

**Becoming a Physics Teacher: Identity conflict in the transition  
from undergraduate physicist to physics teacher**

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# Presentation Structure

1. Research Question and Abstract: An analogy to the life cycle of a star
2. Background: Physics education in England 1850 - present
3. Epistemological Issues - Are conceptions of knowledge different for physicists and teachers?
4. Positionality- Physicist? Physics teacher? Physics teacher educator?
5. Defining Identity in Relation to Physics Teachers
6. Methodology – planned...
7. Questions / Comments / Feedback

## 1. Research Question and Abstract

This study seeks to explore experiences of identity conflict as undergraduate (UG) students of physics make the transition to becoming teachers of physics. Divergent ontologies and epistemologies in the academic disciplines of physics and education are an important influence in this identity conflict. Critical realism is suggested as a theoretical approach for the study that can valorise the perspectives of both physicists and teachers. Interpretative phenomenological analysis (IPA) then emerges as an appropriate methodology to address research questions around the evolving experiences of physics students as they become teachers in a 3-year longitudinal study. Data collection has not yet begun but it is planned to recruit <20 participants who are final year physics undergraduate students studying physics degrees at 3 UK universities. A condition for participation is the intention to train to be a secondary school teacher. To gather data for the IPA, walking interviews will be used as way of exploring physical and mental transitions from physics as academic study to physics as a school-based occupation.



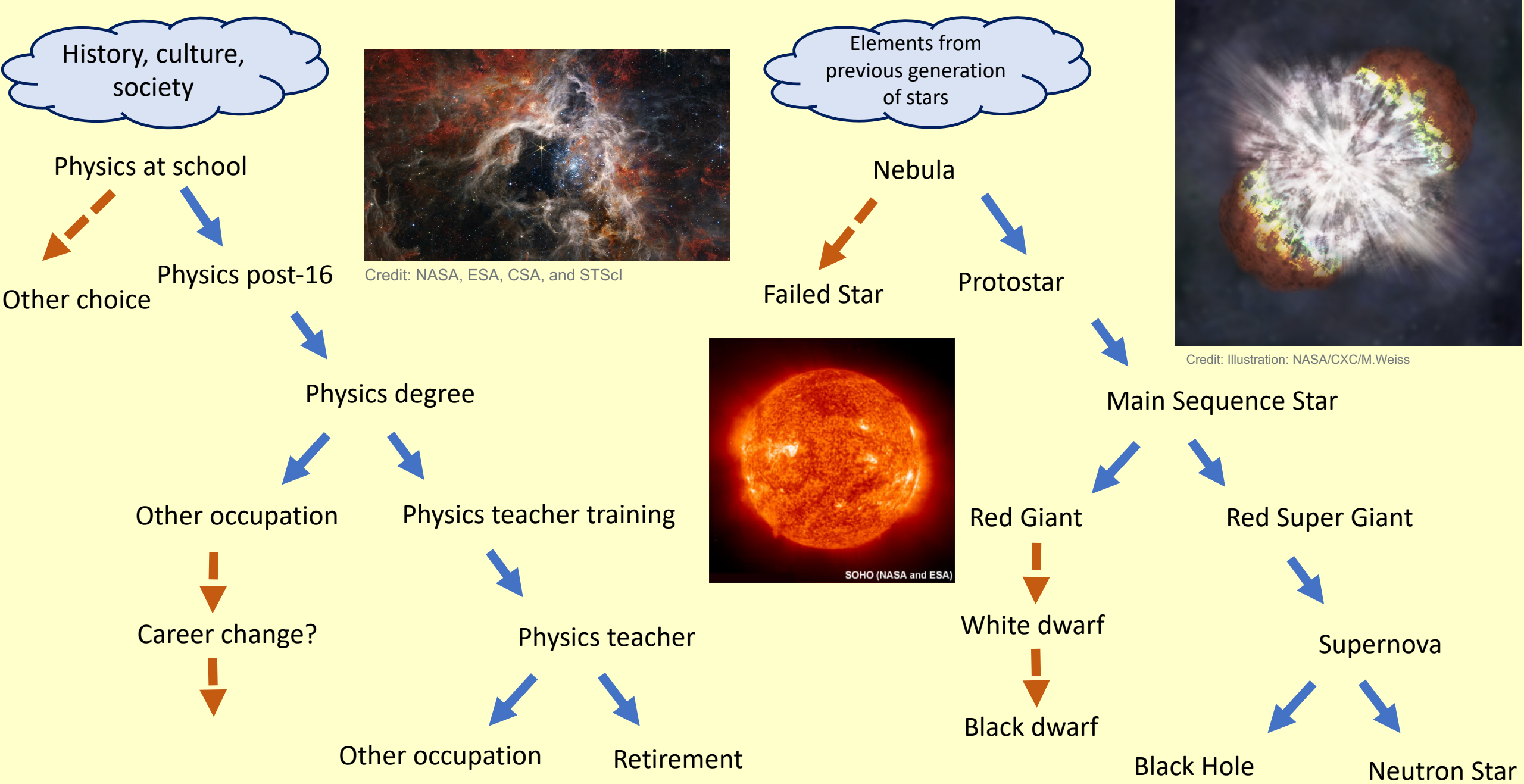
What processes are occurring within a star that will (or will not) ignite a supernova?

Logical empiricist approach?

RQ: In what ways and to what extent does the sense of identity of a physicist change during the transition to them becoming a physics teacher?

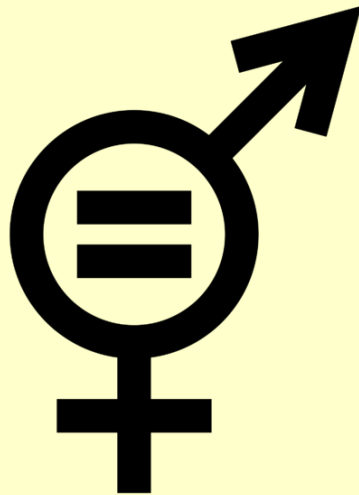


Phenomenological Approach?



## 2. Background: The historical context of physics teaching in England and the problem of recruitment and retention of physics teachers

- There has always been a shortage of specialist physics teachers in secondary schools in England. In 2023 17% of those required were recruited (Department for Education, 2023)
- There have always been tensions about who should teach physics, how physics should be taught and who should learn physics.
- These have led to issues of gender, race and social class inequality in physics.



## Historical Perspective: 1800 – 1870



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### **3 problems identified:**

- Lack of suitable textbooks
- Little encouragement from universities
- Difficulty of recruiting able teachers

(Clarendon Report, 1864)

First record of a laboratory for teaching physics at Stonyhurst School, 1808. (Bishop, 2004)

1830's – 1840's Not possible to obtain formal degree qualification in physics in England.

What would now be recognized as parts of the distinct field of physics emerged in education taught in mathematics, natural philosophy, astronomy

'New' University of London established 1836 : Degrees in Engineering led to entrance tests in science

Some feeder schools start to teach it! E.g. University College School, City of London School, Cheltenham College, Wellington College + grammar schools

# 1874 – Turning Point?

Physical Society founded – professionalization of physics

First experimental physics teaching lab (Clarendon Laboratory) founded, in Oxford, for undergraduates

British Association for the Advancement of Science committee on the teaching of physics in schools

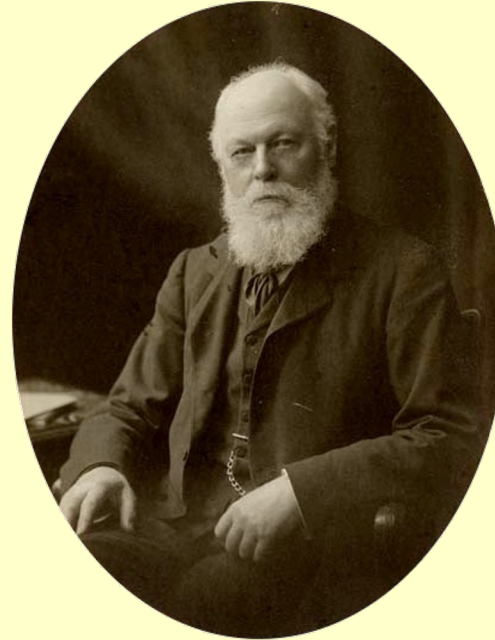


**Robert Bellamy Clifton**  
Professor of Experimental  
Natural Philosophy,  
University of Oxford 1868  
- 1915

Complained that students  
were not completing their  
university studies in  
physics due to being stolen  
by schools to be teachers!

(University of Oxford  
Commission, 1881)

Image by  
[https://wellcomeimages.org/indexplus/obf\\_images/e9/e5/1ce2bcde115d0d779b2e141483cf.jpg](https://wellcomeimages.org/indexplus/obf_images/e9/e5/1ce2bcde115d0d779b2e141483cf.jpg)Gallery:  
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**George Carey-Foster**  
Professor of Physics, University  
College London 1865 - 1898

- Physics that should be learned at school: Mechanics, heat, optics, magnetism and electricity (in that order)
- Pupils should do experiments themselves not just watch demonstrations by teachers.

(Carey Foster, 1874)

Image by unknown author - University of Strathclyde departmental wall, scanned and put up on  
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# From social exclusion to intellectual elitism – toward the 21<sup>st</sup> century

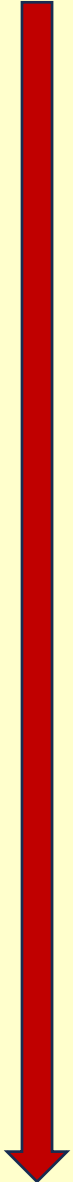
Physics was valued less than other knowledge in society. Not suitable for a ‘gentleman’. A hobby... in the mid-19<sup>th</sup> century (Gregory, 1973)

Physics became important for technological, industrial and commercial prosperity in the second half of the nineteenth century – connection to colonialism. (Morus, 2005)

By 1895 complaints that school curricula were too much dominated by science with literary subjects neglected (Bryce, 1895)

For most of 20<sup>th</sup> century, most physics in schools of different types taught by physics graduates mostly in independent and grammar schools. When compulsory teacher education introduced in England in 1974 there was a waiver for physics graduates.....until 1984..... (Woolnough, 1988)

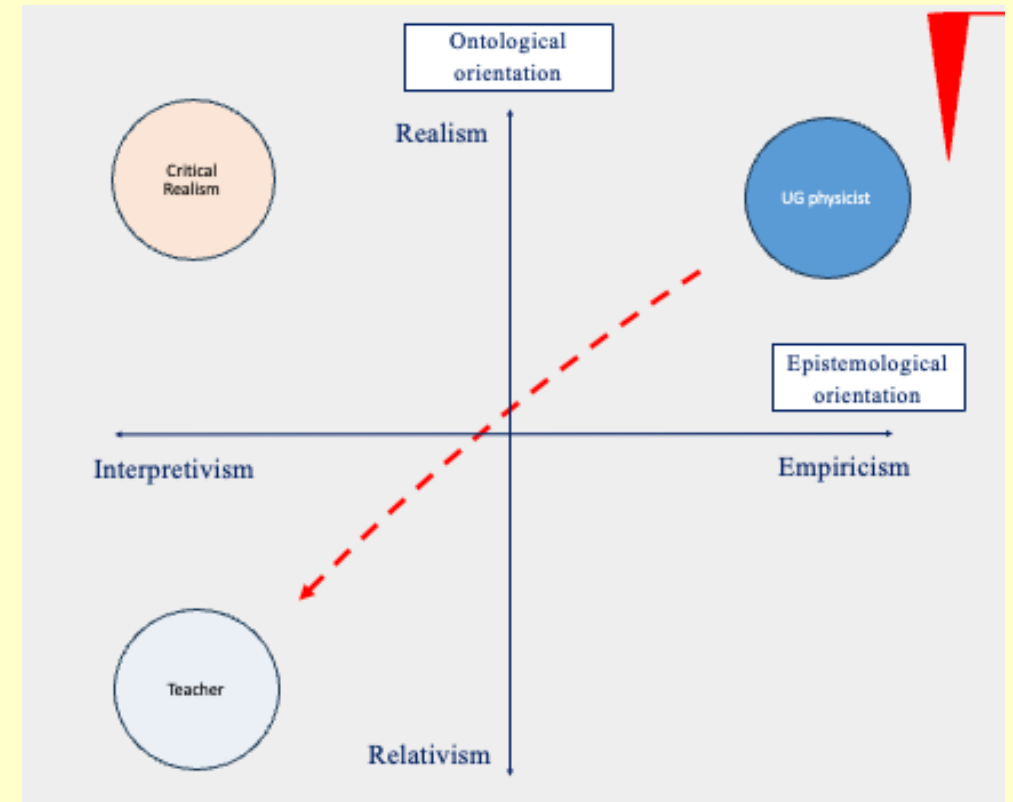
Large-scale study of 15/16 year olds in England find that the discipline of physics is positioned as elite and ‘hard’. Physics struggles with participation and representation. (DeWitt, Archer and Moote, 2019)



### 3. Epistemological Issues

Are conceptions of knowledge different for physicists and teachers?

	Ontological orientation	Epistemological orientation
Physicist	Objects of study are real and exist whether anyone studies them e.g. planets, particles	Gathering data by observation and experiment are the way to know about objects of study
Teacher	Object of study exists in relation to culture, society and context	Exploring the subjective understanding of people is the way to know



Ethical dilemma: How to study identity in ways that have meaning for physicists ?

#### **4. Positionality - Physicist? Physics teacher? Physics teacher educator?**

“Who were they? Typically they were men, (only four were women), who had themselves been successful physics teachers in, for obvious reasons, grammar or independent schools. In later years they would have been expected to have had comprehensive school experience. Almost without exception they were ‘good honours graduates in physics’, most would have gone into teaching after a one-year professional training of which they would speak with derision. Most would have had ten-fifteen years experience of teaching and running a department before entering the University Departments of Education. They were also likely to have been involved with curriculum development, in-service training, or with the ASE and would have written articles or textbooks.”

(Woolnough, 1988 p. 75)

## 5. Defining Identity in Relation to Physics Teachers

Identities are fragmented, are continuously evolving over time and in response to social contexts.

“Physics teachers are, almost without exception, physicists” (Woolnough, 1988, p. 5)

To what extent has this changed?

Identity is “being recognised as a certain kind of person in a given context”. (Gee 2000 p. 99)

Can one be a physicist and a teacher?  
Are identities of physicist and teacher always in conflict? Is rapprochement possible?

## 6. Methodology: Longitudinal Interpretative Phenomenological Analysis (IPA)

1. Making sense of life experiences – especially transitions.



Validity of approach established in diverse fields

2. Double hermeneutic. Researcher makes sense of the participant making sense of their experience.



Authentic curiosity and empathy  
Semi-structured interview the main data collection method – depth and detail

3. Idiomatic. Detailed exploration of particular cases



Small, purposeful sample of ~6 final year UG physics students who intend to train to teach.

Follow for 3 years: final year UG -> training to teach -> first year as a teacher

Walking interview – walk from university department to local school

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