapable of accounting for (or recognising) unknowability, and can thus lead to behaviour



A NEIGHBOURHOOD STORY

UNIVERSITAT POLITÈCNICA DE VALÈNCIA

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KTH VETENSKAP OCH KONST

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ISAlab **Challenge**

Process, Improvisation, Holarchic Learning Loops and all that Jazz: Experiences in Transdisciplinary Education for Sustainable Development

Dai C. Morgan[1], Edmond P. Byrne[2]*, Susan Nesbit[3], Naoko Ellis[4], Kas Hemmes[5] and Javier Orozco-Messana[6]

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[3]Department of Civil Engineering, Faculty of Applied Science, The University of British Columbia, Canada.
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[6]Departamento de Ingeniería Mecánica y de Materiales, Universitat Politècnica de València, España.

Abstract

This paper explores the experiences of an 'Interdisciplinary Sustainability Assessment Laboratory' ('ISA Lab') workshop, which took place over a week at Universitat Politècnica de València during April 2017. The workshop drew together students from a range of disciplines from across engineering and science, law and the social sciences and from a range of countries and backgrounds, including North and South America, Europe and Asia. It also facilitated a rich co-creative learning environment as it was led by (engineering) academic faculty from across Europe (Spain, UK, Netherlands and Ireland) as well as North America (Canada), as well as local experts who helped provide participants with appropriate context and guidance.

*"..in **communicating with people**, they need a **story** or **narrative to relate to**, and while the populace don't necessarily always understand **ecology**, they do readily identify with and understand (**narratives** around) **cultural heritage and family**."*

Exploring Transdisciplinary Education

S. Nesbit[1], N. Ellis[2], S. Danes[3], T. Tan[1], E. Byrne[5], D. Morgan[6], and J. Orozco-Messana[7].

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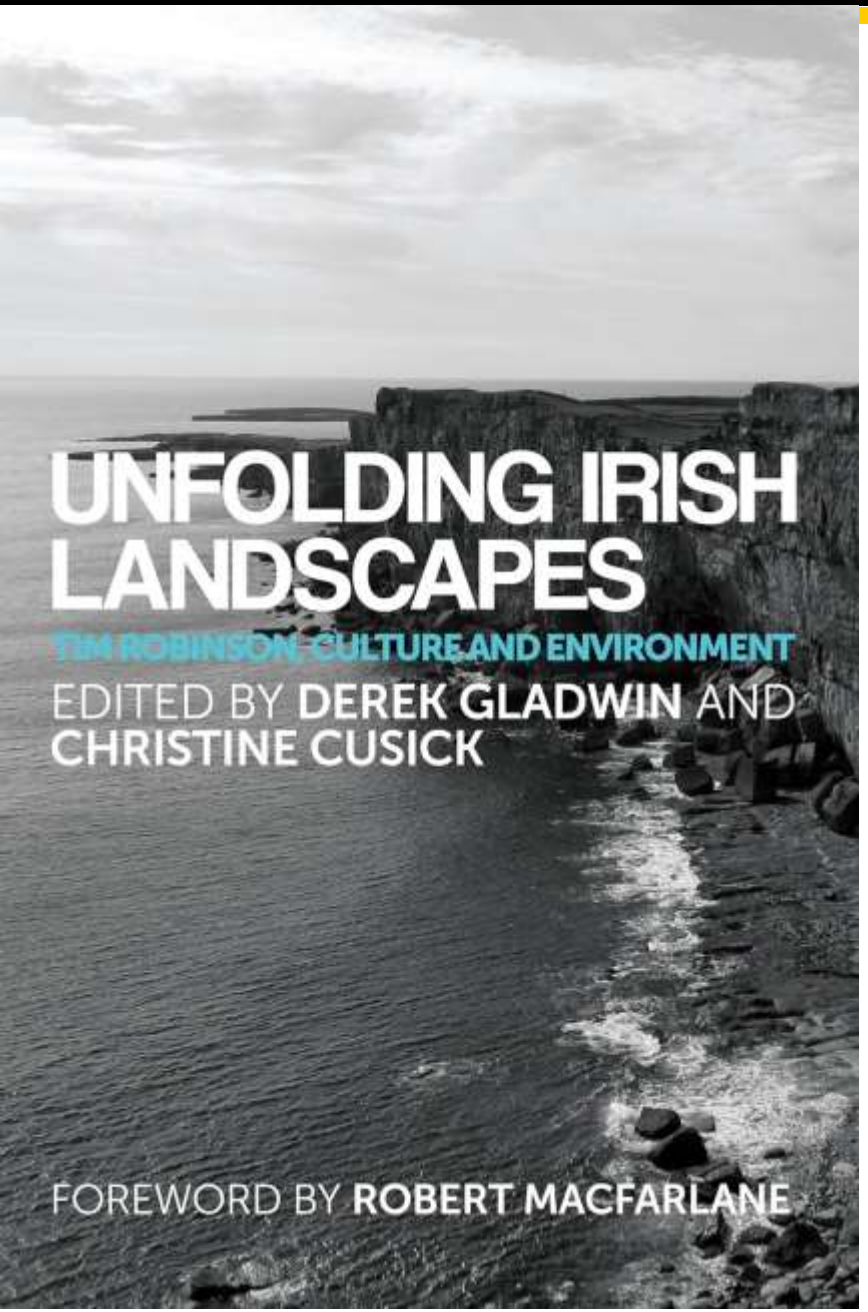
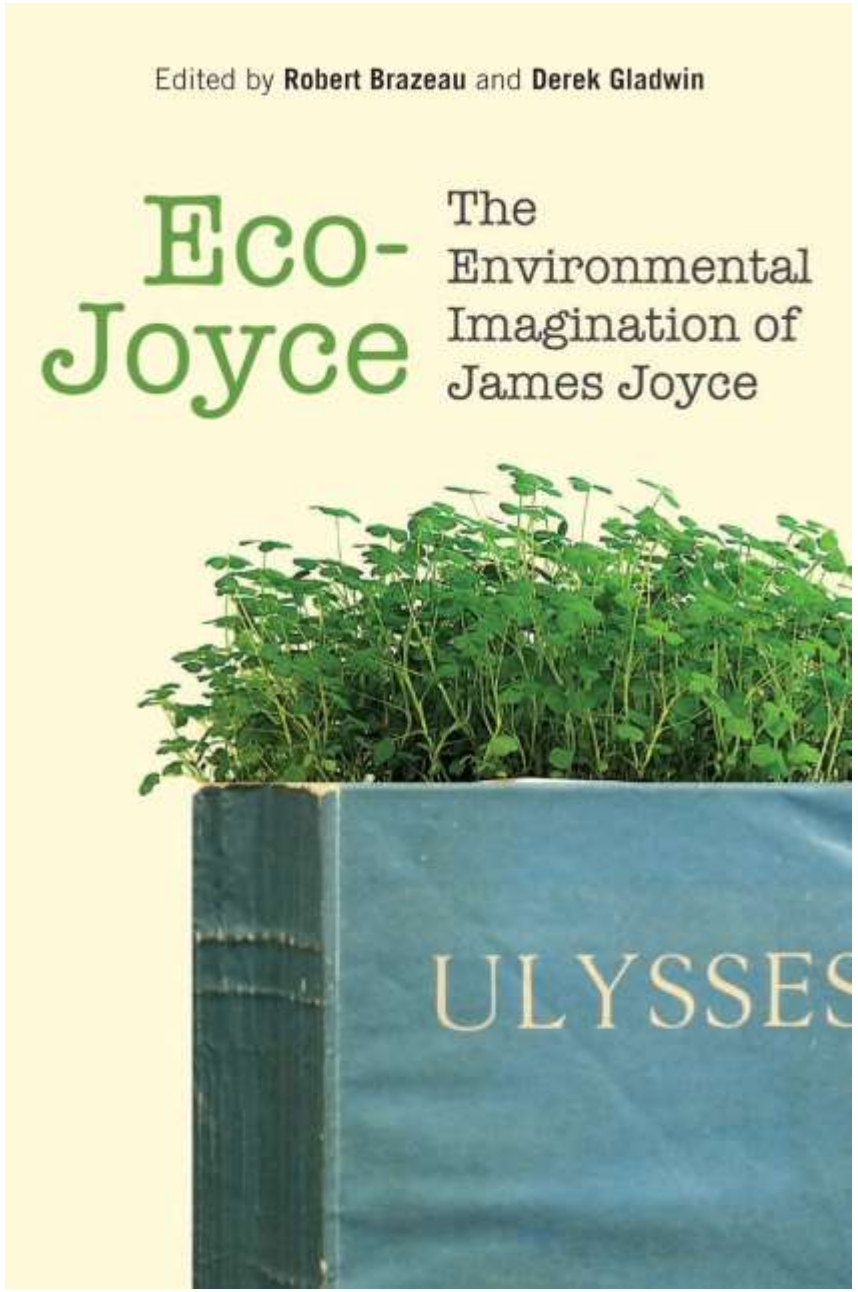
Abstract

Because wicked Sustainability Problems (WSPs) are complex, multi-scaled, value-laden, ill-structured, and difficult to address (for example see Lonngren et al., 2016), teams that include engineers and others with expert knowledge are needed to effectively manage WSPs relating to environmental stress and declining ecosystem health, including WSPs stemming from resource scarcity, biodiversity loss, and climate change. How do we educate engineers to successfully engage in such transdisciplinary teams? What is transdisciplinary education? This paper explores aspects of these questions.

*"..faculty members observed that most teams produced a deliverable to their client that **could not have been created by one discipline only.** That is, the final deliverable was an **emergent** artifact of the team's **transdisciplinary** experience."*


UNFOLDING IRISH LANDSCAPES
TIM ROBINSON: CULTURE AND ENVIRONMENT
EDITED BY DEREK GLADWIN AND CHRISTINE CUSICK
FOREWORD BY ROBERT MACFARLANE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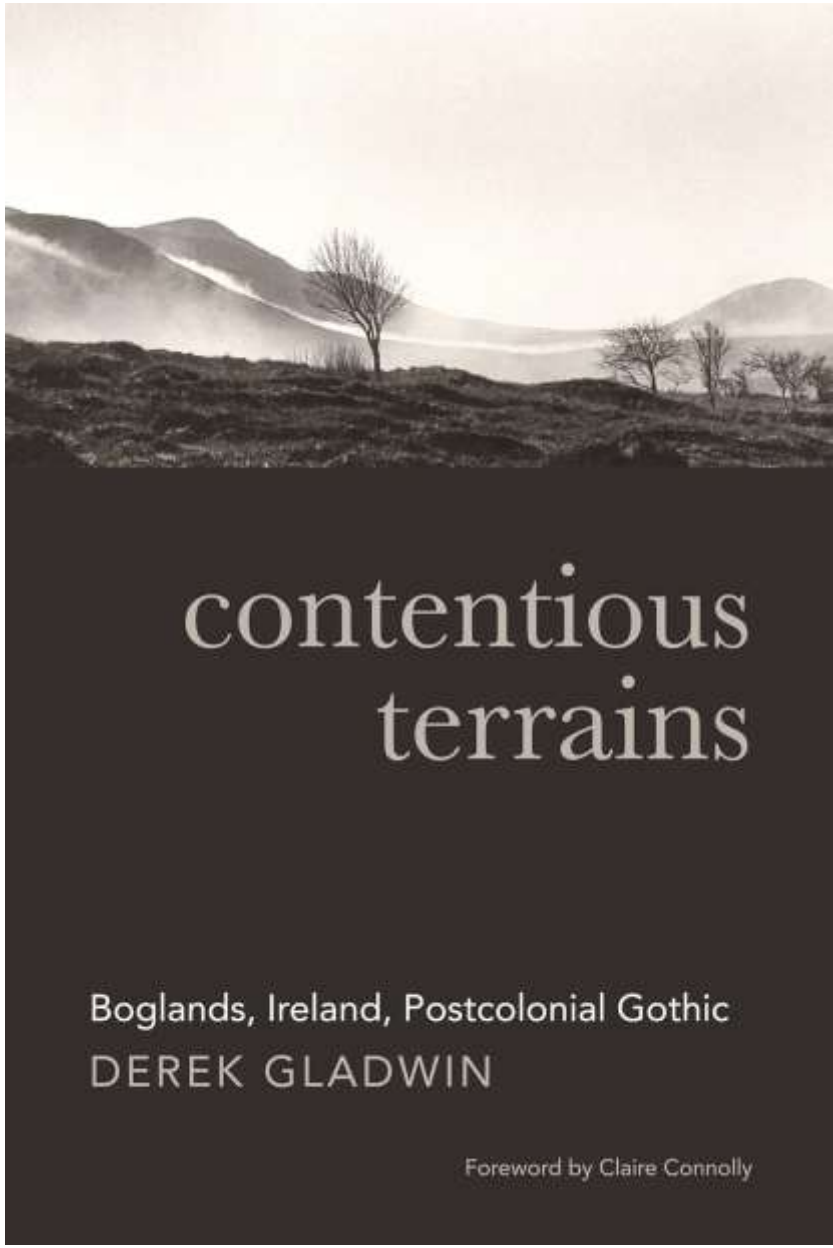
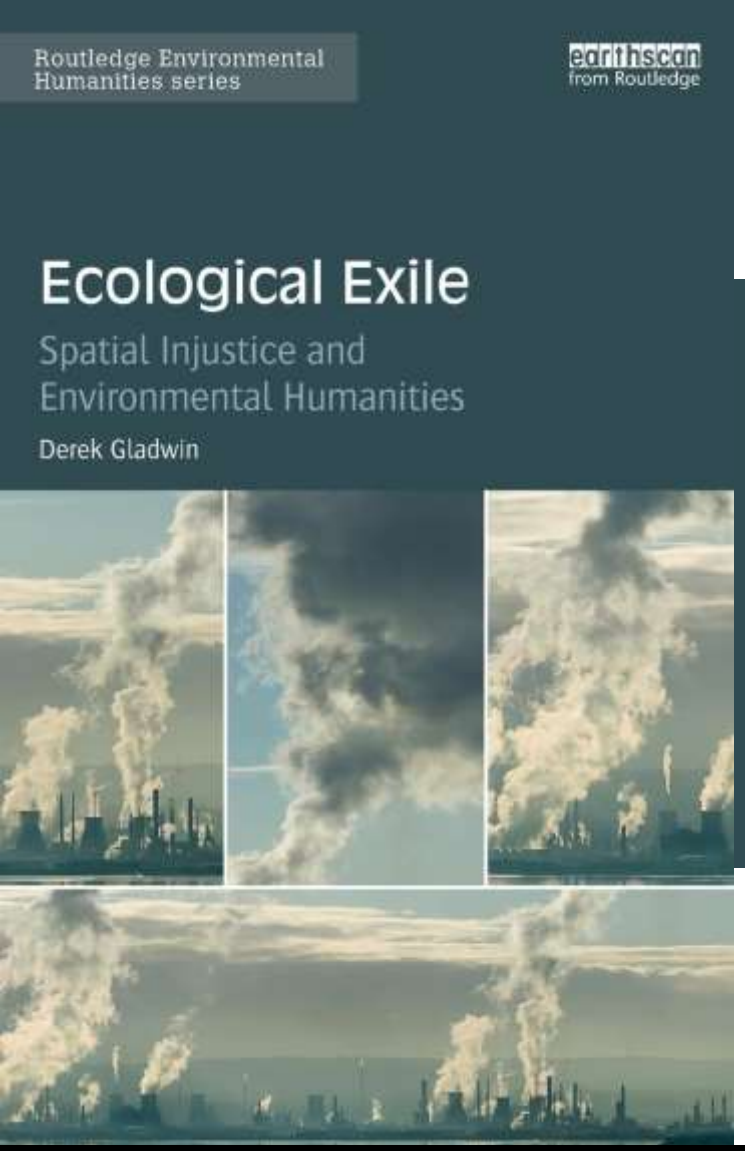
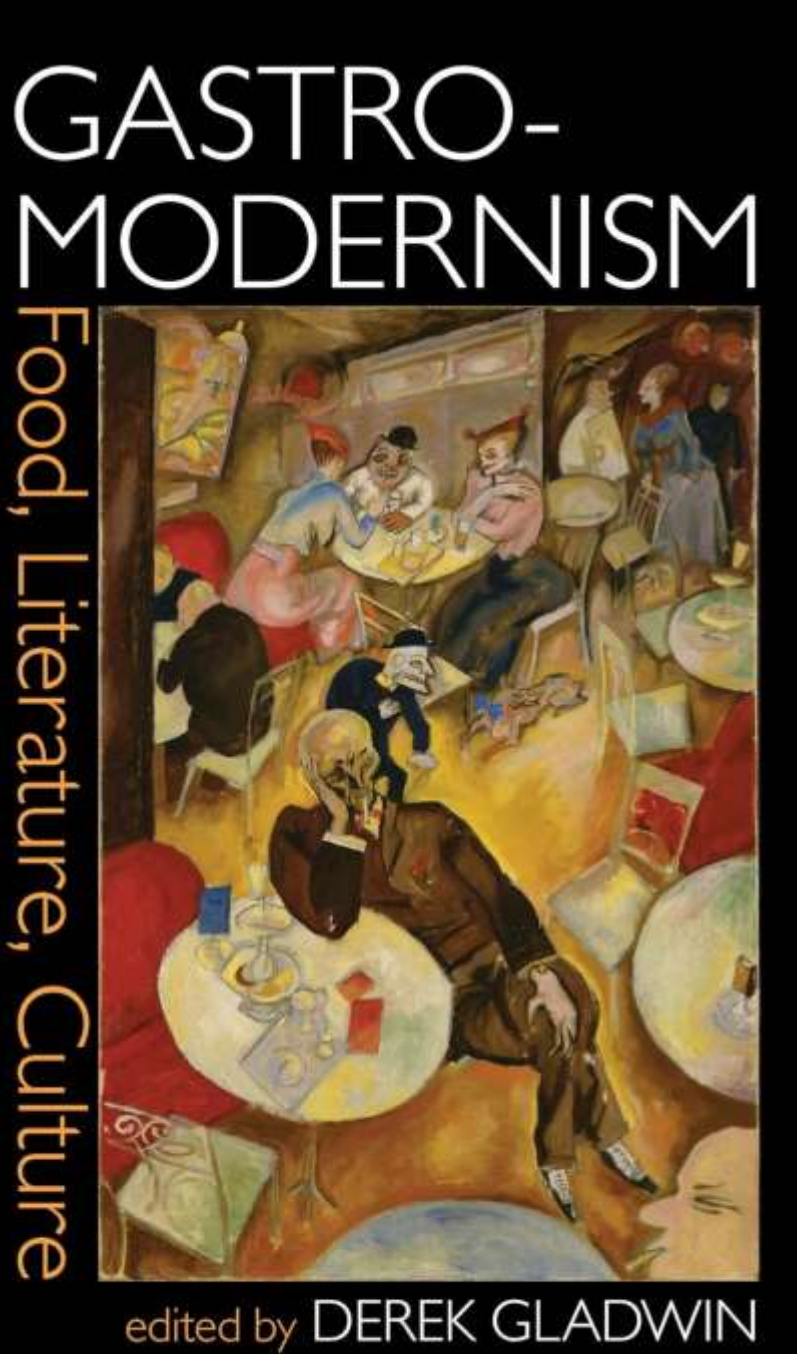
Eco-Joyce
The Environmental Imagination of James Joyce
ULYSSES


contentious terrains
Boglands, Ireland, Postcolonial Gothic
DEREK GLADWIN
Foreword by Claire Connolly



"Gladwin skilfully traces spatially produced instances of ecological injustice that literally and imaginatively abolish people's sense of place (or place-home) ..by looking at two of the most pressing social and environmental concerns – oil and climate"



"Modernism as a cultural and artistic movement also highlights the historical politics of food and eating. The result is that food production, consumption, and scarcity are abiding themes in modernist literature and culture, reflecting tensions amidst colonial, agricultural, and industrial settings."

"Throughout human existence, no matter where our place of origin or when in history, ***storytelling shapes our societies, influencing personal, sociocultural, educational, and public discourses that impact how we live.***

Creating and communicating the ***language of stories*** *- to ourselves and others - enhances our innate voices and can empower us to engage in* ***greater empathy, compassion, and possibility****."*

THE CONVERSATION

Academic rigour, journalistic flair

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We could power a new green movement by talking about energy change

Published: April 20, 2020 10.32pm BST

Words and stories matter

Whether consciously or not, people draw on the tools of **storytelling through language, narrative and imagination** to understand problems.

Focusing our communication and language on energy transition could help **overcome the social impasse** we've reached in addressing climate change.

Making sense of reality

If we start to communicate and educate about energy transition through our **interconnecting** and **overlapping stories,** then we could **avoid polarizing** climate change and publicly shaming those who deny it.

Author

Derek Gladwin

Assistant Professor, Language & Literacy Education, and Sustainability Fellow, University of British Columbia

Language is an ecological phenomenon which responds and evolves with environmental change just as much as environments change with language. (AP Photo/Ross D. Franklin)

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The power of discourse

What if we, as engaged citizens, refocused the emphasis from the deficit language of **"emergency"** or **"urgency"** or even **"heat"** and to the fundamental issue: human-caused actions are affecting many species and living systems at record rates, including human species? The term **mass extinction** already elicits **urgency**, but also invites **collective engagement**, instead of zero-sum words intended to generate emotion over action.

Language, and **communication** as a whole, is **the richest resource** we have in the effort to stabilize the future. But it is a **frequently wast**ed and **inappropriately used resource.**

Storytelling through complexity

Stories allow people to select and share the most relevant parts of the whole system, interpret their actions or roles, **create meaning**, **communicate uncertainties** and provide **relatable trajectories into the future**.
Stories can **explain complexity** because they provide the space for **diverse** and, at times, **opposing** points of view. Collective storytelling can also **change cultural and mythic narratives** to **bring communities together** and **guide a complex system to change.**

THE CONVERSATION
Academic rigour, journalistic flair

How climate storytelling helps people navigate complexity and find solutions

Published: July 19, 2022 4.48pm BST

For a consumer, for instance, making the switch to an electric vehicle (EV) is a difficult decision. (EVgo Network/flickr), CC BY-NC

Despite learning that climate change is hitting the planet faster than scientists predicted, society has been slow to decrease the use of fossil fuels and reduce greenhouse gas emissions.

For a consumer, for instance, making the switch to an electric vehicle (EV) is a difficult decision. There are many interconnected factors to consider, including the cost, what

Authors

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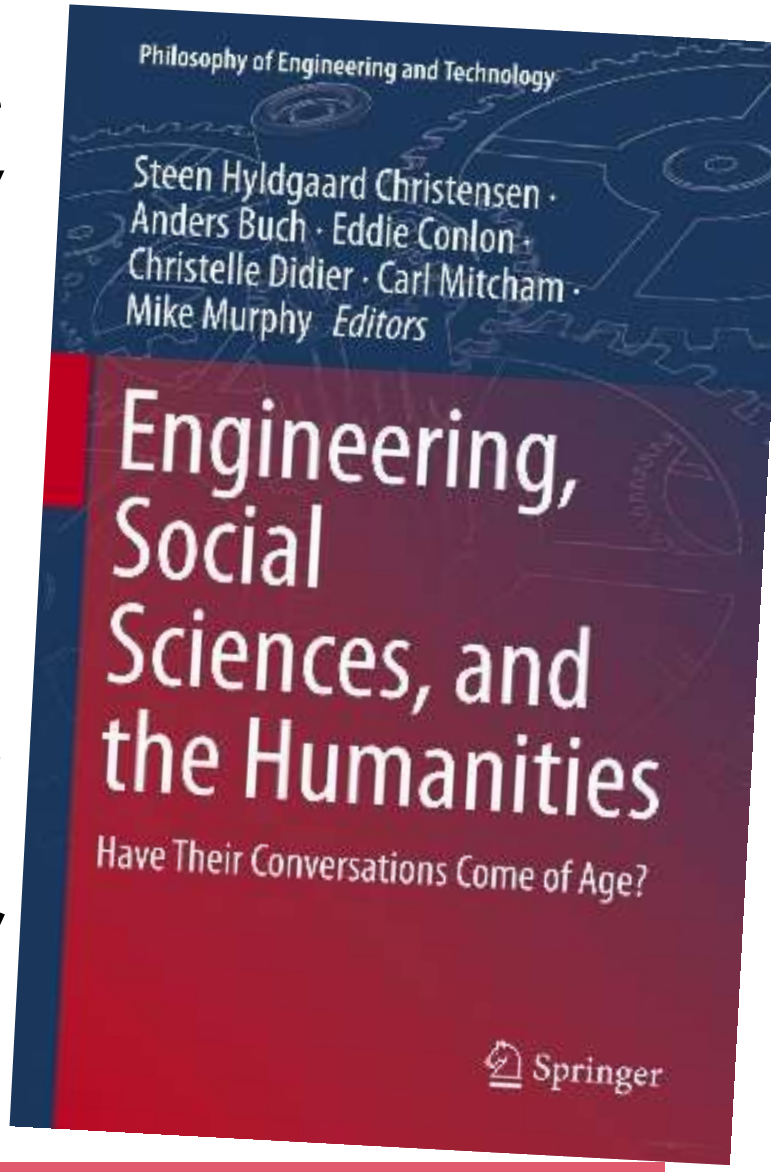
"The human condition is such that **scientific facts** alone serve to leave us **cold**. It is in and through **perspectives** and **worldviews** shaped by **stories, myths** and **narratives** that we are **inspired to act**. When these are imbued and aligned with scientific fact and engineering endeavor, societal passion is aroused and inspired in a way that can make for **powerful progress of a positive kind**.

For example, the UN Environment Programme Emissions Gap Report warns that '**fundamental structural changes are needed**', changes which can only be effected and accompanied by '**deep-rooted shifts** in **values, norms, consumer culture** and **world views** [which] are inescapably part of the great **sustainability transformation**.' (UNEP, 2019). That is, the changes needed are largely non-technological but societal."



Byrne, E. et al. (2022). Engineering with Social Sciences and Humanities; Necessary Partnerships in Facing Contemporary (Un)Sustainability Challenges?. In: Christensen et al., (eds) Springer.

"The idea of **transdisciplinarity** as problem-solving and **creating knowledge purposively** can be seen to originate in the work of Eric Jantsch (1970) who argued that **universities and knowledge should be organised for a purpose** and the university should take an **active role** in **societal planning** and **service to society**."

Gemma O'Sullivan (2023), p. 45*

"Transdisciplinarity is perceived as a **new paradigm** that can **systematise sustainability education.** The **transition to sustainability** is seen to **necessitate collaboration** among disciplines and fields of practice towards **tackling large societal problems** (Charli-Joseph et al., 2016) and universities are motivated to do TD to develop TD research capabilities.

…Second to sustainability, TD curricula are evident when disciplinary areas articulate a desire to give students an understanding of how their **disciplinary** area is **affected by** and **interconnected** with **complex societal challenges**"

O'Sullivan (2023), pp. 56-57*

*O'Sullivan, G (2023) *Shaping transdisciplinary, challenge-based education using knowledge creating teams from five European universities: A realist evaluation.* DEd, TCD.

"Curricula are informed by curriculum ideologies

*…these are **not value free** decisions.*

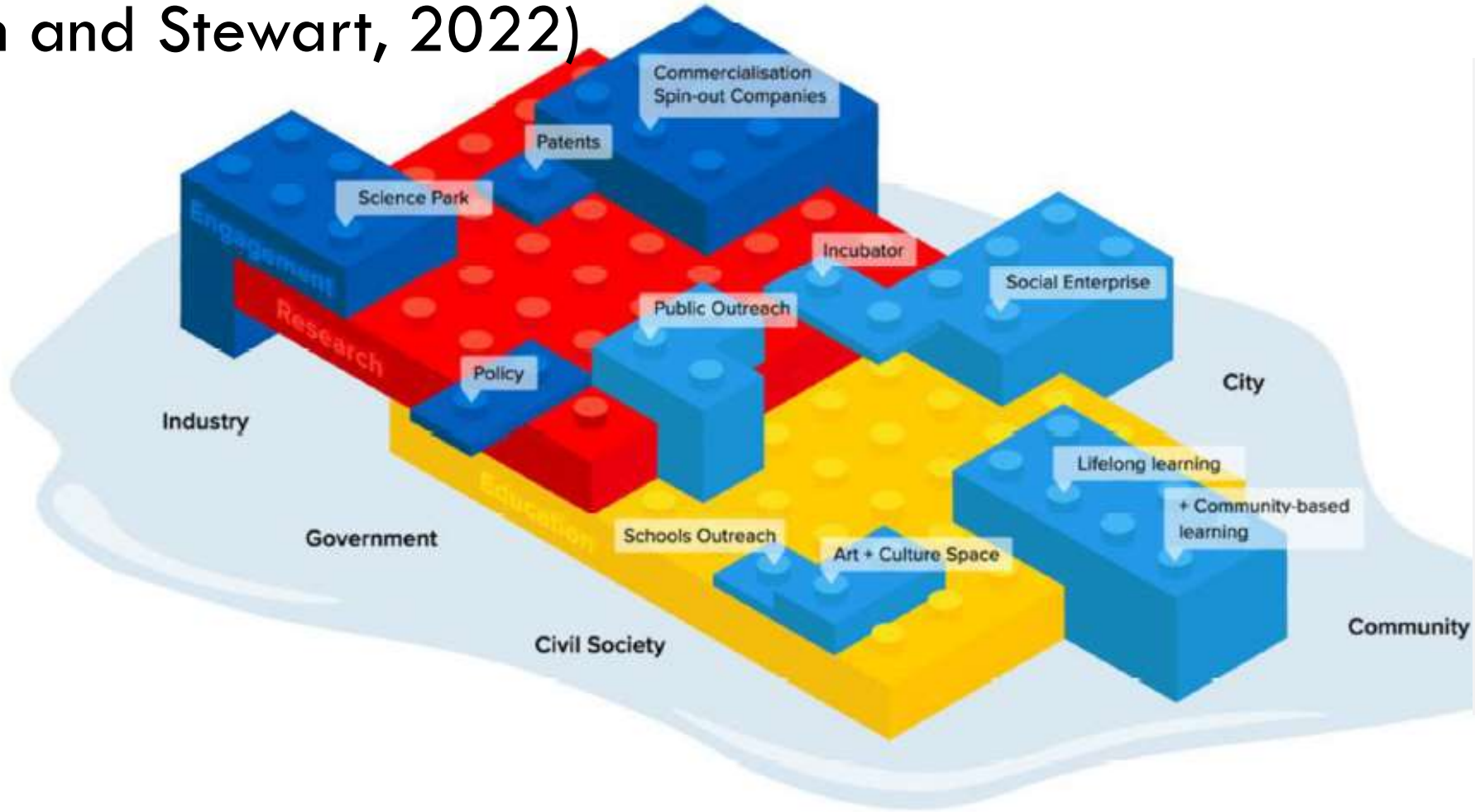
***Curriculum ideology** is defined by Eisner as 'beliefs about what schools **should teach**, for what ends, and for what reasons (Eisener, 1994, p. 47.)'*

*..Curricula, I assert, not only represent a value position but a shared way of life that teaches a certain **worldview** or **set of values** through **action**."*

Gemma O'Sullivan (2023)

Shaping transdisciplinary, challenge-based education using knowledge creating teams from five European universities: A realist evaluation. DEd thesis, TCD, p. 34-36.

Universities' Education (yellow), Research (red) and "Third mission" activities; social (light blue) and business/innovation (dark blue) (Hurth and Stewart, 2022)



Push/pull between Competing Values ..Competing Stories?!

FIGURE 4 | The Amalgam of university third mission activities. In many universities, recent "third mission" activities are often bolted on to their long-standing twin missions of education (yellow) and research (red). Some of these third mission activities are focused on business and innovation ventures (dark blue) whilst others are more socially and community directed engagements (light blue), resulting in a complicated amalgam of extra-mural functions.

Societal Benefit by Commercialisation of Knowledge

"This concept of the university as an **engine of economic growth** originated in the mid-1990s when universities became "**explicit instruments of economic growth** in the **knowledge economy**" (Wissema, 2009) through the **Triple Helix thesis** (the interconnection between **university, industry and government**) at a time when **universities and industry** were exhorted by policy makers to work together more closely for the **benefit of society** derived from the **commercialisation of new knowledge.** Innovation became a factor of economic success (Scholz, 2020). ..This integration of a mission of economic development by universities, next to their traditional activities of research and teaching is also known as the **Third Mission** (Minshall et al., 2007, p. 3)."

O'Sullivan (2023), p. 74

We should be about "*transforming the universities into wealth creating machines*"

Craig Barrett, ex Intel CEO, RTÉ Radio interview, July 13 2013

"Re-purposing Universities: The Path to Purpose" (Hurth and Stewart, 2022)

These three fundamental academic missions **-education, research, and societal engagement-** form the basis of how universities are expected to respond to the **global unsustainability challenge.**

But it is in universities' more recent **"third mission" - the direct transfer of knowledge and technology to society** that their contribution to society has been most effectively expanded [..via] **enterprising and entrepreneurial activities.**

However, this premise arguably rests on **questionable assumptions deep** within the **current economic paradigm** about **what wellbeing is** and **how it is best delivered to society.** [..thus] fundamental problems arise when seeking to advance the third mission because our **current economic way of organising tends to be regarded as deeply complicit in the current socio-ecological crisis.**

V. Hurth, I.S. Stewart (2022) Re-purposing Universities: The Path to Purpose. *Frontiers in Sustainability*. 05 January 2022.

"Re-Purposing Universities for Sustainable Human Progress" (Stewart et al, 2022)

"The fast pace of technological change will mean that **technical skills** are likely to quickly become **obsolete**. This, in turn, necessitates a more fluid curriculum and intellectual experience that provides the tools for students to **think critically, systemically and creatively** about multiple problems that **cross traditional disciplinary divides**.

A vital first step in that **transformation** process is for **universities to recognize that there is a problem**. …Transformational intent necessitates a **whole-institution cultural shift in mindsets**, across research, teaching, knowledge transfer, and campus operations.
..it needs to be supported by a facilitative rather than directive executive leadership, allowing everyone - staff, students, and stakeholders - to **co-produce the mission and shape the transformation**."

I.S. Stewart, V. Hurth, S. Sterling (2022) Re-Purposing Universities for Sustainable Human Progress. *Frontiers in Sustainability*. 2:743806.

UNESCO (2021): 'Transform Education'

"Humanity has only **one planet;** however, we do **not** share its **resources well** or use them in a **sustainable** manner.

..Education is the key pathway to address these **entrenched inequalities.** ..in a world of increasing **uncertainty, complexity and precarity.**
..**We need to transform education**.

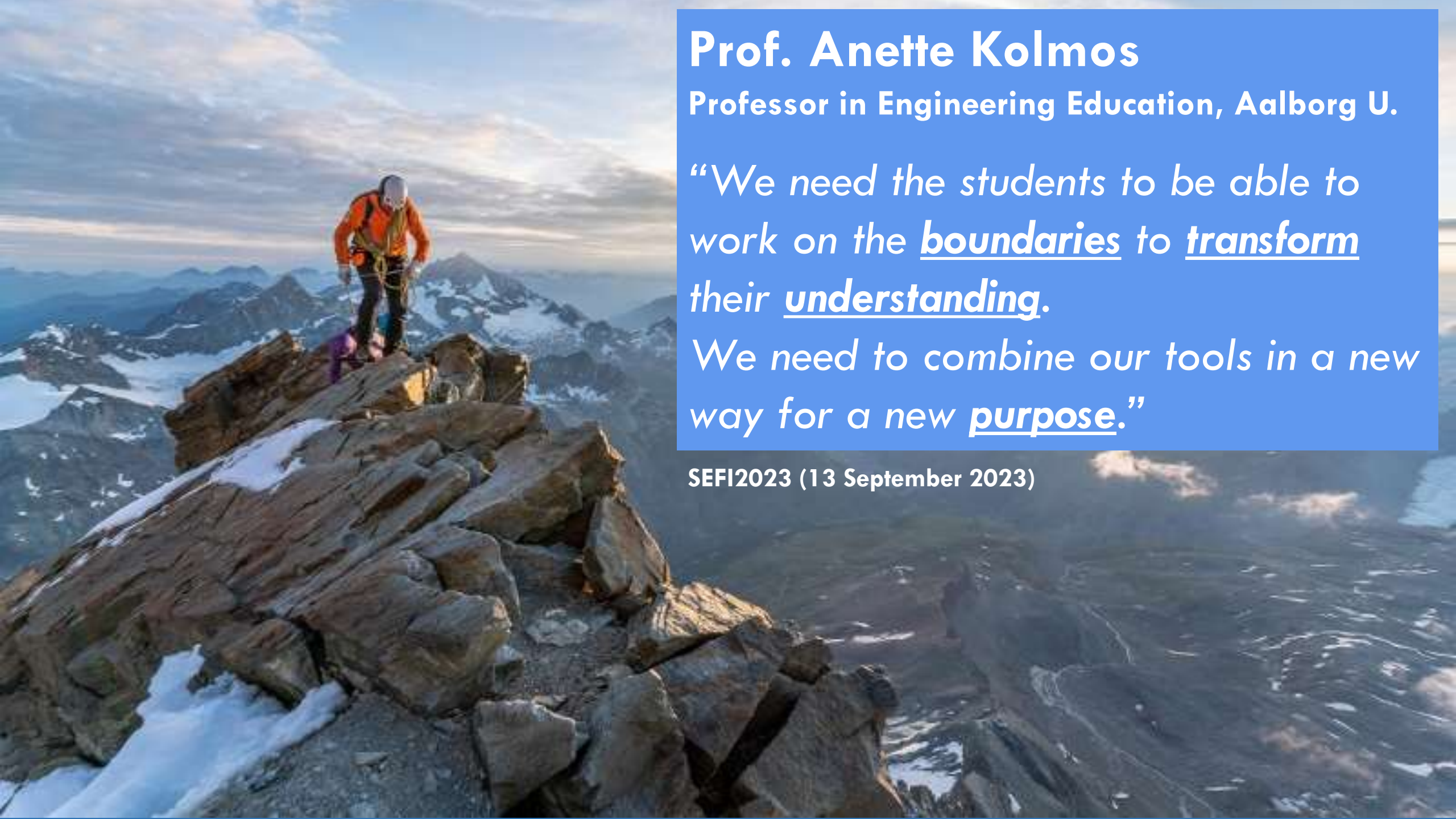
This act of **reimagining** means **working together** to create futures that are **shared and interdependent.** A **new social contract for education** must be anchored in two foundational principles: (1) the **right to education** and (2) a commitment to education as a **public societal endeavour** and a **common good.**"

UNESCO (2021), Reimagining our futures together - A new social contract for education. UNESCO, Paris.

Pedagogies embracing Interdependence and Interdisciplinarity

Pedagogies need to reflect **interdisciplinarity,** just as the problems and puzzles of the planet do not limit themselves to the confines of **disciplinary boundaries.** Yet, as there are many possible solutions to a given problem, **pedagogical approaches** must be selected that also cultivate the **values** and principles of **interdependence** and **solidarity.**

UNESCO (2021), Reimagining our futures together - A new social contract for education. UNESCO, Paris.



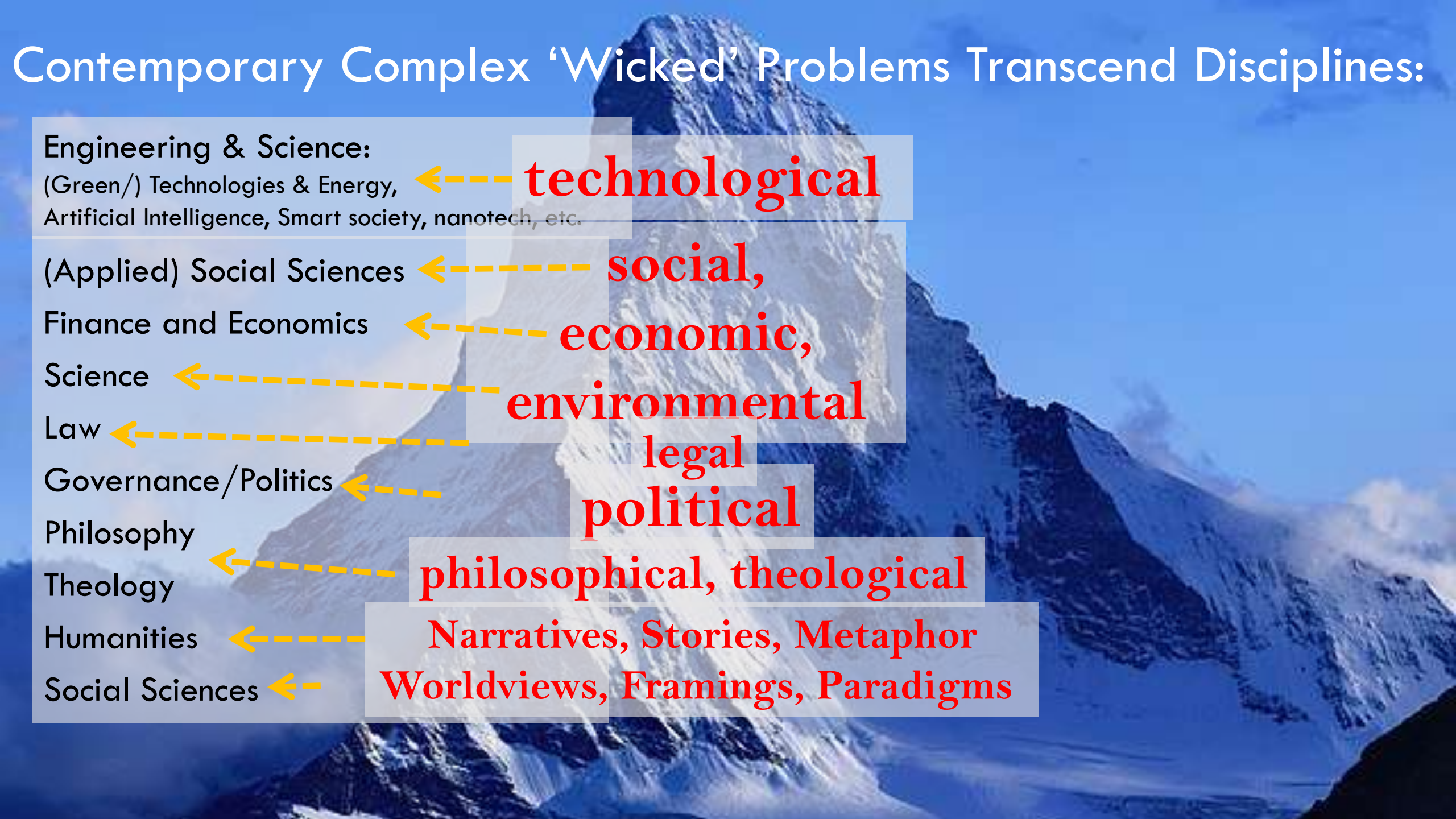
Prof. Anette Kolmos

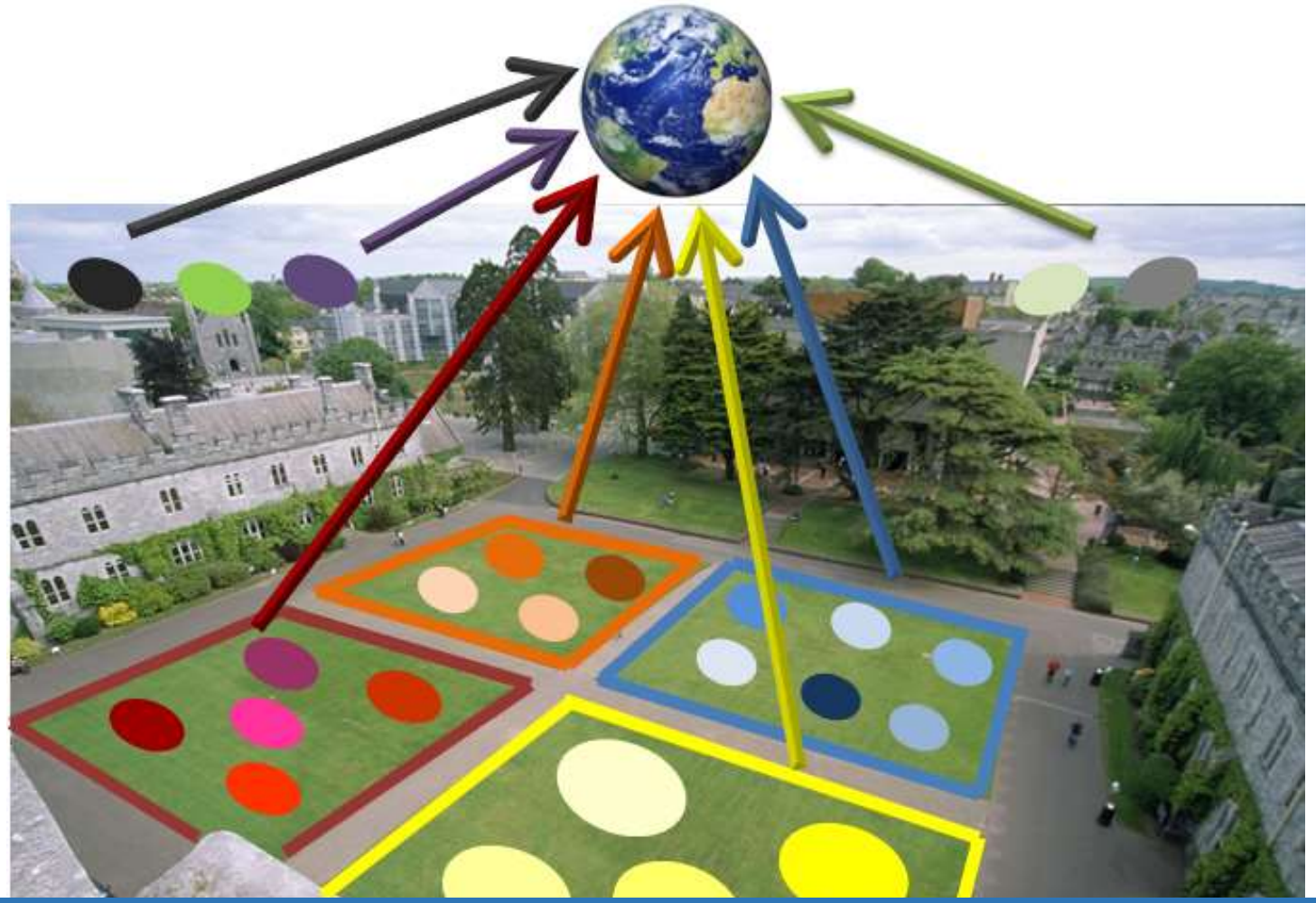
Professor in Engineering Education, Aalborg U.

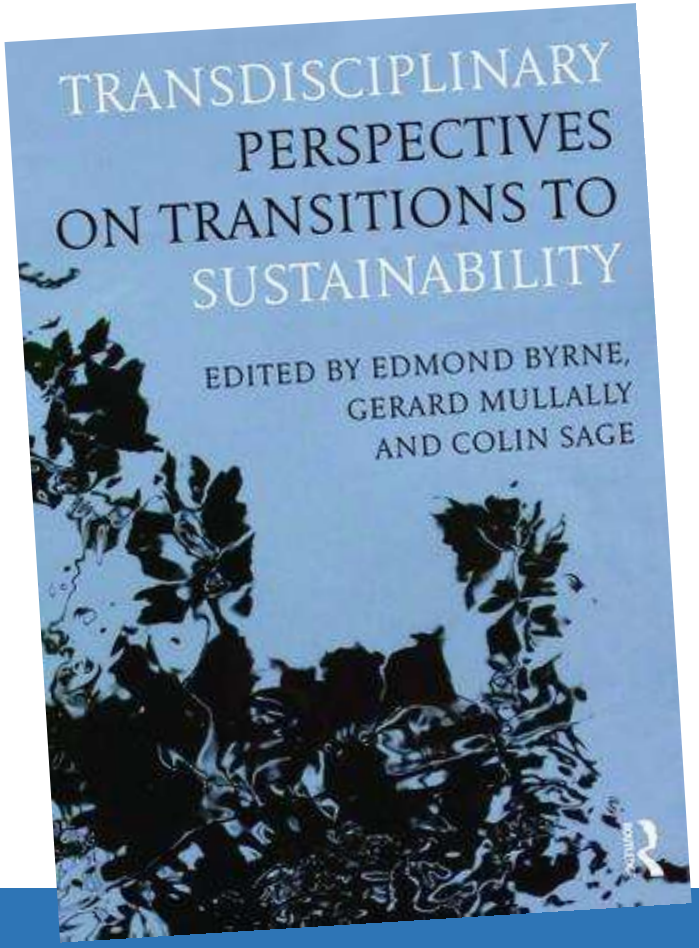
*"We need the students to be able to work on the **boundaries** to **transform** their **understanding**.*
*We need to combine our tools in a new way for a new **purpose**."*

SEFI2023 (13 September 2023)

Contemporary Complex 'Wicked' Problems Transcend Disciplines:







"Essentially, amid the **'silo-ised' constraints of the university** (or should that be 'multiversity'?), the whole was not greater than the sum of the parts. More broadly, within a world of increasing ecological degradation, social upheaval and economic inequality we were making **relatively feeble attempts to address the 'grand challenges' around (un)sustainability.**"

Byrne *et al.* (2017)

Byrne, E. *et al.* (2017). Transdisciplinary within the university.
In: Byrne, Mullally & Sage (eds.), Routledge.

Fit-for-Purpose Higher Education?
Today's first year student.
2050: Aged 45

Conditions to Cultivate Transdisciplinarity

Naoko Ellis and Derek Gladwin

How to use a Theory of Change to design radical educational futures

Gemma O'Sullivan

Utrecht University

Copernicus Institute of Sustainable Development