Evolution and the Controversy: Existential and Psychoanalytic Perspectives

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Doctor in Education (EdD)

8th March 2021

Abstract

The teaching of evolution has been consistently associated with controversy and has been the source of a great deal of debate and research in the science education community across the world. Much of the relevant research scholarship has highlighted the significance of religious belief in this debate. However, little research has looked at affective responses to evolutionary concepts that may in turn explain the rejection of the scientific explanation by some people, irrespective of whether or not they have a religious faith. In this thesis I propose that the concepts presented by evolution can be perceived as potentially disturbing to all; ideas about change, uncertainty, absence of purpose or plan, extinction and struggle, as well as challenges to identity arising from the emphasis on our place in the natural world alongside other animals. Drawing on a psychoanalytical theoretical framework, I have used Free Association (FA) in narrative interviewing to examine novice educators' unconscious and conscious emotional responses to evolutionary concepts. My findings suggest that for many, the ideas inherent in evolution reveal disturbing existential questions, irrespective of whether they have a faith or not. I propose that the role of existential concern, its impact on our relationship with the natural world, and our emotional response to evolution have not been fully appreciated. I suggest affective and existential issues require greater examination in the context of teaching and learning about evolution and that this research highlights the importance of dialogue and trust in the classroom.

Impact statement

I believe that this research has the potential to encourage scientists and educators to think about the controversy that attends the theory of evolution in a new way, one that acknowledges the existential concerns at the heart of our relationship with nature. It has the potential to change how we view the issue, taking the fear out of encountering a possibly controversial subject in our classrooms for teachers and their learners.

I aim to continue to use my findings in Initial Teacher Education (ITE) to better equip beginning teachers to approach the non-acceptance of evolution in a sensitive and constructive manner without compromising the science that students need to learn. In not acknowledging the affective power of knowledge we risk alienating learners and inhibiting learning. I have already used my findings to create opportunities for a discussion of how the controversy is encountered by beginning teachers of science I work with at UCL. In exploring our own experiences of the topic as teachers and learners in a multicultural context, we have been able to discuss ideas such as the nature of truth and what constitutes knowledge in science and other epistemologies. Sharing my interviewees' responses has revealed the potentially negative experiences of our learners and allowed us to think about how we can use honesty and empathy to counter fear and misgiving. Initial feedback from student teachers has been very positive and the workshop I have developed for the course is one of the most well regarded in the course evaluation, as a quotation from a 2019/20 student exemplifies: "This was a really interesting sessions and something I was concerned about as my NQT school is a religious school. I felt a lot more confident on how I will teach these ideas now and how they can be addressed."

I believe a cross-disciplinary approach is also helpful in addressing the issues I have discussed in my research, as these touch on other disciplines. I have already collaborated with colleagues in Religious Education ITE to share expertise about the evolution controversy from a faith perspective and I plan to approach colleagues in Art and Design ITE to consider how students and teacher could potentially use art to express the existential concerns they encounter in their responses to nature. This might, for instance, be through

the work of Mark Dion who has depicted the monstrous in nature and its conception as Other, alien and unfamiliar yet also a mirror to ourselves.

I have already shared my findings at European biology and science education conferences (ERIDOB 2018, ESERA 2019) and at the cross disciplinary conference for *Epistemic Insight* held at Canterbury Christchurch University in June 2020. I have also written a short article based on my early findings for the *School Science Review* in 2017. I plan to continue to disseminate my findings through a new book collaboration on evolution education in 2021 and further journal articles. I also plan to present my findings at further conferences including the Biology Education Research Group (BERG) of the Association of Science Education (ASE).

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Declaration

I, Emma Newall, confirm that the work presented in this thesis is my own. Where information has been derived from other sources, I confirm that this has been indicated in the thesis.

Word count: 47398 words (exclusive of appendices, the list of references and bibliographies but including footnotes, endnotes, glossary, maps, diagrams and tables).

Acknowledgements

I would like to extend my thanks to the many people who helped me on my EdD journey. I have been supported by many people, personally and professionally, and their support has contributed significantly to this final thesis.

Special mention should go to my supervisor, Michael Reiss, who has been a source of calm, sustained advice and support. I am so pleased to have had the opportunity to work with him as a doctoral student and I look forward to continuing to work with him on further academic ventures as colleagues.

Special mention should also go the Charles Darwin Trust, who have not only provided a source of academic inspiration but also financially supported my studies for the first few years of the EdD programme. Trust colleagues such as Randal Keynes, Karen Goldie-Morrison, Carol Boulter, Sue Johnson and Dawn Sanders have provided inspiration and advice and fuelled my fascination for all things Darwin. I owe them all so much.

I would also like to thank my colleagues at the Institute of Education, those on the Science PGCE and MA teams and beyond; in particular Ruth Amos, Jo Nicholl and Ruth Wheeldon. I also wish those of you completing your own doctoral studies all the very best on your own personal, academic journey. I hope I am as much of a source of support for you. Many thanks also to Paul Davies and Claudia Lapping for their time and invaluable feedback.

Additionally, I would like to give my sincere thanks to all my family and friends who have had to provide emotional and tea-based sustenance. Finally, I will stop talking about my EdD! Special thanks to Michele Woods who assisted me with some of the interview transcription, this was of huge help at a difficult time.

Finally, I would like to thanks my husband Alistair Newall for all his love, support and patience during my EdD. I could not have done it without him. I hope I was as supportive when he was doing his PhD. I would also like to thank my lovely daughters Ellen and Dinah. I hope I have inspired you to learn your life long.

Reflective statement

In preparation for the writing of this Reflective Statement I revisited the work I completed earlier in my EdD: the first three written assignments, my Portfolio with its own reflective statement and my Institution Focused Study (IFS). A unifying focus of my education and career has been a desire to understand the world around me. This originated from a need to understand my own experience, but also from a genuine curiosity about both the natural world and human experience. I began my working life after university as a bench scientist, working for the Medical Research Council. This was for a number of years before I moved into clinical science as a practitioner of genetic counselling. This change represented a switch in my focus from exploration through the power of the scientific method, using laboratory science and the controlled experiment, to an understanding of biology in the real world. I did not realise it at the time but this was the first step towards the academic space I now inhabit. It is this in part that I will discuss through this reflection.

At the start of the EdD I was a freelance science communication and education consultant. Essentially, I was involved in science outreach for universities, museums and education charities and in the first assignment for the *Foundations of Professionalism* (FOP) module I examined the tension between scientists and the public and the role of the science communicator within this *third space*. The concept of the third space was developed by Celia Whitchurch and for me it describes the identity crisis experienced by those *blended professionals* who work across professional boundaries. In the FOP I posited briefly the idea that I was considering my "identity as a project" in that assignment, but did not really follow this idea up at that point. It is so interesting to see how I have nevertheless continued to experience my research journey in this way throughout the EdD, moving from a positivist research scientist to an interpretivist social scientist, an identity in flux. This route from laboratory bench to wider world is mirrored by my initial interest in understanding life at the molecular level, to then a developing understanding of complexity at higher levels of organisation. This was first as a clinical practitioner through people's experiences of genetic conditions, then through my interest in the evolution of populations and interdependence of organisms in ecosystems as a focus in science education. Later this continued to develop

into an interest in understanding the complexity of human experience albeit at an individual level.

This interest in the complexity of human experience was evident from the start of my EdD journey. On re-reading my first assignment for the FOP module I note that I argued for a deeper understanding of people's attitudes to science, a move away from a focus on delivering knowledge to the public to an understanding of how perceptions of knowledge are shaped by experience. This began to hint at the understanding I now have of the affective power of knowledge and the reading, reflecting and thinking I undertook for the FOP assignment were important first steps in the development of my ideas and understanding of human experience.

Through the next two modules *Methods of Enquiry 1* and *2* (MOE1 and 2) I began to actively question within which research paradigm I sat. This was quite a difficult experience and one I at first somewhat resisted. I argued that this was because the research I had undertaken as scientist did not fall neatly into the quantitative bracket of research associated with positivism. I still stand by that assertion; however, I also see a possible resistance to that very individual nature of experience I have come to understand. The scientist is often looking for ways of generalising phenomena and it was difficult for me to appreciate there is another way to understand experience at this point.

In the MOE1 assignment I began to consider how I could examine a key organisation that I worked with as a freelance consultant. This was the Charles Darwin Trust (CDT), a small education charity using the legacy of Darwin's life, home and ways of working as a source of inspiration and learning for children and young people. I identified narrative interviewing and documentary analysis as appropriate methods of data collection and began an examination of phenomenology in MOE1 as a potential theoretical approach to understanding my data. I think that this was a valid approach to take but my understanding of phenomenology was embryonic and this proved challenging to my application of its ideas.

In the MOE1 assignment I saw phenomenology as an opportunity to understand experience anew. I was interested in using it to understand the development, application and experience of a key tenet of the Charles Darwin Trust, Darwin-Inspired Learning (DIL). Darwin-Inspired Learning is a teaching approach that was developed by CDT educators drawing on Darwin's ways of working as inspiration. It encourages a sense of place and

direct engagement with the natural world. I began to think about its development and application very broadly, but with time this narrowed down to the experience of DIL and its personal relevance to CDT educators and Trustees, my colleagues in the pilot research project discussed in the MOE2 assignment and the larger project of the IFS.

When I came to my IFS I used the idea of eidetic analysis, derived from the phenomenology of Edmund Husserl, which seeks to consider the essence of individual experience of phenomena. However, I was still attempting to find patterns in the group's experience rather that closely examine the individual. I was seeking to develop understanding through generalisation rather than the personal dimension. I quoted Edmund Husserl on the need for empathy in the approach to analysis, to walk in another's shoes, their motives becoming my motives, but I did not fully achieve this in the IFS. It was only later in analysing the interviews of my thesis research, drawing on intuitive inquiry that I more fully appreciated Husserl's meaning. In my thesis I have gone on to consider existential concerns which could be categorised as universal, but the exact nature of that experience is fundamentally individual and needs to be understood as such. Reading Jean Paul Sartre was helpful in this regard. It helped me understand my instinctive response as a biologist to find taxonomies of meaning, to categorise rather than seek holistic meaning. In the IFS I categorised proponents of DIL as people who had freedom to explore the natural world as children with active adult encouragement, but I did not pursue the richness of the individual experience. Looking back at those IFS data I wonder why a particular member of CDT loved butterflies in particular and another birds, why one of these became a professional scientist, the other a teacher. Details now seem so significant.

On embarking on my IFS I was struggling with the limits to objectivity and at this point in my journey I felt I was producing more questions than answers. It was a personally difficult time for me and the deep reflection I was required to carry out was challenging at this point. I was confused and lacking focus. I was beginning to acknowledge my own place in the research I undertook as part of the MOE2 assignment and the IFS; I was an *insider researcher*, my data were derived predominantly from interviews of colleagues, but on reading back I feel that my own personal contribution to the data and the analysis is to some extent missing.

The MOE2 and IFS did give me the opportunity to consider how Darwin exemplified the interested amateur in some ways, reflecting my own interest in the public understanding of science as a science communicator. He was not formally trained in what would have then been termed natural history and he worked not in a laboratory but in his own home and garden. This was a key source of inspiration to the members of CDT, many of whom began their interest in biology as children exploring the natural world. This seemed true to the identity project I alluded to earlier. I too felt like an amateur scientist and an amateur educator and I feel that is why I am drawn to the third space, where I am still, although in higher education rather than science communication now.

Finally, I want to consider further the origins of my thesis research, which moved away from an examination of an organisation supporting teaching and learning of Darwin's work to a critical analysis of the causes of non-acceptance of evolution, drawing on a psychoanalytical and existential theoretical framework. I began on this journey as a scientist and educator, aware of the controversy regarding evolution in education, but reluctant to engage with it. My own identity and worldview were at odds with those who find evolution controversial and, like many teachers, I feared confronting views different from my own. Looking back, I now think that I did not want to encounter the potential emotional turbulence evolution might provoke in learners. Much of the literature on barriers to evolution acceptance has considered issues such as the difficulties of conceptual change, counter-intuitive explanations and misconceptions, often following the knowledge deficit model of early science communication. When I first started to consider the role of affect there was very little scholarly research devoted to affective barriers, although this has developed to a certain extent subsequently. A key driver in the broadening of my own approach to include an examination of affect was an *Initial Specialist Course* that I undertook as part of my EdD research training. It was entitled *Rethinking Education* and focused on psychosocial research methods drawing on psychoanalytical theory. The guidance in the course handbook stated that participants did not need any prior knowledge but needed "curiosity and a willingness to engage". It was ground-breaking for me. It enabled me to consider the possibility of unconscious responses to evolution and a new way of considering the problem. I was aware that evolution encompassed ideas about change, instability, struggle and human identity and I proposed that responses to such ideas could have an unconscious dimension. Darwin's

own writing hinted at the possibility of existential concerns that could trigger unconscious or conscious affective responses. He wrote about the war of nature, famine and death and described the driver of natural selection as the struggle for existence. In addition the writing of Heidegger, Sartre and other existentialist thinkers allowed me to develop this idea in a particular direction, that of existential concern. What I have ended with is an examination of individual trainee educators' responses to key evolutionary concepts from an existential, psychoanalytic perspective. The scope of the ideas I have encountered in this research seems vast and there are so many interesting dimensions to the research process I undertook and its outcomes that I would have liked to have pursued further. For instance, I would have liked to have discussed in more detail in my thesis the choice and use of the visual stimuli I used in the interviews. They were key to eliciting the responses I did experience in the interviews. I would also like to consider the implications of DIL's aim of direct engagement with the natural world, given the complex relationship with nature my findings suggest some people have. How do we tap into the restorative rather be overwhelmed by the existentially challenging dimensions of the natural world?

Fundamentally, the personal outcome for me of this research has been an opening of my mind, a realisation that the threat was the avoidance of, not the engagement with, the ideas of others. This developed through the stories of my interviewees, a new way of thinking about evolution in the classroom and beyond. I am now more ready as a researcher to embrace complexity and subjectivity to get closer to the heart of experience.

Abbreviations

ASE – Association of Science Education

BERG – Biology Education Research Group

CDT – Charles Darwin Trust

CPD – Continuing Professional Development

DIL – Darwin-Inspired Learning

ERIDOB – European Researchers in Didactics of Biology

ESERA – European Science Education Research Association

FA – Free Association

FANI – Free Association Narrative Interviewing

FOP – Foundations of Professionalism

ID – Intelligent Design

IFS – Institution Focused Study

ITE – Initial Teacher Education

MEP – Member of the European Parliament

MOE – Methods of Enquiry

NQT – Newly Qualified Teacher

TCA – Thematic Content Analysis

TMT – Terror Management Theory

Chapter 1: Introduction

This thesis represents my journey towards a new understanding of a subject much researched and discussed and of personal importance to me – the teaching and learning of evolution. As a biologist it is a subject of great significance, but it is as a biology educator I have come to see it anew and with even greater significance attached. I have presented the research I conducted here semi-chronologically, although adhering to conventional thesis chapter headings. I have done this in order to attempt to represent the journey I took. I began with a kernel of an idea, that being that evolution could perhaps bring to mind disturbing notions. I will expand on the origins of this idea in the *Reflective Statement* that I submit with this thesis, but in brief what I began to question was – is all resistance to evolution explained by a person's religious beliefs?

I began with an examination of *the controversy*, as it has come to be referred to, and our understanding from the literature of the issues of acceptance, belief, knowledge and understanding in the context of evolution and biology education. I argue that it was important to start with the ideas occupying others investigating the teaching and learning of evolution, as concepts, such as acceptance and belief, are not merely simple determinates of whether biology education succeeds. They are subtle, intersecting aspects of the problem of the controversy that are influenced by social, personal and cultural phenomena, but also may say something about the fundamental human condition. Accepting an idea that contradicts how we experience or perceive existence I will argue is likely to be problematic regardless of the reasons for our worldview, be it faith-based or not. I began to explore acceptance of evolution and people's emotional responses to it through a lens of psychoanalytic theory, but then also from an existential standpoint. Psychoanalytical theory had the greater influence on the data collection methods, as my aim was to attempt to tap into emotions that are not necessarily immediately evident to me (as interviewer) or the person interviewed. Psychoanalytical theory has also been used in the analysis of the data through an examination of psychic defences against anxiety, provoked, I argue, by existential questions that are implicit in evolution. However, existential thinking came to play a greater role in understanding the data as I analysed it. What is produced is, I hope, a fresh way of thinking about the controversy that connects issues of acceptance, belief,

knowledge and understanding to fundamental issues of what it means to be human and to constitute our own world.

What follows is an examination of people's responses to evolution and the ideas or concepts contained within it, moving away from considering religious worldview as the sole primary source of influence and considering instead fundamental existential concerns, some of these I argue originating from the unconscious. However, first it is necessary to consider what is already understood about the controversy.

Evolution: a dangerous idea

Evolution has, like many words in the English language, more than one meaning, depending on the context in which it is used. Meaning in language can be ambiguous, but in biology at least the meaning of the term evolution is unequivocal. It is described in the Oxford English Dictionary as *the process by which different kinds of living organism are believed to have developed from earlier forms during the history of the earth*. For many this would be an innocuous phrase; it could be read without any particular emotion, possibly just perceived as a dry scientific idea with little personal relevance. However, to others this seemingly inoffensive description of a fundamental biological concept may feel immensely controversial and even dangerous. In some societies, notably but not exclusively, in some states of the USA, the word evolution has come to feel unsafe, becoming "the 'e' word", too dangerous to use aloud (Long, 2011, p.103). Long discusses that this is to a large extent the result of creationist ideology, the influence of a certain section of religious (Christian) public in the USA. He argues most powerfully that "The tension creationists have wrought is palpable", and contends this has generated a defensive denial against this controversy by scientists in response. To admit there is controversy may feel to some scientists like legitimising objections to evolution (Long, 2011, p.102). This is a toxic combination, supporting polarisation not resolution.

Evolution: subversion and murder

This controversy, the negative reaction to evolution in some quarters and its conflict with religious ideas, is not a new phenomenon. At the time Darwin was working on what he

termed transmutation (the instability of species), such ideas were associated with subversive thinkers and blasphemers (Desmond and Moore, 2009). The French philosopher and scientist Lamarck, who had proposed the idea of the inheritance of acquired characteristics as a mechanism for species change, had been accused of writing and promoting "abominable trash" (Desmond and Moore, 1998, p.161). Darwin's own grandfather, Erasmus, had written and spoken about evolutionary theories of life and his ideas were considered by some scholars as "coinciding with atheism" (Desmond and Moore, 2009, p.90). Promoting such ideas was dangerous; atheism could lead to accusations of blasphemy, which was a crime at that time in Victorian England. Darwin, working on his own transmutation theory, an explanation of nature that required no guiding hand or particular goal (Scott, 2004), described his feelings on revealing his ideas to his botanist friend Joseph Hooker as "like confessing a murder" (Desmond and Moore, 2009, p.314). This may not be so surprising given such a political and social backdrop. However, the scientific community had moved towards accepting the premise that the Earth itself was not fixed and static, but dynamic and undergoing constant change. Geologists, including Darwin's good friend Charles Lyell, had convincingly demonstrated that its surface was subject to continual if often very slow change, but to expand this idea to the biological realm was still controversial, even among scientists (Scott, 2004).

The idea that life on Earth has evolved over millennia from a universal ancestor remains to this day an unacceptable idea for many people, despite the fact that evolution is considered by contemporary biologists as the central unifying theory of their science (Sager, 2008). Public opinion research in the UK and worldwide regularly reveals that a significant proportion of the general public do not accept evolution by natural selection, but hold a diverse range of notions about the origins of the diversity of life on Earth (BBC, 2006; Gallup, 2006, 2010, 2014, 2017).

Language itself gives some indication that our emotional response to evolutionary concepts such as natural selection is not neutral. Consider the phrase 'dog eat dog' which presents nature as uncaring and bestial, the weak being preyed upon by the strong. Anthropomorphic metaphors that play with Darwinian ideas are common in literature and in everyday usage (Nicholson, 1991). In business too, Darwinian language is invoked to suggest savage competition and destruction in the form of "a series of bloody metaphors

invoking images of the Darwinian jungle and guerrilla warfare" (Solomon, 1993, p.22). Language in mass media often uses terms associated with Darwin such as 'survival of the fittest', again to imply savage competition, even in the disparate worlds of fashion and sport (*The Independent*, 2019; *The New York Times*, 2019).

The concept of human evolution appears to cause the most resistance and its acceptance may even be declining in some parts of the world (Miller et al, 2006; Pobiner, 2016). In the United States, Gallup polls since 1982 have consistently indicated that at least 40% of those polled hold creationist beliefs and disagree with evolution as an explanation for human origins. Religiosity is a significant contributing factor to this non-acceptance, but level of education attained and familiarity with the subject of biological evolution have also been seen to correlate with acceptance. A review of recent research indicates that the relationship between understanding and acceptance of evolution is complex, but there is some evidence of a positive link between them (Pobiner, 2016). Given these findings, it is tempting to suggest that instruction in evolutionary science will ameliorate non-acceptance. However, this support of the deficit model for public attitudes to scientific claims belies a more complex reality (Hails and Kinderlerer, 2003).

So, despite the current scientific consensus, Darwin's ideas continue to be repudiated by some, just as they were in some quarters over 150 years ago. A. N. Wilson in his book *Charles Darwin: Victorian mythmaker* (2017) strongly criticised Darwin, accusing him of being fraudulent and even went as far as claiming that Darwin's ideas played a part in inspiring Nazism (Wilson, 2017). It is hard to imagine a more damning accusation. Darwin as the person most associated with the theory of evolution is also often invoked by name in association with negative interpretations of his theory. As Niles Eldredge puts it "it is Charles Robert Darwin who still stands out as the towering nineteenth-century intellectual figure who still gives modern society fits" (Scott, 2004, p.ix). The question for me is why do so many people find his ideas so off-putting? I have come to conclude that religion is only part of the answer.

Bybee (2004) describes teachers as setting up in defence as if backed in to a corner "against *assaults* on the science curriculum" (Bybee, 2004, p.xi). This and so many other observations of emotionally charged situations and responses to evolution make me pause to ask the

following question time and time again – why all this heat and light? Why the need to be defensive? It's just science; most science does not come with this baggage.

I began this research journey in some respects quite reluctantly. I have worked with Darwin's ideas and legacy for some years as an educator, yet when I worked previously as a laboratory scientist, Darwin was not a figure I had considered greatly, I took his ideas for granted. However, once removed from the echo chamber of biological and clinical research, where I only met like thinking individuals, I was confronted with other ways of thinking, by other opinions, values and beliefs about biology and nature. These alternative views, the controversy I was confronted with, made me uncomfortable. I was at a loss as how to approach the metaphysical divide ethically whilst teaching biology effectively – a not an uncommon experience for biology educators, I suspect.

There is so much emotion in this debate on all sides which I would argue has been little examined. Why, I have come to ask, is evolution, perhaps uniquely in the panoply of scientific concepts, associated with such conflict and doubt? I have witnessed various reactions to evolution first-hand in classrooms, both in schools and universities. I have heard both ardent repudiation of evolution as well as the more passive response, 'I don't believe it, I am just learning it to pass this test' from students. I have come to question current explanations for lack of acceptance; do they provide a complete explanation? I suspect that the reactions observed are actually more complex than they may appear. I think there is something that we are missing. If evolution is a dangerous idea what is the danger? Is it a threat to the soul as some see it or is there another threat?

We must of course acknowledge the role and power of religious faith as I have indicated, but what I really seek to understand is why evolution at times provokes such strong emotional reactions. This is with the awareness that many people, despite strong religious convictions, *do not* have such reactions. This has led me to question whether evolution also has the power to disturb those without any particular faith. Is faith the only key to understanding human responses to evolution?

Science v. religion: the great debate

The association between religious beliefs and non-acceptance of evolution has been well established. In the 1930s Dudycha surveyed US college students and although he found a good deal of acceptance in this group, there persisted a small but significant number of students who perceived an incompatibility between science and religion, and who could not accept evolution (Dudycha, 1934). More recently, Woods and Scharmann (2001), who described a continuum of accepting/non-accepting stances in the college students they interviewed, reported that the most common factors influencing students attitudes came down to "the Bible, God, religion, and church", although personal relationships also made a significant contribution – the opinions of significant people such as parents were found to be highly influential.

The idea of a continuum of acceptance in association with religious beliefs was also used by Scott (2004). She described a range of responses including those with strong religious beliefs but who have no problem with accepting evolution. This is a group that has generated less academic interest than those who reject scientific explanations, and I propose that the existence of such a group prompts certain questions that take us beyond the polarised view of science and religion I have hitherto described.

David Long in his examination of evolution in US education describes the avoidance of the concept by the schools in some states, but also a wider-scale denial or avoidance by elements of US society. Long asks "What ends does this muting of evolution serve?" (Long, 2011, p.3). He goes on to frame his examination of this phenomenon of evasion as an anthropological investigation, because he is looking for an explanation in human life experiences (Long, 2011). Lives, of course, are shaped by a multiplicity of influences, but primarily life is home, school, community and nation. Within these institutions lie personal relationships, culture and, of course, religion, although Long's ethnographic account of a group of US college students demonstrates how interwoven and interdependent these are. It is from this backdrop that we have to consider people's responses to evolution, which makes clear the complexity of the task. Some of the answers may be found in the role of home, family and community, but possibly not necessarily just in the way we have examined their influence so far. In addition, is there also something about being human itself that causes disaffection, even alarm, at certain biological phenomena? The question I tentatively

began to ask at the start of my research was what is the affective impact on a learner of such an idea as evolution by natural selection? This began to widen to how might evolution clash with a person's existential worldview, how they perceive existence? We all possess a worldview which can be defined as "the fundamental cognitive orientation of a person or group regarding the world and life—how people make sense of human and physical nature" (Chuang et al, 2020, p.4035). In cultural theory, worldview is comprised of three domains: 'cultural bias', 'social relations', and 'a myth of nature'. From this standpoint our worldview greatly influences our relationship to nature, myth of nature being indicative of our perspective on the natural world (Thompson et al, 1990). I will discuss how the way in which we relate to nature may be influenced by an existential worldview in the literature review.

Chapter 2: Literature review

What does the literature tell us about teaching and learning in the context of evolution?

Cognitive barriers

Before I look at the situation for biology and education anew, it is important to consider what we already understand and what has been the focus of research to date. Much of that research has examined cognitive barriers and the conceptual difficulties evolution presents (Sinatra et al, 2008; Gregory, 2009; Shtulman, 2011). The process of biological evolution encompasses a number of inter-connected ideas, which could be summarised as follows – evolution is the result of selection pressure on organisms causing differential survival and reproduction. This in turn acts on heritable forms of intraspecific (within species) variation (in other words, genetic variation), leading to changes in allele frequencies in a population. So, evolution in essence requires an understanding of biological variation, inheritance, selection, competition, adaptation, differential survival and reproduction. These are all substantial concepts to understand in their own right, without the inclusion of additional relevant concepts at the molecular level, such as genes, alleles and mutations, which are generally taught in the later stages of formal education. In addition, a good understanding of evolution by natural selection requires an appreciation of a process that acts at the level of the population, not the individual. Ernst Mayr describes this as population thinking, which it could be argued is a counterintuitive mode of thought; humans are likely to conceptualise evolution at the level of the individual or possibly family members, a more personal and less abstract conceptualisation natural to human thought (Mayr, 1988). Thus, in summary, evolution is difficult to teach; it is a concept that is hard to grasp, but the reasons for this are complex.

Bardarpurkar (2008) captures the fundamental misconception held by many children which is perceiving evolution as "individual transformation" (Bardarpurkar, 2008, p.304), born of necessity – a process of personal adaptation driven toward a particular end. The reality is that evolution is concerned with far more unpredictable events, often acting over long time periods and on a whole species.

Misconceptions are not just demonstrated by children; examinations of adults' understandings of evolution, including those of pre-service and in-service teachers, have indicated that the same misconceptions seen in children's explanations are exhibited by adults, even by some of those teaching biology (Brumby, 1984; Nehm and Schonfeld, 2008; Smith, 2010a; Rosengren et al, 2012; Friedrichsen et al, 2016).

Intuitive biological thought: folk biology, teleology and essentialism

There is a body of research that suggests that people intuitively think about biological entities in a way that is fundamentally different from how they think about non-living things such as rocks and stars. This phenomenon is described as *folk biology* (Atran, 1998). Folk biology is the study of naïve or intuitive beliefs about the organic world. There is evidence across cultures that people tend to employ basic rules of classification to living things which may not coincide with the taxonomic categories conceived by biologists. This intuitive thinking may be associated with essentialist ideas that support these intuitive categories (Atran, 2001). Essentialism is the belief that living things have eternal, immutable identities or essences. People with essentialist notions see organisms as having an underlying, unseen nature that gives them their distinctive characteristics (Samarapungavan and Wiers, 1997; Rudolph and Stewart, 1998; Sinatra et al, 2008; Blancke et al, 2011). This type of thinking is most common in young children but can persist into adulthood. There is evidence that our thinking tends to lapse into essentialist positions under pressure, when we encounter something unfamiliar (Sinatra et al, 2008). Such a situation is reminiscent of what happens to thinking when we are exposed to an "urgent experience" as explained from an existentialist perspective (Yalom, 1980, p.31). The existential philosophy of Martin Heidegger (2010) expresses how we live in two modes of being. The majority of time we are in a state of forgetfulness, absorbed in everydayness, a surface and unthinking perception of reality, taking the world as we experience it for granted. However, another mode characterised as *mindfulness of being* can be induced through these urgent experiences, such as a reminder of our own fragile assumptions about reality (Heidegger, 2010). If evolution challenges our existential assumptions about nature and our place in it, could it act as an urgent experience? Might it be a reminder that our worldview is a personal

construction of reality? Could this trigger essentialist thought? I will return to these ideas throughout this thesis as such propositions form the foundation of my research.

Another form of intuitive biological reasoning is teleological or goal-directed thinking. This describes explanatory frameworks that see adaptations of animals and plants as existing to fulfil a need. This allows for variation within a species and subsequent selection, but the selection is purposeful and towards a particular end. A common example is that birds have wings because they need them to fly (Rudolph and Stewart, 1998; Sinatra et al, 2008; Kampourakis et al, 2012). Evolution is generally conceived by biologists as a more directionless process involving selection acting on advantageous variants; however, there is some basis to teleological explanations and it has its origins in Aristotelian ideas. This is a source of potential confusion and such thinking can produce barriers to understanding the full biological explanation. Associated with such thinking is belief in the inheritance of acquired characteristics – a model that allows for species change, but towards a desired end. This type of thinking is highly intuitive and was a significant barrier to acceptance of Darwin's mechanism for species change by his scientific contemporaries. Even Darwin himself discussed ideas of use and disuse leading to loss or retention of biological structures in later editions of the *Origin of Species.*

In addition, teleology can be associated with ideas of intentionality and agency that may underpin creationist beliefs (Sinatra et al, 2008; Blancke et al, 2011). Such intuitive ideas are resistant to change and provide a significant issue for educators. Effective learning may require a radical change in how a person understands their world. In combination, these ideas "encourage us to see our world as unchanging, orderly and commonsensical" (Sinatra et al, 2008, p.191). They allow us to perceive purpose and meaning where there may be none, giving the impression of a predictable and coherent world. I referred earlier to Darwin's then radical idea of the instability of species, one of Darwin's enduring interests, but words like 'unstable' and 'change' are value-laden. Perhaps conceiving of nature as stable and enduring is what we believe instinctively; perhaps it is our preferred view of nature? Again, a challenge to our perception of the world as stable and imbued with purpose could be seen as a potentially urgent experience, exposing existential questions.

Belief, acceptance, understanding and knowledge

An examination of the years of scholarship that have documented the barriers to teaching and learning of evolution points to the importance of the relationships between the terms 'belief', 'acceptance', 'understanding' and 'knowledge'. A significant amount of research encompassing science education and educational psychology has suggested that the relationships between these four concepts is complex and incompletely understood (Smith, 1994; Southerland et al, 2001; Nehm and Schonfeld, 2007). It is difficult to develop a coherent idea of what influences these four terms in evolution education from the various studies undertaken. There is no complete consensus in regard to defining the terms, the research approach taken, the instruments used or the populations studied. Therefore, although correlations have been observed between these concepts, such as between understanding and acceptance in some studies, consistency of findings has been difficult to achieve and it is not possible definitively to determine causation (Smith, 2010a).

<u>Do you believe in evolution?</u>

Mike Smith (1994) discussed belief in evolution in contrast with acceptance of evolution. He examined what we mean by the words 'belief' or 'believe', pointing out that they can have different meanings to different people, the scientist and the lay person, the religious person and the atheist. We all have beliefs, we have our worldview, which may or may not be faith-based and evolution may not only challenge those based on religious faith. It may shatter an illusion of stability or make us confront our corporeal, animal nature.

James Williams (2015) examined the distinction between acceptance and belief. He proposed that holding up evolution as something to believe in lends credence to creationist arguments that evolution is not science but a belief system (Williams, 2015). Williams asserts that this application of belief in the context of evolution is the crux of the problem of non-acceptance and that removing it from the language of the debate could offer a solution. However, he also acknowledges that it may not be as simple as that; drawing on psychology, he recognises the contribution of affective factors on learning that may be at work. He quotes Jonathan Cohen "Belief is a disposition to feel …" (Cohen in Williams, 2015, p.327)

which I suggest begins to reveal more about the issue at hand. Feelings are not always responsive to evidence that contradicts them.

Acceptance versus understanding

Acceptance has appeared as the concept most tested and discussed in the literature in the context of evolution and science education, but how is it defined? Sinatra et al describe it as a person's perception of the "validity of a construct" (Sinatra et al, 2003, p.512). This could be based on their assessment of the evidence, although the implied relationship between knowledge, understanding and acceptance is not clear. The relationship between acceptance and understanding has been investigated from many perspectives but the resulting explanations do not provide a consistent and coherent association (for reviews see Glaze and Goldston, 2015; Pobiner, 2016).

Ingram and Nelson (2006) examined understanding and acceptance. They compared their findings with those of previous studies, including Lawson (1983) and McKeachie et al (2002), who had found that a lack of acceptance had negative consequences for the understanding of evolutionary theory by college students. Ingram and Nelson conducted investigations into the effectiveness of a semester-long college course for biology majors and, in contrast, found that attitude prior to instruction had little impact on student achievement in assessment.

Rutledge and Warden (2000) in the United States looked specifically at teacher understanding and acceptance of evolution. They worked with high school teachers in Indiana, examining their understanding and acceptance of evolution and their understanding of the nature of science. The authors were interested in the relationship between understanding and acceptance and found a strong positive correlation between them. There was only a moderate level of acceptance of evolution as a valid scientific explanation in this group, the evolution of humans being particularly problematic for some.

Nehm and Schonfeld (2007) carried out a study which examined biology teacher attitudes in Initial Teacher Education (ITE) before and after a graduate-level biology course that was taken as part of the participants' certification as teachers. It was hoped that the course would increase teacher knowledge and understanding of evolution. The research

instruments were questionnaires and essay questions on evolution and natural selection. The research revealed that teachers' initial knowledge and understanding was surprisingly low, despite the fact that 95% had taken biology undergraduate degrees.

A positive impact on teacher understanding was seen post-course; however, what was interesting to note was that in the essay questions on natural selection the least referred to scientific explanations involved overproduction of offspring and competition. I suggest that another way of interpreting the debate may be almost hidden in plain sight and this and other small findings in the literature point to something else that may influence acceptance. Evolution encompasses a number of concepts; are some more dangerous than others? Is overproduction and competition, with possibly wider implications and personal relevance, more problematic than, say, variation? A study by Friedrichsen (2016) on teachers' self-reported levels of understanding of evolution indicated that tree thinking in evolution (that is, phylogenetic trees and modification by descent), human evolution and geological timelines were some of the least understood and least taught concepts. These concepts also could be considered problematic for reasons other than cognitive complexity. Might it be that *our* connection to nature, our biologicalness as it were, and the vastness of time stimulate more existential concerns than has been appreciated to date?

Where should teachers stand in relation to these notions of acceptance and belief? Is understanding enough? Southerland et al (2001) considered that teaching for acceptance is a justifiable aim, but with the proviso that it is not obligatory. The academic consensus meanwhile appears to be for understanding to take precedence over acceptance (Ingram and Nelson, 2006; Wiles and Alters, 2011; Reiss, 2018). This stance is important as acceptance may require an alteration of how we perceive nature and our place in it and the emotional investments we may have in that view.

The debate continues and a recent UK study (Mead, Hejmadi and Hurst, 2018) returned to this question of the link between acceptance and understanding of evolution, examining the relationship between the two in a large cohort (n = 1227) of students age 14-16. They found that lower acceptance of evolution prior to teaching predicts lower understanding after the teaching. So, acceptance in their study did predict understanding; however, their interpretation of this lower understanding was not, they maintain, that it was a result of psychological conflict leading to rejection of teaching (as argued by McKeachie et al, 2002

and others), but a consequence of lower scientific aptitude. So, by implication, ability may predict acceptance. However, these claims were in part derived from the fact that the non-accepting students tended to be in lower ability sets in school, without the authors scrutinising their own assumptions regarding this. In addition, they also argued that support for their claims came out of focus group discussions with students but without presentation of the primary data or analysis. This study prompted a number of prominent academics to respond via an editorial comment in the same journal, pointing out the complexity of the issues that this study omitted to consider (Dunk et al, 2019).

Here is a cautionary tale; can we assume a straightforward relationship between any of the factors examined, these being knowledge, understanding, belief and acceptance? Surely, they do not tell the whole story. Indeed, a very recent study has suggested that the level of acceptance is not being consistently measured and that the various instruments used to study acceptance may generate different findings. Barnes et al (2019) assert that there is no universally applied definition even of evolution acceptance and greater consistency in definitions and research instruments is urgently needed if we are to understand this complex education landscape. What is clear is that acceptance and understanding, although not simply associated in a cause-and-effect manner, are intimately related. I will argue that affective influences on acceptance and understanding need to be considered beyond the current acknowledgement of the role of religious faith in this regard.

Knowledge and belief

Southerland et al (2001) examine the relationship between knowledge and belief and acknowledge the challenge this presents, as in defining these terms it is difficult to say where one begins and the other ends; they are intimately related to each other in language. A person can experience a belief as knowledge; for instance, they may feel they just know something to be true. Southerland and colleagues therefore discuss evolution in the context of the nature of knowledge; is some knowledge more valid than others? Science is given special status in Western societies, but this is problematic as it does not then acknowledge the importance of other forms of knowledge and of beliefs (Southerland et al, 2001). This is nowhere more evident in science education than in the discourse around acceptance of evolution. Teachers experience the reality of the blurring of knowledge and belief in their

classrooms; students arrive with diverse beliefs that may not concur with the scientific explanations they are presented with. If we want to enhance knowledge in our students, but not interfere with their beliefs, there is a problem if the two are inextricably bound. Perhaps we cannot therefore be surprised if teachers resort to saying 'you don't have to believe it, but you need to learn it for the exam'. The responsibility for the beliefs of their students could be felt to be too great. So far, I feel the literature reveals more questions than answers.

Smith and Siegel (2004) consider the importance of making a distinction between knowledge and belief, for instance in terms of appreciating the nature of science. Science has its limitations; it can only reveal understanding through empirical data. It cannot be based on belief alone. However, in the reality of the classroom and the lab, people may not be consciously aware of the difference between the two, nor recognise that beliefs can have irrational origins (Nehm and Schonfeld, 2007).

Smith and Siegel also consider how science educators themselves may view knowledge and belief, quoting Gess-Newsome (1999) that "science educators tend to view knowledge as 'evidential, dynamic, emotionally-neutral' in contrast to belief which is described as 'both evidential and non-evidential, static, emotionally-bound'" (Gess-Newsome in Smith and Siegel, 2004, p.556). Is this really so? Is belief static and is knowledge emotionally neutral? I will argue that we as teachers may be making false assumptions about the affective charge of scientific explanations. What we may see as an interesting phenomenon may be viewed by our students as a threat to their worldview, but perhaps not just in the way we may imagine.

Evolution education – the UK context

There are far fewer studies that examine British and European attitudes to evolution, compared to US ones. However, Scottish university students have been the subject of such an examination in the last couple of decades, first in 2000 (Downie and Barron, 2000) and then in a follow up study in 2012 (Southcott and Downie, 2012). The 2012 authors examined the attitudes of 1st and 4th year students of a bioscience degree course. First year students who were taking degrees from a range of science courses, choosing bioscience as a 1st year

module, reported a lack of acceptance at around 7% of respondents. This fell to 0% in 4th year students, whose course was high in evolutionary biology. Miller in 2006 had reported a level of around 7% rejection of evolution in the British general public, indicating that 1st year students in this cohort had a similar level of acceptance/rejection of evolution as the UK general population. What is notable is that although religious beliefs were cited by most respondents as the reason for their rejection of evolution, a significant number also reported that they had insufficient knowledge or that they thought there was insufficient evidence, indicating that their ideas were not fixed and possibly not purely related to religious beliefs at all. Another feature was that although faith was a cause of rejection, most of the students who declared a faith did not reject evolution. Some 4th year students also reported having changed their minds from rejecting to accepting evolution during their time on the course. However, their reason for this was not that evidence had convinced them, but that either they had decided that accepting evolution did not need to conflict with their beliefs or that it was a result of a change in their personal/social lives (although the change was not defined).

Evolution and education: looking at the situation anew

Attitude to evolution: emergence of affect

The controversy around Darwin's theory of evolution is well documented as I have discussed; the issues involved are complex, but as Rutledge and Warden describe:

> [the] difference in understanding and acceptance of evolutionary theory between the scientific community and the general public represents more than a lag between the generation of knowledge in a discipline and its dissemination to the public through the educational system. Rather, it represents a gulf in understanding that has not been successfully bridged through a century of science education.
>
> (Rutledge and Warden, 2000, p.23)

Such a gulf begins to look like a blind spot.

However, if this was so, would we necessarily be aware of such thinking? Blind spots are just that, things we do not see, that we are not aware that we are blind to. Hence, I wondered,

would such thinking be conscious and, if not, could it be a factor in acceptance and understanding of evolution that can also transcend personal faith?

Some anecdotal observations point to the disturbing nature of evolutionary theory for some people. Richard Dawkins in the preface to his book *Unweaving the Rainbow* (1998) remembers correspondence he received from readers of his first popular science book on evolution *The Selfish Gene* (1976); which was summarily described by a couple of correspondents as a "cold, bleak message" full of "nihilistic pessimism" (1976, p.ix).

However even within the research literature on faith or pedagogy, what I might term the conventional literature on acceptance, clues to the role of affect emerge. Alters and Nelson (2002) reviewed research looking at the levels of understanding in the general public in the USA. These were reported to be low, which may not be surprising given most research findings on knowledge and understanding of evolution in various populations. However, interestingly, the public's own perception differed, with a significant proportion reporting they did feel informed on the subject. This could have several explanations but might the disparity be suggestive of denial? 'I don't need to examine this idea because I understand it, I can safely ignore it.' Is this indicative of avoidance too? People not accepting evolution may not be fully aware of their motivations, certain ideas if anxiety provoking may be spilt off in our psyche. The nature and implications of biological evolution could be managed in this way.

A few reports begin to reveal what is sometimes not acknowledged in this area of scholarship and this is that the learning of evolutionary biology can be "for many students … simply overwhelming academically, emotionally and spiritually" (Sinclair in Alters and Nelson, 2002, p.1898). Students' religious beliefs may not be the only influence. Gail Sinatra and colleagues (2008) in their excellent examination of the challenges for students in learning evolution, distil what is a complex issue into quite a simple message, namely that understanding and/or acceptance of evolution is not a matter of adding to a student's knowledge of the topic; we can't simply teach ourselves out of the issue. It is about stimulating change, students may have to see the world anew. Ferrari and Chi (1998) refer to this conceptual change as an ontological shift, requiring a change in the nature of one's reality. Such an alteration in worldview, I argue, may require relinquishing long-held beliefs in an unchanging, stable universe in which humans are somehow special, separate from

nature. This worldview as I have described it also may be independent of religious faith. This has significant implications for teaching and learning.

Looking beyond the influence of faith: existence and anxiety

Although work on the affective domain in this context is not as advanced as our understanding of cognitive and religious barriers, some themes are emerging in studies of evolution education that enable us to begin to look at how affective barriers may work. Some studies have indicated that evolution provokes negative reactions not directly associated with religious belief. For instance, a study by Brem et al (2003), examining the perception of evolution among a diverse group of US college undergraduates, found that despite controlling for belief, a greater exposure to information about evolution appeared to be correlated with a more negative attitude to accepting evolutionary theory. The negative consequences of acceptance perceived were related to greater selfishness and racism coupled with a lack of purpose to life and diminished spirituality. Blancke et al (2011) also cite people's negative perceptions of the perceived randomness and lack of direction associated with evolution, as well as the consequences of human and animal suffering. Sinatra et al (2008) discuss emotion as a barrier to conceptual change in the domain of evolution and suggest "evolutionary theory is emotionally and personally unpleasant for some students to contemplate" (Sinatra et al, 2008, p.192). Bizzo (1994) interviewed a group of high school students in Brazil, including those of no stated faith, and found that many students tended to perceive biological conceptions of competition as acts of violence.

A new direction?

So, from the conventional literature on understanding and acceptance of evolution a new perspective tentatively begins to emerge, one that possibly points to something fundamentally unsettling about evolution as an idea, but how can this be characterised? Many of the ideas that may provoke anxiety could be considered as those engendering an existential threat and this I have alluded to in brief in this review. These are ideas that imply radical change, instability, death, extinction and the near relatedness of humans to other animals.

Samarapungavan and Wiers (2007) in a study of a group of Dutch middle school students (age 7-13) found that children form a number of non-evolutionary explanatory frameworks for biological diversity. In this group most were essentialist rather than creationist in nature. The children in general did not apply a supernatural cause to life on Earth, but nonetheless believed that organisms had always existed as they are or had been only somewhat modified over time. This essentialist thinking is common in children particularly, and has prompted me to consider whether the belief that animals, including humans, are not subject to radical change is more comforting than the explanation science offers us, as the former suggests stability and certainty. Another noteworthy finding that Samarapungavan and Wiers presented was their observation that naïve explanatory frameworks employed by children to other scientific concepts do not seem to display the same consistency as do those for evolution, and are more likely to break down when applied. The essentialist frameworks for evolution presented by these children did a good job of providing a consistent and stable, if incorrect, explanation for their experience of nature. I ask therefore if it is possible that biological evolution is more sensitive to existential concerns than other scientific concepts? Childhood may be the time when existentialist concerns may arise in response to ideas about the natural world, but are not voiced and possibly even repressed.

The evolution of humans is also differentially rejected compared to other organisms. It is well documented that most of the resistance to Darwin's ideas occurs when they are applied to humans in particular (Miller et al, 2006; Glaze, 2018). Is there something particularly threatening in applying Darwinian concepts to humans? Do they imply something we would rather not acknowledge, such as our relationship to other animals, including apes, and so highlight something we have in common, the brevity and vulnerability of our existence?

Certainly, evolution can provoke emotions and generate feelings of stress and anxiety. Griffith and Brem (2004) argued that clinical models of stress and coping can be applied to the teaching of evolutionary theory and identified behaviours such as avoidance and feelings of conflict in the teachers they worked with. A clinical approach has also been taken by Bland and Morrison (2015). They explored whether evolution was able to generate detectable negative emotional responses in people by way of physiological changes, when asked questions about evolutionary themes. They did indeed detect a stress response to

evolutionary principles. Theirs was small study of only 33 undergraduates and they did not examine the potential role of worldview or faith on the responses; nevertheless, this study offers another indication that evolution can induce affective responses.

A very interesting and unusual perspective on affect and evolution has come from the literature not on education but from examining the beliefs and attitudes of social scientists (De Baca and Jordan, 2012). They discussed resistance by social science researchers to employing evolutionary explanations to understand human behaviour. They acknowledged the justified concerns of researchers that evolutionary explanations risk ignoring important social and cultural factors and can justify inequality and promote discriminatory political agendas. However, they also evidenced the role of meliorism, an emotionally-based personality trait which is "the concept that human beings are inherently good and possess the agency to rid the world of injustice" (2012, p.683). Meliorism, they claim, was a common affective barrier for acceptance of evolutionary explanations which may point again to a form of denial and splitting off of knowledge.

Finally, one further study also pointed to the possibility of deeper and more opaque feelings about evolution. Tracy, Hart and Martens (2011), looking specifically at people's feelings towards Intelligent Design (ID)[1] and evolution, found that exposure to prompts reminding participants of their own mortality was associated with increases in acceptance of ID and rejection of evolution. This finding was irrespective of participants' faith. The researchers postulated that existential threat is a potential cause of non-acceptance of evolution.

[1] Intelligent Design or ID: the theory that life, or the universe, cannot have arisen by chance and was designed and created by some intelligent entity. (Source: *The Oxford English Dictionary*.)

Old origins, new thinking: existential issues in science

Lessons from climate change and cosmology education

The literature examining acceptance and understanding of climate change and the origins of the universe, scientific topics that similarly challenge our notions of human origins, significance and connection to nature, also suggests problematic issues of an existential quality. In studies of climate change acceptance, a sense of apathy has been noted which it has been suggested originates from a sense of being overwhelmed, a defensive position "brought about by the magnitude of the problem" (Schuetz, Bhattarai and Mealy, 2011, p.273). Climate change as a result of human activity is a widely accepted phenomenon within the scientific community, as is evolution. However, the parallels do not end there. Despite a huge amount evidence in support of our role in producing climate change and the risk to the Earth resulting from this, a significant proportion of the world's public do not accept the conclusions drawn by scientists. In 2017 a British Social Attitudes Survey (Fisher et al, 2018) indicated that while over 90% of respondents agreed climate change is a reality, only 36% of them associated the change with human activity. This indicated that a substantial proportion of the UK public, despite evidence to the contrary, did not see activities such as burning fossil fuels as a contributor to elevated global temperatures. The consequences of not addressing the issue are predicted to be severe, potentially rendering much of the world virtually uninhabitable for humans. As I have asked in relation to evolution, why do people not accept human causes of climate change? Why is there denial? Researchers have begun to consider what psychosocial factors may be at work in climate change denial, admitting that "our collective equanimity in the face of this unprecedented risk is perhaps the greatest mystery of our age" (Hoggett, 2019, p.3).

Climate change denial research, in a similar way to much of the research into non-acceptance of evolution, has examined the public's perceptions, knowledge and beliefs about the existence and causes of climate change (Hornsey et al, 2016). Much of the research to date, again in parallel with research concerning evolution acceptance, has followed a deficit model of explanation. In other words, people as seen as are lacking something, for instance, concern or motivation (Lertzman, 2019) or knowledge in the form of information through education. Hoggett argues that there has been a "continued belief in some policy quarters that information was the key to change, that once citizens had the

right information, communicated in the right way, then the scales would fall from their eyes" and, as in the case of evolution education, we are still waiting (Hoggett, 2019, p.5).

Some authors attempting to understand climate change denial are moving away from the positivist-leaning, cause-and-effect models of climate change acceptance. Emotion, meaning and experience are becoming a focus of great interest as researchers draw on insights from art, literature, philosophy and psychoanalysis (Hogett, 2019; Lertzman, 2019). It is being recognised that climate change is associated with existential threat, it potentially engenders feelings of despair, impotence and guilt and these may mobilise coping mechanisms such as the psychic defences of denial, rationalisation or projection (Hoggett, 2019). Climate psychology research is examining ways of accessing unconscious forms of experience through the use of narrative, metaphor and imagery to help people voice fundamental anxieties. Hoggett (2019) talks about disavowal or how psychic defences such as denial keep thought divorced from feelings. Such a view could contribute to our understanding of why people do not accept evolution, beyond considering the role the religious faith alone.

Lightman and Miller's investigation of cosmological beliefs also suggest that issues similar to those experienced in response to climate change and evolution exist for astronomical concepts such as the origins and expansion of the universe. The majority of people they questioned believed the universe was static and unchanging, but what was significant was that the view was expressed through a fear of change and a possible future risk to the Earth (Lightman and Miller, 1989). In other words, understanding the universe as science explains it can be perceived as existentially threatening; this has key parallels with evolution. However, neither our scientific understanding of the universe nor biological evolution suggests an *imminent* threat to anyone's personal safety. Rather, the threat is symbolic, a reminder that nothing lasts forever, change through destruction is inevitable. The timescales for these changes are of no tangible significance at the individual level. In this way, cosmological beliefs are potentially in greater alignment with evolution beliefs than are those to do with climate change, which is associated with a relatively imminent danger.

The human family and other animals

Weisberg et al (2018) attempted to examine a large demographically representative sample of the US population, focusing on the role of knowledge in acceptance of evolution using a survey adapted from an earlier Gallup poll. What was particularly interesting for my purposes is that the researchers changed the wording of a question in the original Gallup poll that probed people's beliefs with respect to creationist or evolutionist explanations of nature, by omitting reference to human evolution and asking about the evolution of other animals and plants only. The impact of taking humans out of the equation was that a significantly smaller number of people indicated they had creationist views and more accepted the theory of evolution – for other animals and plants, that is. The authors argue they only made small wording changes and that the surveys were directly comparable. I would argue they had made a very significant change. Evolution when applied to humans challenges our very species identity and may make us consider the meaning of our existence; seen in this light, few things could be more profound. Another interesting aspect of this article was that they also probed for tolerance of ambiguity. They found that those who were less tolerant of ambiguity were more likely to reject evolution.

Terror Management Theory

Terror Management Theory (TMT) is a psychosocial theory drawing on ideas proposed by Ernest Becker (2007). Becker based his analysis on Darwin's ideas and existentialist thinking, such as the work of Soren Kierkegaard, but also psychoanalytical thinkers such Irvin Yalom, whose work I shall draw on extensively in my data analysis. The theory is partly concerned with the human perception of our relationship to other animals. Goldenberg et al (2001), drawing on Becker, discuss how a number of human behaviours serve to highlight the distinction between ourselves and other animals – such a cutlery use, clothing, disgust at bodily functions and attitudes to sex and our bodies. Ernest Becker suggested that such behaviours separate us from other animals in an attempt to deny our corporeal nature and hence, ultimately, to deny that we as biological entities are vulnerable – subject to death and decay. "Cultures promote norms that help people to distinguish themselves from animals, because this distinction serves the very important psychological function of providing protection from deeply rooted concerns about mortality" (Goldenberg et al, 2001,

p.427). We have a biologically driven instinct to do all we can to survive, but at the same time we are aware that ultimately we will fail, that death is inevitable. TMT proposes that much about human behaviour can be explained by this paradox. This is an existential burden which can be defended against by developing a worldview that symbolically denies our animal nature.

Nature, death and anthropomorphism

"Anthropomorphism is the assigning of human qualities, behaviours and motivations to inanimate objects, animals or nature" (Norenzayan et al, 2008, p.190). These authors studied a group of 109 psychology students, around half of whom were non-religious. The students were asked to assign characteristics to a benign natural object (a tree) and a threatening one (a volcano), before and after exposure to a reminder of death. What they observed was a reduction in the tendency to anthropomorphise both objects following the death reminder, the volcano being subject to the greater reduction in anthropomorphic descriptions. This downplaying of similarities to humans may be a function of the mortality salience as described by TMT. John Berger also wrote of anthropmorhising behaviour of humans in his seminal work *Why Look at Animals* (1980), suggesting that this was a common in pre-industrial societies when humans lived closely with other animals and that its decline is as a result of separation from nature. This begs the question: is mortality salience a particular feature of industrial civilisations, particularly in a more secular world? This is beyond the scope of this thesis but I will argue that non-acceptance of evolution can also be in part explained by TMT.

However, it must be acknowledged that our relationship with nature may also provide comfort in the face of anxiety. Such is the complexity of our relationship. Schweitzer et al (2018) used both phenomenological and psychoanalytic perspectives to examine peoples lived experience with respect to the natural world. They developed a relational explanation of our experience, seeing evidence of nature being experienced as a metaphorical primary attachment, integral to a form of positive childhood experience, nourishing and containing. The meaning of containment in a psychodynamic sense is of emotional containment. Developmentally, the mother provides this for a child. Such ideas in psychoanalysis are based on notions of the *holding* environment proposed by Donald Winnicott, which allows

the infant to perceive itself as one with its mother, as yet undifferentiated, and Wilfred Bion, who describes how the mother *contains* the infant's difficult thoughts in order to prevent them from being overwhelming.

Hence, nature may also be perceived as therapeutic – consider the description of 'mother nature'. But how can these two positions be reconciled? Koole and Van den Berg (2003) propose that death reminders as used in TMT research negatively affect people's responses to wild, uncultivated nature. People as less inclined to negatively evaluate cultivated, managed nature in response to death reminders. It seems nature can alleviate existential concerns, but only as long as it "is not perceived as highly uncontrollable and overwhelming" (Koole and Van den Berg, 2003, p.21).

Renee Lertzman (2010) also used the relational psychoanalytical theories of Melanie Klein and Wilfred Bion to examine our attitude to the environment and sustainability. She described how natural processes can be anxiety provoking because of our dependency on ecological systems. This she describes as managed by a compartmentalising or splitting off of our awareness of our relationship to nature. "This capacity for disassociation is related to the issues of vulnerability and anxiety, evoked in dependency contexts and exemplified by our relationship with nature" (Lertzman, 2010, p.114). Such also could arguably be the response to the insignificance of human beings on an evolutionary scale and other ideas inherent in evolution.

Fundamentalism and existence

Although this thesis is not concerned primarily with the role of faith in the non-acceptance of evolution, I do want briefly to consider what can be learned from a psychoanalytical consideration of the concept of fundamentalism, considering both religious and political fundamentalism. Frank Summers (2006) describes fundamentalism as a reaction against wider cultural or social influences on a faith or set of founding principles. He describes how a consequence of fundamentalist practices is a "cessation of temporal processes" (Summers, 2006, p.331). A fundamentalist will not tolerate any deviation from the founding principles, which are usually set down in a text. Symbolically, time stands still from the moment the text is taken up by the faithful, there can be no development, no change. This

is a deterministic position: “meaning and purpose are inscribed in the writing of the text and are therefore determined for the remainder of human existence” (Summers, 2006, p.332). A belief in the infallibility of the text means that a person does not have to acknowledge and manage uncertainty and the complexity of human existence. It is “the burden of existentialist choice [that] is the target of the fundamentalist even more than science, secularism or the dilution of faith” (Summers, 2006, p.335).

Fundamentalist adherents are perceived by the group as all good, detractors as all bad; an example of splitting from a Kleinian perspective, a polarisation and separation of good from bad in the psyche (see glossary of psychoanalytical terms– Appendix 1). However, Summers refers to this as a secondary phenomenon, which originates from a need for certainty, in turn caused by existential anxiety and the need to merge with others (the fundamentalist believers, the group). This is to deny individual existence and the possibility therefore of isolation.

Fundamentalism may represent a very extreme manifestation of the use of group identification in order to manage the anxiety of uncertainty, responsibility and isolation. As such it may be able to throw light on more common responses to existential concern that I will argue may be trigged by evolutionary concepts.

Psychoanalytical perspectives in education

Psychoanalytical thought has already been applied in the context of education. Deborah Britzman has problematised education generally from a psychoanalytical standpoint and posits our memories of education as being “a timeless affected world” (Britzman, 2009, p.1). Freud described education as one of the impossible professions as he saw learning as laden with unconscious resistances due to power, desire, love and hate as played out in classrooms (Freud, 1937).

Britzman also describes the experience of school education as being exposed to an “avalanche of certainty” (Britzman, 2009, p.2), so at odds with the supposed realities of the world ‘out there’: nature, politics, relationships – chaos, real life is an uncertain business. School may present us with a body of knowledge and skills, but if the certainty this appears to present misses something that our unconscious may well perceive, misses another

message in the learning, something far from certain, what then happens to learning? I propose that evolution as it is taught and learned in classrooms may do just this. Although clothed in scientific certainties – facts – it cannot but compromise this edifice with notions of competition, predation and struggle. It presents ideas of success and failure with no certainty, only struggle. In addition to this, the ultimate in uncertainty – death and extinction – are central and unavoidable in any discussion of evolution, even if only by implication. If we do not examine these ideas, these fundamentally uncertain realities, then interventions to increase knowledge I suspect are not likely to increase acceptance. I also go further and suggest that in viewing religious faith as the most important factor in the problem of non-acceptance, we are again still missing something. In designing interventions, addressing a perceived knowledge deficit, we are only considering "idealised and generalised classrooms" (Bibby, 2010, p.2).

Origins, big questions and learning

Melanie Klein's analysis of a young child, the boy Fritz, examined his curiosity about the natural world and was revealing of a child's desire to know, to understand where we have come from, how we and the universe work and where we are going. Fritz from around four years of age had many questions about individual origins, birth, what people are made of, bodily functions, sexuality, reproduction, growth and development. What struck me most in Klein's account of him was his desire to also understand more universal origins and existential questions: "Where was I before I was born?", "Mamma how did the sun get right up there" (Klein, 1998, p.3 and p.6) and his desire to understand what was a story (fantasy) and what was real. Another question invoked a connection with time, seeking answers about temporality: "how long does the day after go on coming? ...[2] For how long does the new day come … doesn't the night always belong to the day before and early in the morning is a new day again?" (Klein, 1998, p.5). Klein suggested that children have an "Instinct for knowledge" (Klein, 1998, p.20), for which she coined the term the *epistemophilic instinct*.

In my position as biologist and educator trying to make sense of my own pedagogic experience, I see children wanting to understand those very things Fritz asks. It seems to be

[2] … indicates omitted material.

distilled into: Where did I come from? Where did the world/universe come from? Where are we going? Who are we? What is life? These are fundamental questions we all pursue in different ways; evolution gives an explanation, but for some it may not bring comfort.

Melanie Klein highlights what she sees as the importance of answering questions honestly and openly without prejudice, what she describes as "frankness" (Klein, 1998, p.2). She maintains that false, forbidden or denied ideas damage a child's ability to grow emotionally; they produce an "injury to the instinct for knowledge" (Klein, 1998, p.20). Young children demonstrate an open-minded curiosity, but what happens to this? Does our later confrontation with the transience and unpredictability of life make us want to look away or package nature in a more acceptable form? This implies a mighty weight of responsibility on teachers. Biology is now potentially dangerous knowledge. Tamara Bibby suggests that "Education splits good and bad knowledge". She goes on to say that a prescribed curriculum "can feel relatively safe to engage with. Owning our own notions of what is worth or unworthy of being known can give more trouble" (Bibby, 2010, pp.108-109). By implication, we may all be making unconscious decisions as to what constitutes good and bad knowledge.

Evolution: difficult knowledge

Difficult knowledge is an idea developed by Deborah Britzman (Britzman, 1998; Pitt and Britzman, 2003) to explain our response to the traumatic content of knowledge. It is derived from psychoanalytical theories of trauma and has been described as knowledge that "appears disturbingly foreign or inconceivable to the self, bringing one up against the limits of what one is willing and capable of understanding" (Simon, 2011, p.433). As knowledge, the theory of evolution may appear dangerous, troublesome and difficult.

In their 2003 paper, Pitt and Britzman discuss how the experience of difficult knowledge shares aspects of cognitive dissonance. The writing of Barbara Herrnstein Smith (1997) describes the disorientating experience of such knowledge:

> … an impression of inescapable noise or acute disorder, a rush of adrenalin, sensations of alarm, a sense of unbalance or chaos, residual feelings of nausea and anxiety. These are the forms of bodily distress that occur when one's imagined,

> taken-for-granted sense of how certain things are – and thus presumably will be and in some sense should be – is suddenly or insistently confronted by something very much at odds with it. Perceptually, it is the wave of vertigo one may experience at an unexpected sight.
>
> (Herrnstein Smith, 1997, p.xiv)

Pitt and Britzman (2003) develop this further and then extend it with reference to the uncanny quality of difficult knowledge. In confronting difficult knowledge, we may have to attempt "to make sense of not just the unexpected, but what was, in fact, anticipated through the lens of anxiety" (Pitt, and Britzman, 2003, p.770). It explains how the familiar can also disturb. Evolution may challenge what we believe about our origins and existence, who we are and what we might become.

Summary

Research in this field of biology education has comprehensively examined the role of religious faith in people's responses to evolution, but general affective responses to evolution have not been considered to the same extent. Much of what I have understood from the literature about the role of affect has in fact emerged as a secondary finding in the conventional literature on non-acceptance. It is true that previous research has indicated that psychological factors could play a role in people's responses to evolution (Allmon, 2011). Intuitively we may prefer explanations that match our everyday experience of a constant and predictable world with humans at its centre. I have discussed in this chapter how teleological and essentialist explanations may be favoured in times of stress, during urgent experiences (Sinatra, 2008). However, is there evidence that a confrontation with an alternate reality to an intuitively derived one can provoke emotional responses and even possibly existential concern? There is some evidence that existential threat can provoke a greater acceptance of Intelligent Design (Tracy, Hart and Martens, 2011). Can evolution be considered difficult knowledge? Such knowledge having an uncanny quality, potentially triggering cognitive dissonance. Cognitive dissonance, the discomfort caused by contradictory understandings, has been examined in the context of evolution and biology education, and we know it is possible for persons to hold unacknowledged contradictory

beliefs (Allmon, 2011). Perhaps those of no religious faith can accept evolution, but it may still unconsciously conflict with their existential worldview, their place in nature and human significance. However, such a conflict could also trigger non-acceptance of evolution. My aim is not to examine the occurrence or causes of non-acceptance of evolution, but to explore their affective responses to it. Individuals if asked may accept evolution, but still have an emotional response to the idea. Evolutionary theory may reveal hidden existential concerns, which if evident in non-religious people may also have implications for the responses of people with a strong faith-based reason to not accept evolution.

In this chapter I have reviewed the current understanding of scholars and educators of the issues of acceptance, understanding, knowledge and belief in the context of evolution. I have highlighted certain findings within the scholarship on evolution education that point towards the possibility that evolutionary theory may be a trigger for existential concern and considered lessons learned from bodies of work concerning affect, existence and unconscious defences. The research I now go on to discuss considers people's affective responses to evolution and evolutionary concepts, drawing on both psychoanalytical and existential perspectives to examine the possibility of existential concern in the face of evolutionary theory.

Chapter 3: Research methods and methodology

Methodology – the defended subject, narrative and intuition

In attempting to examine conscious and potentially unconscious affective responses to evolution, the predominant methodological approach I used was psychosocial, but within a research design informed by both narrative and intuitive inquiry. In investigating responses to evolution, previous studies have used a range of methods from attitudinal surveys to in-depth interviews and observations. Our current understanding from this large body of important research is largely formed from direct observation and interpretation, from questions and their responses, those responses revealing common themes or certain attitudes. I aimed to look at the issue in a different way. My initial question was 'What if we are missing something?'. Is there an explanation originating from existential experience, a notion of what it means to be human, that is so fundamental, possibly formed early in our experience, that we may not always be aware of it? How could I tap into such thoughts or feelings as they may be unlikely to be revealed directly? During this research journey I identified narrative and intuitive inquiry and free association in interviewing as a means of exploring and analysing conscious and unconscious affective responses and the emotions through which they are experienced.

My research questions

1. Do evolutionary concepts provoke affective existential responses in some people?
2. Does the application of Free Association during interviewing, coupled with the use of visual artefacts depicting relevant concepts allow affective existential responses to evolution to be examined?
3. Do such responses occur in people who do not hold creationist beliefs?

Method: data collection – the narrative interview

After considering a range of possible research methods for data collection, I chose in-depth semi-structured interviews. A qualitative method seemed appropriate as I was attempting to explore responses that I thought were unlikely to be revealed by more quantitative approaches. For instance, in baldly asking via a questionnaire how people felt about evolutionary concepts, I thought I would not be likely to get the rich responses that I required in order to understand evolution and affect at a deep level. I used an interpretivist paradigm examining individual accounts, acknowledging the subjective nature of the experience investigated. My aim was to "get inside the person and to understand from within" (Cohen, Manion, and Morrison, 2007, p.21). An interpretivist approach was therefore appropriate.

It has been argued that an interview is not merely a means of passive information transfer from interviewee to interviewer, but an active, two-way process – a co-construction of experience and knowledge (Holstein and Gubrium, 2011). It is not just a case of revealing existing thoughts but creating thought. My experience in the interviews I undertook supports this; I suggest that many of the thoughts experienced by the participants had not been thought consciously until then. I will expand on the implications of this when I turn to my use of psychoanalytical theory.

The narrative dimension

> One of the primary ways – probably the primary way – human beings make sense of their experience is by casting it in a narrative form. (Gee, 1985, p.11)

I was essentially aiming to locate and understand affective responses and, as Polkinghorne (1988) puts it, to understand why people "behave the way they do" (p.x). Narrative research concerns people's stories, their personal narratives. In examining concerns of an existential nature about evolution I needed to consider experience and its relation to time, change, identity and also our relationship to the natural world. Narrative inquiry, the examination of storied lives, can facilitate an examination of these facets of experience and engender a profound understanding of what it means to be human (Clandinin and Connelly, 2000).

The model presented in science education discourse on the matter of evolution is often one of deficit in terms of public understanding and acceptance. There is also an adversarial and conflict-driven dialogue coming from certain sections of society, not least in media accounts (Meadows, Doster and Jackson, 2000). My argument is that there are a number of potential responses to evolution that may in turn cause resistance to understanding, that cannot be wholly explained by religion but may be existential in nature. I reasoned that a narrative approach to considering existential influences would allow me to explore the issues from the position of personal stories which could reveal the subjective ideas and attitudes at work. "The stories that people tell about their lives represent their meaning making" (Josselson, 2011, p.224).

I therefore attempted to hear people's narratives through interview, although not a conventional life story interview, but one that looked at elements of life history in relation to the broad lenses of time, identity and the existential concerns – *isolation, meaning, responsibility* and *death* (see later in this chapter for an explanation of these concepts). Temporality was key as through narrative I aimed to understand how existence, past (the life history), present and potential future are experienced when encountering evolution and the concerns possibly implicit within it.

Narrative is, of course, also subjective, complex and ambiguous (Clandinin and Connelly, 2000). Clandinin and Connelly (2000, p.31) describe a "sense of tentativeness" in narrative interpretation, recognising the possibility of multiple interpretations. However, the justification comes from the intention to create a new sense of meaning "to yield a new set of knowledge claims that might incrementally add to knowledge in the field" (Clandinin and Connelly, 2000, p.42).

I did not employ conventional narrative analysis but limited my application of narrative research to the method of data collection and the initial descriptive analysis, which I will go on to discuss in this chapter and Chapter 4.

The interview process: design and delivery considerations

The interview approach used was semi-structured with the interview schedule (Appendix 2) supplying a number of standard questions, but they were very much starting points for both

the broader and more specific questions which emerged responsively as the interview progressed. This is interview as dialogue or conversation, encouraging free association of ideas (Lertzman, 2019). I took this approach to allow participants to be able to take some control of the direction of the interview. As Robson states “The less the degree of structure of the interview, the more complex the performance required from the interviewer” (Robson, 2011, p.301). I have experience as a counsellor, educator and science communicator, all of which helped me to negotiate my role as interviewer, creating a positive interview atmosphere and drawing on empathy, reassurance and acknowledgement of any difficult issues broached to informally explore the sometimes sensitive and personal issues that came up.

The interview was structured as described by Robson (2011) with an introduction, warm-up, main body, cool-off and closure. In order to make participants feel at ease I spent some time introducing myself, my background and research interests as well as thanking them for their participation. The warm up part of the interview asked for information on their school experience generally and then became increasingly specific, probing how they felt about school science and any recollection of learning about evolution or Darwin. This set the scene for the main part of the interview and gave me some information on their level of interest and attainment in science as well as some first indications of their attitude to evolution. This was the most obviously narrative aspect of the actual interview as participants recalled their experiences at school and home as children.

The main body of the interview concerned discussion of the visual artefacts or prompts (see Appendices 3.1, 3.2 and 3.3). In this part I used free association questioning (discussed below). Finally, I drew the interview to an end by asking if the participants had a faith, and if so, what it was. I also asked if they held any alternative beliefs such as astrology. I was particularly interested to see if they had any beliefs in the pre-ordained. I did not make any notes during the interview but did make field notes afterwards; in particular, I took notes about how I was feeling and of any words or images that surfaced in my thinking. All the interviews were audio-taped using a Samsung smartphone voice recorder and subsequently fully transcribed.

Visual representations and meaning

In devising an interview schedule, I aimed to provide a very loose structure around which I could explore interviewee participants' thoughts and feelings towards evolution generally and responses to a number of visual artefacts that in some way represented evolutionary concepts. These visual artefacts or prompts were:

1. A textbook illustration depicting an evolution timeline
2. A video art work presenting a fish transforming via Intermediate stages into a man
3. A set of photographic portraits of great apes.

These probes represented change, extinction (struggle for existence), the vastness of geological time and humans as animals (see Appendices 3.1, 3.2 and 3.3).

Visual prompts in interviews are sometimes used for research into sensitive or potentially controversial topics and can assist in examining people's attitudes, beliefs and perceptions (Robson, 2011). I felt that as I was attempting to probe potentially hidden or difficult thoughts and feelings, and those of a nature potentially hard to describe, visual depictions of the concepts I was interested in might prompt a richer set of responses from participants than verbal questioning alone. The stimuli were chosen because they each could represent the existential ideas that I suggested evolution may signify to some people, these being concepts such as change and instability, insignificance, struggle, vulnerability and death.

The first, the timeline, looked like an image they may have seen before in school textbooks. It was drawn in a naïve, 'friendly' style common to children's books, although starkly showed both extinction and the relatively very recent appearance of humans on Earth.

The second was a video artwork displaying an artist's interpretation of evolution through a shapeshifting creature. The artist's own explanation reveals the connection with the 2000 millennium, a time of symbolic change and uncertainty.

> Origin was a series of manipulated photo images and animation created in 1999. It describes the human evolution based on my own imagination. I suggest that there were ten stages in human evolution, from the fish form (as Coelacanth) and then transformed to the reptile, monkey and human ... My motivation came from the

> upcoming millennium. The new millennium (year of 00) reminds me of the grand beginning of everything.
>
> (Origin 1999: Daniel Lee – http://www.daniellee.com/projects/origin)

The third stimulus, the photographs, were passport photograph style full facial shots of great apes by photographer James Mollison. I chose these because of how seemingly human the faces shown were. They blurred the boundary between human and ape and might reveal where we see ourselves: as part of nature, as human apes, or do we see apes as Other?

> While watching a nature program on primates I was struck by their facial similarity to our own. Humans are clearly different to animals, but the great apes inhabit that grey area between man and animal. I thought it would be interesting to try to photograph gorillas, chimpanzees, bonobos and orangutans using the aesthetic of the passport photograph - its ubiquitous style inferring the idea of identity.
>
> (James and other apes: James Mollison – http://jamesmollison.com/books/james-other-apes/)

The participants, pilot stage, recruitment and sampling

A pilot interview was carried out with a volunteer who was known to me. This person was a young, newly qualified teacher of biology. The purpose of the pilot interview was to check the internal validity of the questions I was asking and the suitability of the visual stimuli used in support. It was also an opportunity through the audio recording and transcript to evaluate my performance as an interviewer prior to carrying out the research interviews. This was a very useful exercise and confirmed that the stimuli and questioning developed into an instructive account of one person's reactions to evolutionary concepts informed by their own narrative.

<u>Sampling considerations</u>

Sampling in qualitative research is a subject of some debate, with one perspective being that the size of the sample is relatively unimportant, unlike in quantitative research which

considers issues of statistical power. The in-depth nature of the interviews, researcher time and resources also meant that there needed be a practical limit on the number of interviews I could carry out and analyse. These are typical considerations of qualitative research and mean that sampling cannot provide a representative sample of most populations (Cohen, Manion and Morrison, 2007). Nonetheless, in attempting to ensure the validity of my research I gave it significant consideration. In some respects, I employed convenience sampling. I interviewed education students as I had professional access to universities for recruitment. However, in other respects it was purposive, as I specified novice educators as my sample, of both of a science and non-science background, potentially allowing some comparison between these groups (Cohen, Manion and Morrison, 2007; Silverman, 2011). In the end, beyond those issues of practicality, I used an approach described as sampling for meaning, which advocates a process that considers "the selection of subjects in research that has as its goal the understanding of individuals' naturalistic perceptions of self, society, and the environment" (Luborsky and Rubinstein, 1995, p.98). Hence, meaning is more important than representativeness. What Luborsky and Rubinstein advocate is "adequate numbers of conceptual perspectives that will enable the study to identify a variety of meanings and to critique multiple rich interpretations of the meanings" (p.109), which I would argue are supplied by the range of educational and cultural backgrounds of the interview volunteers (see below), the richness and depth of the interviews and the analysis I employed.

Research participants

The participants were recruited as volunteers through their university tutors. An incentive of a £25 voucher for a well-known online book supplier was given both to encourage participation and also to acknowledge the time they were giving to support my research.

Eighteen research participants were recruited, seventeen interviews were fully analysed (one interviewee was not a student and therefore did not comply with the sample criteria and their interview was not analysed, along with the pilot interviewee). All those who featured in the analysis were undergraduate or postgraduate students of education. The rationale for recruiting undergraduate and postgraduate students of education was that as adults their ideas and perceptions are likely to be more fully developed than school

students, but as a significant number of them are young adults they may retain a recent memory of school biology. They also have a particular interest in education. The seventeen analysed interviews constituted three groups of interviewees:

- Seven undergraduates undertaking an Education Studies BA degree at a North London university. The recruited interview participants were a diverse group in terms of age, gender, ethnicity, nationality and religion. Education Studies undergraduate students are expected to have an interest in education and many plan to work in the state primary sector in the UK and thus will be expected to teach evolution in year 6 (ages 10-11).
- Seven PGCE (Postgraduate Certificate of Education) Secondary Science students from a Central London university, each with a degree in science and training to be a biology, chemistry or physics specialist. They have a commitment to education and may have to teach evolution. This group was also diverse in age, gender, ethnicity, nationality and religion.
- Three MA in Education students from a Central London university. These were postgraduate students of education but not necessarily scientists.

None of these three groups is representative (or intended to be) of the general public. As potential educators they are likely to have an interest in the subject and to have reflected on their own experiences in education.

The table in Appendix 4 gives details of interviewee characteristics and their pseudonyms. However, I did not formally collect demographic data with the exception of religious faith. Nevertheless, personal information, such as ethnicity, was volunteered by some participants during the interview.

Validity and narrative interviews

There are obvious difficulties in attempting to generalise from such subjective accounts and, of course, subjective interpretations (Riessman, 1993). However, generalisation is not the aim of a narrative interview approach; it is more to understand the personal, unique experience, which may or may not also tell us something about the human condition (Josselson, 2011). I made the decision to look at the issues involved in depth rather than

breadth and was interested in a person's particular view or experience. There are many excellent studies using a variety of methodological approaches that have looked widely at the issue of the controversy in teaching and learning about evolution (Smith, 2010a; Smith, 2010b, Glaze and Goldston, 2015; Pobiner, 2016). These have revealed a number of key and common issues at play, but my aim was to deal with the deeply personal, as it was there that I felt that new understanding could start, in a small way, to be achieved. I deliberately chose a subjective approach to data collection to illuminate some of the complexity of human experience and its impact on our worldviews, our attitudes to change, to uncertainty and to our identities. Narrative reveals something about identity and can "extend and deepen" our existing conceptualisation of the issues (Josselson, 2011, p.239).

Narrative interviewing also allows researchers to examine the possible influences that could shape people's ideas. I touch on the influences in the analysis of the interviews; however, the aim of this study was not to divine causes of acceptance or non-acceptance, but rather to examine types of responses from an existential perspective.

Riessman (1993) points out that the critical issue for the use of narratives in research is trustworthiness, which she discusses through four approaches: persuasiveness, correspondence, coherence and pragmatic use. I argue that the approach I have taken is persuasive as it is supported by evidence from the interviewee's accounts and alternative interpretations are considered. Also, coherence was approached globally through a holistic approach, locally though the relationship of parts of the narratives to the whole. Also through what Riessman terms thematic coherence which involves identifying content that contains repeated themes as "within an interview a theme was worked over, again and again" (Riessman, 1993, p.67).

Interviews occur in the dimensions of time, place and the social/personal (Clandinin and Connelly, 2000). My interviews were carried out in university settings, although some were in public, some in private areas. The same visual prompts were used and the ordering of the main elements of the interview was constant across the interviews. The questions were informed and refined by the answers in a continual dialogue (Mishler, 1986). The personal dimension was key in allowing participants to feel relaxed, respected and listened to and was ethically very important to me, the conversational nature of the interviews being very helpful in that regard. The risk may have been to direct the participant towards certain

responses; however, my approach was to be led by the responses and so the interviewee's reactions and answers very much directed the interview (for a specimen interview transcript see Appendix 5).

Intuitive Inquiry

Somewhat late in the research process, when I had already begun data collection, including transcribing some of the interviews, I came across the research method of *Intuitive Inquiry* (Anderson, 2011; Anderson and Braud, 2011). It is based on a hermeneutical approach, recognising subjective experience and is cyclical. As the name suggests, it invites the researcher to use intuitive modes of approaching research questions. As a person with scientific training this was a personally challenging departure from how I instinctively think about empirical research. As a geneticist I have been specifically taught to distrust intuitive ideas when it comes to understanding the processes involved in biological inheritance. These processes are often counterintuitive and go against lay or folk ideas about inheritance (Wood-Robinson, 1994; Richards, 1996; Lewis et al, 2000). However, reading Rosemarie Anderson (2011) on Intuitive Inquiry had resonance for my own investigation. She stated that intuitive inquiries tend to claim a person, the researcher being driven to seek a deep understanding of something important to them personally. They also often indicate a need for a wider cultural change and are often looking into the particular rather than the general. "Details matter. Secrets matter. The ordinary is extraordinary" (Anderson and Braud, 2011, p.16). This quotation described how I felt about my research topic. I felt that something in our current understanding of teaching and learning about biological evolution was being missed and it has come to mean a great deal to me to understand this and offer an alternative set of ideas that could shape biology education and our learners' classroom experiences. There are small signs that are hidden from view; behind the controversy there are extraordinary human experiences, signalling something about what it means to be human.

Intuitive Inquiry, Anderson wrote, allows researchers to "explore topics that require attention by the culture at large, as though they are called to envision anew and seek solutions for dilemmas in which we as humans find ourselves embroiled" (Anderson, 2011, p.244). Anderson goes on to discuss, using a psychoanalytical perspective, how the

researcher's interest in a seemingly small topic may reflect what is "the tip of an iceberg of a call from the culture at large for change" (Anderson, 2011, p.244). There was an issue that, from my perspective, was not being fully addressed by the research community; we were blind to its full sense, the rest of the iceberg. I therefore felt justified in drawing on and adapting this intuitive approach.

Anderson also referred to perception via the unconscious and explored mindfulness in the context of social research activities (Anderson and Braud, 2011). I often felt on my research journey that something interesting was directly in front of me but that I was not always consciously aware of it. This, of course, also reflects ideas in psychoanalytical thought that deal with unconscious thoughts and feelings which was another aspect of my interpretative approach. In analysis I took the Intuitive Inquiry approach of experiential exercises, using the preparation and concentration routines to encourage mindful thought and tap into my own unconscious (Anderson and Braud, 2011).

Mindfulness and intuition, as I have mentioned, are not approaches that I have an obvious affinity with; they run somewhat counter to my scientific training, but they call for an open-mindedness which was very important in looking at an old problem afresh. I was required to be open to new ideas, possibly ones very different from my own. I also wanted to take myself out of my own comfort zone as, after all, it was possible that that would be my research volunteers' experience, if faced with existential concerns. Therefore, I did not wish to be the distant, objective observer, but fully with them in our discussions. As this research did not begin as an Intuitive Inquiry, I have drawn on aspects of it rather than fully utilised its approach.

The five cycles of Intuitive Inquiry

Anderson and Braud (2011) describe the research process in Intuitive Inquiry as hermeneutic because it is an iterative process that moves in cycles backwards and forwards between the data, readings and interpretations of the data (Figure 3.1). In moving between data and readings in a cyclical manner I used readings to inform the direction of the research throughout. The cyclical nature of this approach and the focus on intuition and meaning rather than causal connection also draws on hermeneutics, whereby "the meaning

of a part can only be understood if it is related to the whole … Conversely, the whole consists of parts, hence it can only be understood on the basis of these" (Alvesson and Skoldberg, 2000, p.53). Therefore, moving between parts and whole in data analysis, as well as between data and readings, completing the hermeneutic circle.

Cycle 1: The topic of research is decided upon through an "imaginal dialogue" (Anderson and Braud, 2011, p.28). This was my experience in retrospect as I had already drawn on doctoral training in the relevance of psychoanalytical thought for education. The potential for its application in understanding the acceptance of evolution at once seemed obvious and I began to consider what the concept of the unconscious mind could bring to a study of evolution and learning.

In this first cycle, an Experiential Exercise is undertaken, which involves selecting a text that claims your imagination. I had already focused on a text that had stimulated my thinking in an existential direction. It was the well-known *tangled bank* quotation from Darwin's *Origin* (see Appendix 6). The key part being "Thus, from the war of nature, from famine and death, the most exalted object which we are capable of conceiving, namely, the production of the higher animals, directly follows" (Darwin, 1859, p.490).

Cycle 2: A review of the literature is carried out and from this a set of initial lenses for the inquiry is defined. This is the researcher's prior knowledge of, attitude towards and understanding of the issue at hand. Anderson and Braud describe the lenses as "both a way of viewing a topic and what is seen" (Anderson and Braud, 2011, p.43). I defined the preliminary lenses from my reading of the wider literature on the understanding and acceptance of evolution and my initial reflections on the new ideas I had encountered in psychoanalytical theory and its application in education. For instance, the specific rejection of human evolution was a common finding in the literature that looks at the non-acceptance of evolution and it seemed to highlight issues of human significance and identity. However, they were also drawn from my professional understanding of the controversy as an educator.

The initial broad lenses were:

- Feelings/thoughts/emotions about human significance
- Change as something to fear

- Identity as animal.

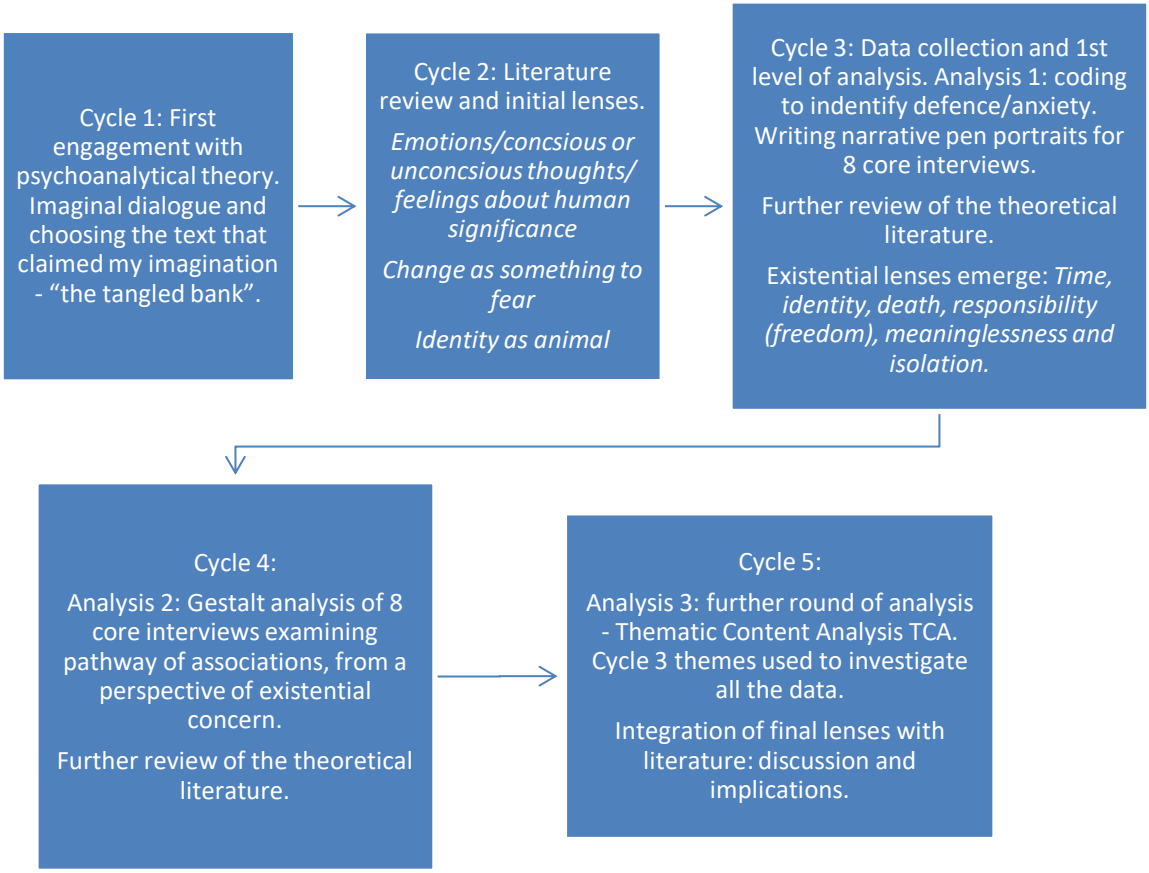
Cycle 3: Data collection and 1st level of analysis via summary data reports (see Pen Portrait Narratives – Appendix 7). This analysis drew on a psychoanalytical framework to identify defence against anxiety, but also openly expressed anxiety, through thematic coding. This thematic coding was the reference to the 'parts' of the interviews.

However, in the case of the eight core interviews, this was also then followed by a descriptive analysis of the whole interview using the meaning derived from the coding, so a return to the 'whole'. I produced summaries of my initial thinking via the eight pen portrait narratives which were a narrativisation of the interviews using this 1st level of analysis. This activity in addition to my reading prompted me to generate the existential lenses that I will go on to discuss. They were based on a deeper interpretation of the data, drawing on psychoanalytical and existential principles. I also tabulated the characteristics of the research volunteers at this point (Appendix 4). The methods of analysis are considered in greater depth again later in this chapter and in Chapter 4.

Cycle 4: Data interpretation. It was during Cycle 4 that I carried out a Gestalt analysis of the eight core interviews, which I explain later in this chapter. Each cycle begins with what Anderson calls an experiential exercise. For this stage of the research I used this technique to consider my own intuitive practices. I drew on this experience during the analysis. I have included my own short reflective notes for the eight core interviews in Appendix 8, which provide an indication of some of my thinking at the time. This 2nd level of analysis also used the principle of hermeneutics as I broke down the interview into parts, but then derived a holistic meaning or Gestalt from these parts, using the codes derived in Cycle 3 and the theme of existential concern.

Cycle 5: The final lenses were used to look at the literature again and to consider the implications of the findings for those involved. I also carried out a third round of data analysis using Thematic Content Analysis (TCA), applying the Cycle 3 existential lenses as themes.

Figure 3.1: The five cycles of intuitive inquiry.



Psychosocial research – psychoanalytical contributions to social research methods

My aim in conducting this research was to throw light onto people's emotional responses to the subject of evolution. From personal experience and reflection on that experience, I have begun to perceive the problem as follows: it is as though the community of teachers and researchers interested in these issues is having a conversation, but around a large, intervening obstacle that we are not consciously aware of, but possibly see glimpses of out of the corner of our eye. It is the nature and consequences of this obstacle that I wish to explore. The oblique nature of this experience suggests that the issues may have an unconscious aspect and may therefore not be accessible to conventional qualitative research. This in turn suggested that psychosocial approaches, specifically ones that draw

on psychoanalytical thinking, within which the concept of the unconscious mind is central, may be a means of exploring the issues in a new way.

Psychoanalytical theory is a means of interpreting people's accounts of themselves and their lives. It is not a single theory but a number of "different visions of reality" (Greenberg and Mitchell, 1983, p.20). It derives from the original ideas of Sigmund Freud, subsequently adapted and transformed into a number of competing theories or schools by others. It is defined as "a systematized body of knowledge about human behavior" (Moore and Fine, 1990, p.152) that is premised on the existence of the unconscious mind, which itself describes the existence of mental content out of reach of conscious awareness, that can be deduced indirectly through free association, interpretation of dreams and possibly affective responses. Ogden describes it as a "process of thinking and rethinking, dreaming and re-dreaming, discovering and rediscovering" (Ogden, 2009, p.1). Such theory can help us express something about the complexity of life by picking out particular elements that may be central to human concerns.

The concepts of evolution and the theory of psychoanalysis have an intuitive affinity in a non-obvious and curious way. They are both to some degree controversial outside of their professional settings. In a study by Yasseri et al (2014), they were both, along with Freud, found to be included in a list of controversial topics subject to "edit wars" in Wikipedia (Yasseri et al, 2014, p.26). They both subvert surface appearances or explanations. Frosh aligned psychoanalysis with Darwin's ideas as they both damage "the 'self-love' of humans by showing they are not at the centre of the universe" (Frosh, 2010, p.7). They both imply either instability or impermanence. Evolution is counter-intuitive (Atran, 1998); concurrently "the unconscious subverts and disrupts whatever one thinks of as certain or clear" (Frosh, 2010, p.6). How natural then to bring them together in a strange journey of (hopefully) discovery. I suspected instability and impermanence may be some of the ideas tapping into existential concerns, possibly even at the root of some of the resistance to evolution. Accordingly, a means of investigation that may reveal such a sense of insecurity seems appropriate.

Defining affect and emotion

An important aspect of this research is an understanding of what I mean by affect and emotion, terms often used interchangeably, but actually, although related, describing distinct phenomena. Some of what I will go on to describe is emotion, at other times affect, and this may, I argue, be related to the level of unconscious or conscious thought involved. It has been acknowledged that defining the terms affect, feeling and emotion is particularly difficult because they are defined differently in different academic and clinical contexts. The definition of affect that I have worked with is one that comes out of the psychoanalytical tradition (Redman, 2009, p.54), that uses "affect to refer to bodily propensities, such as those associated with the so-called 'basic emotions' … existing only within a relational context". Redman describes emotion as "the discursive repertoires through which a particular culture attempts to speak about and name the affects and their associated feeling states" (Redman, 2009, p.54).

This is supported in Moore and Fine's dictionary *Psychoanalytical Terms & Concepts* (1990), which states that emotions are the "outwardly observable manifestations of feelings" with affects broadly being "related phenomena, some of which are unconscious" (Moore and Fine, 1990, p.9). Hence, affect may be a product of the unconscious, those basic responses that are experienced automatically. Emotions, on the other hand, are how we may recognise the result of affect outwardly. In looking at responses to evolution I am interested in those that have an existential component and may or may not be unconscious; hence, my focus is on both affect and emotion in the interviews.

Psychosocial research: psychoanalytical theory and the unconscious

How can psychoanalytical theory be used to examine our perceptions of evolution? If one considers the idea of the dynamic unconscious, it becomes possible to think about elements of our thinking, our psyche, which are not accessible to us or to others. The unconscious is not simply a store for thoughts and memories we don't want; Freud saw it as a seat not only of repressed thoughts but also of creative energy (Bibby, 2010).

Assuming the existence of the dynamic unconscious allows the conceptualisation of a person's responses to a question or visual prompt as potentially originating from the

unconscious as well as the conscious parts of our psyche. This is the psychic aspect of psychosocial research and was of interest to me as I asked the question: if some of the ideas inherent to evolution are dangerous or disturbing might they be subject to repression? And if so, how can they be elicited during an interview? Hollway and Jefferson, whose approach I have drawn on in both interview design and analysis, refer to the *defended subject* (Hollway and Jefferson, 1997; 2000). Their assumption is that anxiety activates unconscious defences. Anxiety in this sense does not refer to worries about concrete, rational concerns regarding real phenomena, such as fear of losing your job if your employer is laying people off, but to anxiety that is either excessive in relation to the event or may be unconnected with real, contemporary phenomena. Existential concerns, as I will go on to describe them, can fall under this description.

Acknowledging the role of the unconscious, of affect, of emotional responses and existential concerns in response to a scientific topic, required innovation in research approach. Valerie Walkerdine in her investigation of gender and class in young women's experiences of education and work at the end of the 20th century looked at unconscious processes as well as examining social barriers (Walkerdine, Lucey and Melody 2001). It is work such as hers that I draw on my approach: compassion and empathy of the researcher, drawing on personal experience in research, being vulnerable and deep listening, looking beyond the surface. Key to this is experience of evolution, not perception, attitude or belief; what matters is how such knowledge is experienced, the phenomenology of evolution as it is encountered as an explanation (Lertzman, 2019). Lertzman describes radical listening, with an emphasis on interviewer-volunteer rapport, verbal and non-verbal cues, trust or a "compassionate research attitude" which, she asserts, generates rich data (Lertzman, 2019, p.30).

I have drawn on biography at times during the research interviews. However, although I also draw on Hollway and Jefferson's use of biography and the notion of unconscious defences I was not attempting to link an individual's responses to their past. I was not aiming to identify early intersubjective sources of defence, to explain responses in relation to past trauma for example, but rather to elicit responses that might indicate anxiety provoked by existential themes associated with evolution. These responses may be unconscious purely because they have not been consciously considered rather than necessarily actively

repressed. As I will discuss, existential concerns are not those of routine thought, they are often masked by the mundane, habitual nature and the 'everydayness' of life.

Psychoanalytical theory is not one school of thought, but consists of Freud's foundational principles and multiple, subsequent interpretations and developments of that theory. The outcome of the application of psychoanalytical theory will therefore depend on which version of psychoanalytical thought has been applied. Much of what I owe to psychoanalytical theory is drawn from the object relations school and Melanie Klein, but also Wilfred Bion and Donald Winnicott. However, many of Freud's ideas are also referred to, as are also those of Anna Freud in terms of psychic defences.

The objects referred to in object relations are people, the theory being one offering an explanation of the dynamics of interpersonal relationships originating from the primary relationship between mother and infant. An object does not directly correspond to a real person, but is an internal, psychic construct that represents the real individual. The subject carries these templates of others "around in his head" (Greenberg and Mitchell, 1983, p.11), and their psychic existence may have a profound, unconscious impact on a person's thinking and behaviour. Greenberg and Mitchell describe these internal objects, representations or personifications as "serving as a loose anticipatory image of what is to be expected from people in the real world; as becoming closely entwined with the individual's experience of who he is: as persecutors, fulfilling the function of critical internal fifth column; or as a source of security and resource, invoked at times of stress or isolation" (Greenberg and Mitchell, 1983, p.11). Hence, object relations refers to an "individuals' interactions with external and internal (real and imagined) other people, and to the relationship between their internal and external object worlds" (Greenberg and Mitchell, 1983, p.14).

The second theoretical position I have taken draws on existentialism and its application to psychoanalytical thought. It is through this I am positioning myself from a more phenomenological stance than is generally associated with psychoanalysis. Existential psychoanalysis is a branch of psychoanalytical theory that is based on the work of existential and phenomenological scholars such a Jean Paul Sartre and Martin Heidegger. It represents a move away from a drive or relational model to a position where "man is no longer understood in terms of some theory – be it mechanistic, a biological or a psychological one – but in terms of a purely phenomenological elucidation of the total structure or total

experiences of *being-in-the-world."* (Binswanger, 1954, p.312). I will return to it and how I used it in data analysis later in the chapter.

The psychosocial and narrative

As Viney and Bousfield (1991, p.757) write, "Much of our cognitive and emotional work is performed using narrative structures". Building on this, where does the unconscious sit in terms of narrative research? There is a tradition of decoding or demystification in narrative research. Riceour (2008) describes two directions in hermeneutics, the process of deriving meaning from text. These are restoration and demystification, the hermeneutics of faith and the hermeneutics of suspicion. The later recognises that personal narratives describe experience, but in the form of hopes, desires, fantasies and representations through their memories, and "the present of the past always reshapes the telling" (Josseleson, 2004, p.2). The implication is that some meaning may need to be decoded, that is, it may be disguised. Ruthellen Josselson (2004), in her account of the two approaches and their possible synthesis, recognises the ethical concerns a stance of decoding hidden meaning poses and prefers the term *hermeneutics of demystification*. As she says, "the participant is not dissembling or censoring" (Josseleson, 2004, p.15). In the interviews I shared with participants, it has become clear to me that I was not in a sense revealing meaning that the interviewees were unaware of; rather, they only became aware of certain things in the interview – new ideas and ways of thinking were revealed to them as much as to me. As Frosh (2008) suggests, rather than exposing unconscious thoughts already in existence, the thoughts explored in a clinical encounter, and arguably in interviews such as those I carried out, create the unconscious in that moment. I had when interviewing and afterwards when listening and reading back, a strong sense that the person interviewed had those thoughts consciously for the first time in the interview. We created them and their meaning together. It is not that they do not represent people's genuine responses, more that they were the product of a joint demystification.

Free Association and narrative interviewing

> There are many ways of accessing materials and processes that formerly were tacit, silent, unconscious … to learn from our unintentional slips of the tongue and unintended but revealing changes in behaviour, perceptions, memories.
>
> (Anderson and Braud, 2011, p.232)

Hollway and Jefferson (2012, p.2) argue that language and therefore people's storied accounts are full of a "range of unexamined meanings". They go on to argue that social research therefore needs to be done differently. This is because they reason that we don't always "tell it like it is"; we are defended subjects (Hollway and Jefferson, 2012, p.2).

Free association is a tool of psychoanalysis which can be used in interview design and interpretation. Christopher Bollas describes free associative thinking as like riding a train: "Each location evokes a set of associations" (Bollas, 2002, p.3). This journey in thought with its branches, pauses and diversions is a creative process and can promote unconscious communication in a clinical setting. I am not claiming that this is necessarily possible in an interview, but through free association certain words, phrases, or expressions may be suggestive. Such a method of interviewing relies on open-ended questioning, encouraging an attitude of reflection, even reverie, of unguardedness (Lertzman, 2019). My aim was to allow participants to think in ways they may not have done before with possibly unexpected results. Through free associating using the images and video I hoped to allow interviewees to deeply explore their reactions to these ideas.

The principle of free association was used in the approach I took to questioning and draws on Hollway and Jefferson's (1997) approach of Free Association Narrative Interviewing (FANI), although without any attempt to attribute people's responses to past events in their lives and I did not use free association in the analysis as they do. I attempted to elicit responses, accounts and feelings from the interview participants through unstructured questions, asking them to let me know whatever came into their mind. The rationale for this is to elicit a narrative that is at least in part guided by unconscious thoughts and feelings, which may not be accessible by more traditional narrative interviewing methods (Hollway and Jefferson, 2012). As Hollway and Jefferson put it "Free associations defy narrative conventions and enable the analyst to pick up on incoherences (for example, contradictions,

elisions, avoidances) and accord them due significance" (p.34). People attempt to produce coherent narratives but free association may allow unconsidered responses to emerge. Such responses may originate from unconscious sources and thus be symbolic or metaphorical in nature (Hickman, 2019).

The qualitative method that Hollway and Jefferson based their approach on was the biographical-interpretive method developed by Rosenthal (1993) and others. At its core is the idea that there is an intrinsic Gestalt to people's accounts, *Gestalt* meaning that an organised whole is perceived as more than the sum of its parts (Hollway and Jefferson, 1997; 2013). My premise is that people's responses to evolution may not operate entirely at a conscious level and that any discussion of ideas associated with biological evolution may contain hidden meanings that may be revealed by particular responses, but also through a holistic interpretation of their accounts.

The interview approach adopted by Hollway and Jefferson (1997; 2013) was also based on four principles, three of which I adopted in my interviewing:

- Use of open-ended questions: This was a crucial aspect I employed, since to derive hidden meanings and derive a person's core concern it is necessary to use questions "framed for maximum openness" (Hollway and Jefferson, 1997, p.63). If the participant's meanings are to be elicited, the researcher must ask questions that don't just reveal the researcher's own sense of meaning; they must give maximum freedom to the participant.
- Eliciting stories: This is hopefully a consequence of very open-ended questions; people narrativise their accounts to a greater or lesser degree and in doing so make choices not just about what to say but also how to tell, what to focus on and what to leave out. It is through these choices that meanings are often revealed.
- Attentive listening, using respondents' ordering and phrasing: Employed to repeat responses, echoing ideas, at times to check meaning and follow up significance, to elicit further responses for clarification or deeper examination.

The remaining principle was avoiding "why?" questions, but I did not fully adopt this principle. Hollway and Jefferson avoided asking "why?" questions to prevent intellectualisation as a response. However, I was interested in any response that might

indicate a defence, including rationalisation or intellectualisation. Nonetheless my core questions began “what”, typically followed by “how” or “why” (see Appendix 2). I was very clear to my interviewees that the questions were in no way a test of knowledge; there were no right or wrong answers. I also asked the volunteers to describe what they saw in the visual prompts, initial impressions, what they were reminded of.

I embraced the notion that unconscious thoughts could have an impact on people’s responses to an idea such as evolution, but it was with some caution. My suggestion was that there is something perhaps intrinsically unsettling, worrying, naturally affective, about the concept of evolution, but that we may not be aware of those feelings for many reasons. However, it would be too easy as a scientist to label some responses rational and others irrational; I feel that can be a false dichotomy. Despite this concern, I strongly felt that our emotional responses can reveal something about how we feel about our human identity and our potentially precarious place in nature.

Returning to validity: validity in psychosocial studies

Can psychoanalysis be taken out of the clinic?

What can the idea of the unconscious add to the debate about teaching and learning about a topic like evolution? I wished to address the deception I perceived that we can educate ourselves out of the issue of non-acceptance and wondered what concepts such as projection, identification and denial could add to our understanding (Frosh, 2008).

However, the use of a psychoanalytical theoretical framework brings with it important and problematic research issues. A research interview is not a clinical encounter and the researcher (certainly this one) is not a psychoanalyst. The relationship is short-term and only a glimpse of the individual is possible in such circumstances; the encounter lacks the depth of a clinical one (Frosh, 2010). However, my intention is not to understand the person in such depth and the interview is not therapeutic in intention; I merely wish to tap into some people’s affective responses to a very particular subject that I argue for most people are likely to be instinctive rather than thought through. This may not be the case if someone is a person who holds a very strong position regarding evolution; however, such people are in the minority and not the focus of this research. I argue that psychoanalytical theory offers

"suggestive aids to comprehension of complex events that in their unexpectedness or emotional intensity seem to show the traces of the unconscious" (Frosh, 2010, p.4). With acknowledged limitations, it allows me to examine anxieties provoked by the ideas presented which are an understandable outcome of existential concerns that evolutionary concepts could initiate. Psychoanalytical theory in its tendency to subvert also offers a new way of examining an oft-discussed issue without the fantasy of certainty, without claiming to find definitive answers, but to obtain a deeper understanding (Frosh, 2010).

Validity and the psychosocial

I have already alluded to some issues of validity in qualitative research but will now consider further matters pertinent to these concerns for data collection and analysis in a psychosocial paradigm.

I would suggest that psychosocial research itself, specifically the application of psychoanalytical thinking, supports validity. One of the criticisms of interpretivist research is the reliability of interview accounts; can you take them at face value as they are inherently subjective (Cohen, Manion and Morrison, 2007)? However, in assuming people are defended subjects I was deliberately subverting this notion. I was fully acknowledging the subjective nature of people's accounts, by considering the contribution of the unconscious. The use of psychoanalytical theory allows for new perspectives, not directly articulated by the person interviewed, so nothing is taken at face value. Denzin (1991) also discusses the issue of language, that it potentially plays tricks, as language is not the thing itself but, rather, signifies something. However, psychoanalysis also uses those tricks; they are a matter for interpretation themselves (Denzin, 1991).

Transference and countertransference[3] are seen as a potential cause of bias in interview research (Cohen, Manion and Morrison, 2007) but again are the substance of the analysis for the psychosocial researcher. Selective accounts by the interviewee can also cause bias (Silverman, 2011), but once more, selection is a tool for those interested in unconscious responses; what is omitted is as important as what is said. Hence, I argue that an

[3] Re-enactments of past relationships (see Appendix 1 for further explanation)

assumption of defence, a perspective that looks beyond what is immediately apparent, addresses some of the issues of validity for qualitative research.

Ethical issues

Any research project involving human volunteers must consider potential ethical issues inherent in such research. In involving people in research, a researcher is entering a relationship with them and has a responsibility to protect them from harm (Silverman, 2011). This for me means being honest and empathetic and representing my interviewees fairly and with compassion. It is this that I have strived to do and will discuss here.

Before embarking on a research project Silverman (2011) suggests the researcher ask the following questions:

- Why am I researching this topic? Is it to contribute in some way to the common good?
- Do I aim to help, through my research, the people who contribute to it?

This was a very helpful starting point to a research journey that could initiate uncomfortable thoughts and feelings and to which people's responses could not necessarily be predicted. I chose this project because I felt I could contribute something to our understanding of why evolution is at times difficult to teach and to learn. The people who volunteered to be interviewed were educators at the start of their careers and I hoped to benefit the education community of which I am also a part. I hoped by looking at the issue in a different way I could contribute positively and constructively.

Mishler's (1986) seminal writing on interviewing in social research discusses the potential "asymmetry of power" (p.117) between interviewee and interviewer in traditional research interviewing and how to better empower respondents, in order not only to treat people more ethically but also to enrich our research. He talks about moving away from considering the interview as seeking answers to the researcher's problems, seeing it more as a means of addressing respondents' problems, "specifically, their efforts to construct coherent and reasonable worlds of meaning and to make sense of their experiences" (Mishler, 1986, p.118). To this end he suggests that the creation of narrative accounts is a particularly significant means of enabling respondents to make sense of and derive meaning from their

own experiences. Through the co-construction of narrative, I aimed to give voice to the common cares, worries and also joys of existence.

A key ethical principle of research is informed consent. My ethics application for doctoral research and the participant consent form (Appendices 9.1 and 9.2) details how I secured this consent through openness of information, communication, right to withdraw from research, etc. In addition, it demonstrates how I intended to ensure confidentiality and security of data, and privacy of the individual. I aimed for integrity and trustworthiness, adhering to the ethical principles for research outlined by the British Education Research Association (BERA, 2018).

An issue Mishler (1986) raises around informed consent is concealment with the intention of ensuring validity, the concern of researchers that those interviewed should not be aware of the phenomenon the researcher may be interested in. Hollway and Jefferson (2012) to a certain degree took this line, not wishing to influence people's responses by foregrounding the interview with an indication of the ideas they were testing. However, I considered that trust was crucial, enabling those interviewed to feel comfortable talking to me and conducting the interview in a supportive manner. For this reason, I was open regarding my motivations, in that I wanted to examine emotional responses to a biological concept. I was also very happy to answer any questions and believed an informal approach would allow a deeper response by participants. It could be argued that this risked signalling expectations, but I was constantly surprised by the richness of responses and how they emerged through discussion of the visual prompts and people's stories of school and family. I felt that ethically it was important to mitigate any potential power imbalances using informality and openness; I shared personal information about myself when relevant which meant that the interview was often conversational in nature. I was prepared to take comparable risks in exposing my own thoughts and feelings as my volunteers. However, this risks bias and I was also aware of the need to allow the participants' responses to lead the conversation.

I have discussed earlier in this chapter the issues inherent in using psychoanalytical theory outside the clinic and there are implications for the ethical treatment of a psychosocial subject, particularly "one that deploys unconscious defences against anxiety" (Hollway and Jefferson, 2012, p.77). In response to this I am clear that this was not an exercise in psychoanalysis; I was interviewing people asking for their ideas, responses, their stories, but

I was not in a therapeutic role and my task was not to clinically analyse the people participating in the interviews. In addition, although I drew on object relations theory in psychoanalysis, I was not attempting a relational analysis of the interviews (interpersonal analysis), except in the sense of people's relationship to the natural world. My intention was to use free association and the theory of the dynamic unconscious to explore affective, instinctive and existential responses to biological ideas that may be held by us all. I also aimed to share insights through interviewing, that it be a two-way experience that could develop mutual understanding and reveal thinking for both participants. As Winnicott puts it I was attempting to "enter imaginatively … into the thoughts and feelings and hopes and fears of another person; also to allow the other person to do the same to us [me]" (Phillips, 2007, p.12).

Finally another issue that requires ethical consideration is the payment of volunteers. I provided a £25 gift voucher as an incentive to take part. It has been argued that payment undermines free choice in participation (Hollway and Jefferson, 2012). However, I defend this choice for a number of reasons. As a student of education myself, unconnected to their course of study, I was not in much of a position of authority. I hoped that the inducement would simply signal my thanks for their time and involvement in my research by supporting book purchases for their studies.

Thinking differently: psychoanalysis and existentialism

> I hadn't any right to exist. I had appeared by chance, I existed like a stone, a plant, a microbe. My life grew in a haphazard way and in all directions. (Sartre, 2000, p.124)

In Cycle 3, through reading and analysis, I refined the original lenses using existentialist psychoanalytical theory. I explain this here. "Existential thinking offers no security, no home for the homeless … It addresses none but you and me" (Laing in Thompson, 1998, p.357). This quotation encapsulates the essence of the problem with evolution in one sense. If evolution suggests purposeless, instability, death and extinction, even inhumanity, then it offers no security; such concerns are surely existential. For this reason, I have taken and rethought what was originally a psychoanalytical approach to a phenomenological issue and

considered how existential concerns, about the nature of existence, could be developed and applied to the data in a meaningful way.

Existential psychoanalysis is in fact a branch of psychoanalysis, which as its name suggests combines existentialist philosophy, principally that of Martin Heidegger, with psychoanalysis. It is a small branch of psychoanalysis which is somewhat controversial in a clinical setting (Thompson, 1998). However, as developed by Jean Paul Sartre and others, it has I believe a peculiar resonance with the ideas developed in this research, being concerned with existence. Guy Thompson (1998) summarises the perspective of Laing who saw existential psychoanalysis as concerned with the conflict between authenticity and self-deception. The experience of existence and what it tells us is sometimes a heavy burden. I was interested in exploring the impact of our knowledge about existence and what evolution implies for this knowledge. I suspected the implications could provoke existential concerns that may lead to repression of such knowledge.

The term *existential* is difficult to define; in the realm of existential psychotherapy Irvin Yalom describes the existential orientation as a focus on concerns "that are rooted in the individual existence" (Yalom, 1980. p.5). Existence encompasses the past, present and future; it refers to our origins, our identity, meaning and purpose and our potential fate. Surely this is also what evolution requires us to confront? So, by its very nature evolution is associated with the existential. In my reading, following my first attempt at descriptive analysis of the eight core interviews (Cycle 3), I encountered the work of Irvin Yalom, a Professor of Psychiatry and practitioner of existential psychotherapy. He described the existential approach as "deeply intuitive" (Yalom, 1980, p.5) and the existential position as "a conflict that flows from the individual's confrontation with the givens of existence" (Yalom, 1980, p.8), an inevitable part of being human. I had been struggling with reconciling the association of psychoanalysis and pathology with an awareness of what I was proposing related to normal attitudes toward evolution. I did not wish to suggest that what I was perceived in people's responses was an indication of psychopathology but was in fact a normal response to existence. In existential psychoanalysis I saw how a notion of the unconscious, the existence of psychic defences against anxiety coupled with existential concerns, could explain some of the classroom and wider public phenomena I have encountered as a teacher and scientist. I felt that existential psychoanalytical theory could

serve as another way of examining and understanding people's emotional responses to evolution and possibly as a result provide a framework for understanding the non-acceptance of evolution beyond the role of religious faith.

At this point I made the decision that the major focus of my further analysis would be examining the interview texts for evidence of existential concerns provoked by evolution. Psychoanalytical principles, such as object relations theory, would be drawn on to explain and identify possible defensive positions in the interview accounts that I argue are provoked by existential concerns.

Irvin Yalom's writing provides four categories of existential concern that confront us; these "ultimate concerns" (Yalom, 1980, p.8) are death, responsibility/freedom, isolation and meaninglessness, and they may stimulate conscious or unconscious anxiety. Although, as in Freudian psychoanalysis, anxiety provokes defence, that anxiety is not in response to drives but in existential psychoanalytic theory is in response to an "awareness of ultimate concern" (Yalom, 1980, p.10).

I describe the four categories of concern in relation to the natural world/evolution based on Yalom's definitions as follows:

Death

As the Book of Common Prayer (1662) declares, "In the midst of life we are in death". This is perhaps the central ultimate concern. Life and death are intimately connected. In nature we see abundant life, but it is only possible because there is also death. We know death is a reality, but we can choose to overlook life's fragility. In relation to nature we may choose to see the beauty in seasonal change, rather than the decay and death winter may bring. On a more personal level, thoughts that linger on death in nature may serve as a reminder of our own, so we may avoid such associations. The concern may not be triggered by a direct encounter with the possibility of our own death, but something Yalom described as a death equivalent, something that could symbolise death. In an attempt to avoid the thoughts associated with death we may rely on fantasies of specialness or invulnerability. Yalom suggests that "Our belief in exemption from natural law underlies many aspects of our behaviour" (Yalom, 1980, p.121). So, defences may temporarily allow us to forget the

inevitability of death. Heidegger (2010) described this as a state of *forgetfulness of being*. However, certain ideas or situations may act to remind us and provoke anxiety. Evolution, as an idea associated with the struggle for existence, competition in the life and death sense and the possibility of extinction, could provoke defences as an attempt to deny death.

Responsibility and Freedom

Freedom in the existentialist sense is freedom to create our own meaning, to make choices and take actions. The implication of this is that any apparent structure or coherence in the world is the product of human thought or action; it is ours to own, and we are free to superimpose what we wish on reality; we create our own reality. However, in consequence the inference is that the world is not necessarily ordered as we see it, we are not revealing a pre-existing reality that we can observe; rather, each individual is responsible for creating their own reality, for their own life's structure and meaning. This means humans are responsible in the existential sense of the word; they are authors of their own lives.

In his novel *Nausea* Sartre describes his protagonist's realisation of his own responsibility for what he perceived:

> And the, all of a sudden, there it was, clear as day: existence had suddenly unveiled itself. It had lost its appearance as an abstract category: it was the very stuff of things, that root was steeped in existence. Or rather the root, the park gates, the bench, the sparse grass on the lawn, all that had vanished; the diversity of things, their individuality, was only an appearance, a veneer. (2000, p.183)

Responsibility in this sense, that true meaning only exists as created by an individual, is inextricably aligned with freedom, as freedom is necessary for an individual to constitute their own world (Yalom, 1980). This responsibility is profound and Yalom suggests not something we are aware of as we go about our daily lives. When realised it can cause us to question everything we see and become aware of our ultimate separation from all other beings: "To experience existence in this manner is a dizzying sensation. Nothing is as it seemed. The very ground beneath one seems to open up" (1980, p.221); indeed, Yalom describes this as state of *groundlessness*.

Isolation

Intimately linked with this freedom is the understanding that we are inevitably alone. This does not refer to interpersonal isolation, although it is related to it, but isolation in its absolute sense. We enter and leave existence alone and it is our confrontation with this that prompts concern. This idea can be very much in conflict with our need to feel "part of a larger whole" (Yalom, 1980, p.9).

Such isolation is itself not grasped by us most of the time; we live in a state of everydayness, surrounding ourselves with things we attach significance to, completing routine acts that serve to shore up our sense of the world. Our reality as it is perceived may be replete with connection, if we are lucky enough to have close relationships with others. However certain circumstances, such as a confrontation with our own mortality, may reveal this isolation, the "unbridgeable gulf between oneself and another human being" (Yalom, 1980, p.355). Between us and others is nothingness, a void.

Meaninglessness

"If we must die, if we constitute or own world, if each is ultimately alone" (Yalom, 1980, p.9) what meaning does life have? This is to become aware that any supraordinate structure or coherent meaning is of our own making. There is no plan, we are not actors on a stage with a role supplied for us. If we accept this, then we must also accept that the world is unconcerned with us, it is indifferent. To conclude that the world continues only by natural forces, that our life has no ultimate purpose, is profound indeed. We need then to seek and find our own meaning: we are the meaning-makers. In the analysis of the interviews I refer to both meaning and meaninglessness, as I encounter instances of interviewees meaning-making in the face of evolution and its implications.

Yalom suggests that any of these concerns may be provoked by what he terms an urgent or boundary/border situation or experience; these include confrontation with death or death equivalents as explained above. However, they are also, he suggests, provoked by the breakdown of a primary meaning-making schema. Any person with a belief of a religious nature, or otherwise, about human origins and identity could be disturbed by evolutionary concepts if these do not fit their model of existence. This model may not be consciously thought through, but possibly intuitively derived. Consider the strong coherence of

explanatory frameworks adopted by children as described by Samarapungavan and Wiers (1997).

Existence: Time and Identity

My reasoning in including time and identity as lenses was based on my experience of the interviews, a decision arrived at gradually through the data collection process and contemporaneous reflections on that process. I had a strong sense of identity claims in the interview that at times were expressed through people's reactions to the visual prompts. Identity is also an aspect of freedom/responsibility as identity is in part an act of self-creation although informed by external factors. Bilsker (1992) notes that ego identity as part of the nature of being is a particular type of existential position. We are born into a certain family, culture, geographical place, which Heidegger (2010) describes as a state of *thrownness*. This state may provide boundaries to our identity, but existentialist thinking asserts that our identity is our own creation. Identity formation is a key part of adolescence; however, it is a process with which we continue to engage with all our lives. Our identity is part of how we construct personal meaning and therefore influences our relationship to the wider world and to nature itself.

Time was included as a result of my experience of time in the interviews and discussions of time-related subjects. I noticed that sometimes people's conceptions of time were odd, intuitively-based. It is also a concept existentially connected to death, as a human life span is finite. The timescale of evolution is also so vast that it highlights for how little time human have existed, possibly a challenge to our perception of human significance.

Psychoanalytical theory: defence against existential concerns

I have also drawn on conventional psychoanalytical thought in the interview analysis through examination of people's responses to evolutionary concepts including those that may indicate a defended position. Psychoanalytical theory suggests the existence of the dynamic unconscious – an aspect of the psyche that is not directly knowable, but the site of repressed thought, the reason for that repression being defence against thoughts that cause anxiety (Freud, 1923). It is dynamic because it is not merely a store of repressed memories.

The unconscious can only be detected indirectly through dreams or through outward manifestations such as slips of the tongue or possibly defences acting on speech and behaviour. The unconscious is not bounded by time, it is not rational and it can tolerate contradiction, it does not have to make sense. Freud saw the unconscious as actively controlled by forces that prevented the free expression of unsettling ideas (Freud, 1923). Free association was a tool developed by Freud as a means of tapping into unconscious thought (Bollas, 2002). The application of free association in this research was in order to examine possible defences to evolution and its implications.

Freud and later psychoanalysts defined the defences deployed by the unconscious. I have principally based this analysis on the ideas of Anna Freud (2015) and Melanie Klein (Hinshelwood, 1991; Klein, 2011). However, I have also drawn on the ideas of Wilfred Bion and Donald Winnicott as psychoanalytical thinkers from the object relations school. The principle psychoanalytical terms I refer to in my discussion are listed and explained in the Glossary of Psychoanalytical Terms (Appendix 1). I have not assumed all responses will be defensive; some may indicate acceptance, which I will discuss also.

Methods of analysis

My experience of the interviews and subsequent reflection on reading the transcripts led me to treat the interviews in one of two ways. I chose eight core interviews to carry out three levels of analysis, including thematically; the remaining nine interviews were only analysed thematically using part of the 1st level and the 3rd levels of analysis, and were not analysed holistically. I discuss the reasons for this below.

1st level of analysis

In Cycle 3 (see Figure 3.1) I analysed all seventeen interviews using the initial lenses of human significance, change as something to fear and our identity as animal and in addition I examined the data for evidence of psychic defence, transference and other unconscious dynamics. I looked at language and metaphor and the unfolding story of the interview to consider possible defences and responses that might indicate anxiety. I then applied codes to the data, labelling parts with interpretation. I repeated this reading of the interview texts,

checking meaning and adjusting my interpretation when necessary. I then completed a round of descriptive analysis on eight of them, using the approach of narrativisation.

These eight interviews were initially chosen from the original seventeen first, by looking beyond the role of religious faith. I made the decision to analyse in the greatest depth the responses of those interviewees who were least likely to be influenced by religious beliefs. Secondly, I also undertook this first round of analysis on those interviews that revealed the most indication of existential concern. The exception to the first criterion was Zara's account. Zara was a practising Christian and as such her responses were very much informed by her faith. However, she also exemplified some of the most apparent existential concerns and also the experience of knowledge as trauma which is very significant for my interpretation.

This narrativisation was not purely the individual's story, but also the story of the interview itself. So, from each core interview I created what I term a *pen portrait narrative*. This is my own word picture of the interview, constructed after repeated listening to and reading of interview transcripts, reference to my post-interview notes and reading of the theoretical literature. These narratives treat the interview data as a whole, and examine the story told from psychoanalytical and existential perspectives in a broad manner. They are drawn on in the Discussion (Chapter 5) and are shown in their entirety in Appendix 7.

2nd level of analysis: pathway of associations and Gestalt

The cycle of addressing the whole to understand the parts and an examination of the parts to illuminate the whole is a tension apparent in hermeneutics (Alvesson and Skoldberg, 2000). In analysing the interviews using psychoanalytical theory it was important to examine them holistically. I was concerned that it might not be possible to capture what are emergent thoughts and feelings prompted via free association through the normal coding of conventional thematic analysis alone. The following quote from Hollway and Jefferson describes my reasons for this: "In any encounter (physical, visual or verbal) with another person, the significance of what you know, and what you feel about what you already know, strives for a form or whole which goes beyond the elements" (Hollway and Jefferson, 2012, p.65).

Hollway and Jefferson's approach to this requirement for Gestalt is to construct a *pathway of associations* (1997). Hollway and Jefferson assert that these pathways of associations are produced from what matters to the individual and "that the whole will signify more than the sum of its parts" (Hollway and Jefferson, 1997, p.63). People's emotional concerns underpin their responses and produce the pathway and, through this exercise, it is possible to throw some light on the person's Gestalt or core concern.

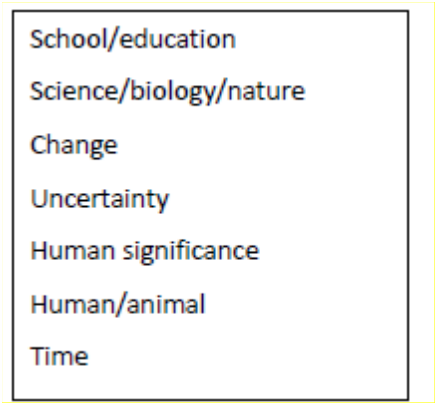
Hollway and Jefferson describe this process of understanding core concerns as follows: "Their idea of hidden meaning being revealed through the gestalt of a story is analogous to the psychoanalytic concept of free association, in which the links between elements in the narrative are provided by unconscious meaning associations, which then provide clues to the significance of a person's account" (Hollway and Jefferson, 1997, p.67). I have borrowed from this idea, in that I have attempted to understand the interview Gestalt, the overarching theme, but I did not apply the concept of free association in the interview analysis as they did. I was interested in a broader analysis to reveal central themes through holistic interpretation. I was not using a psychoanalytical relational analysis to interrogate the associations of meaning, just to draw on narrative interviewing's holistic approach, to examine if any core themes emerged from an interview. I identified meaning frames (the parts) in the core interviews, as they appeared chronologically in these interviews. From these I created a descriptive Gestalt or primary concern(s) for each interview (the whole). I concluded this analysis with my some of my insights into the interview at the time and later, and my own contribution to the meaning developed through my conversation with the volunteer participants (see Appendix 8).

3rd level of analysis: Thematic Content Analysis

All seventeen interviews were then analysed thematically using the themes or lenses that emerged collectively in Cycle 3 from the pen portrait narratives and the Gestalt analysis of the eight core interviews and from further reading of the literature on existential psychoanalysis. These lenses were time, identity, death, responsibility (freedom), meaninglessness and isolation. I describe the first two as existential concepts and the remaining four as existential concerns. I describe their meaning and derivation later in this chapter.

I carried out this Thematic Content Analysis (TCA), specifically drawing on the approach described by Rosemarie Anderson (2007) although the method I used differed in that the themes/lenses were pre-existing rather than emerging as part of the process. The first step was to demarcate meaning units in the interview in the order in which they occurred. These were selected by the criteria below which constituted what Anderson terms 'relevant descriptions', which arise from the research questions, initial lenses and aims of the research (see Box 3.1 for a list of these criteria). Some interpretation when identifying meaning units was necessary, but was kept at a minimum.

Box 3.1: Analytical criteria for meaning units



The meaning units were marked out on Microsoft Word documents of the interview transcripts (see Appendix 10 for sample excerpts of transcripts with TCA). Each meaning unit was labelled in Microsoft Word using the 'comment' function and categorised using a code. The codes were derived directly from the interview text and so were in the actual words of the person interviewed.

When this was achieved the entire interview text was then examined and categories of meaning units combined under single codes if appropriate and so grouped together. Once this process was complete for all the interviews, the six existential lenses derived from Cycle 3 were applied as themes to each meaning unit. I refer to the themes of the analysis as lenses as this seems a more accurate description of the ideas applied to as much as derived from the text. Rather than explicit themes they are a means of 'seeing' the meaning in the text; they are lenses through which to view responses.

This is the point when the data were interpreted through a framework of existential psychoanalytic theory. Single and multiple lenses could be applied to single meaning units. It was important that the interpretation was undertaken in respect of individual meaning units, but not losing sight of the context of these meaning units and the structure of the interview as a whole. The determined lenses were recorded on the transcript document using the highlight and text colour functions of Microsoft Word. This colour-coding was applied to comment labels containing the codes rather than direct to the transcript text (see Box 3.2 for the colour-coding key). See Appendix 10 for examples of how the lenses were used to interpret the interview text thematically.

Box 3.2: Colour-coding key used for TCA

Time : yellow

Identity : green

Death : light blue

Responsibility/Freedom : purple

Meaninglessness/meaning (both terms were used for this theme): pink

Isolation : red/orange

Chapter 4: Outcomes of the 3 levels of analysis from an existential examination of emotional responses

The process of data analysis: first level of analysis Cycle 3

The analysis of the data drew on the assumption that not all our responses in free association are consciously derived; our unconscious mind may hold repressed thoughts and feelings. This repression may be in response to anxiety and such occurs according to psychoanalytical theory through unconscious defences. Anxiety in this case is likely to be disproportionate to any perceived threat; this Klein (1988) termed depressive anxiety. This assumption in turn requires a particular approach to analysis as Hollway and Jefferson describe: "The idea that anxiety leads to distortions and displacements demands a methodological strategy designed both to recognize and decode anxiety's many guises" (Hollway and Jefferson, 1997, p.55). In the first level of analysis of the interview transcripts in Cycle 3 I applied the notion of psychic defences, transference and other unconscious dynamics to the data, looking for contradictions, indicative words or phrase choice, but also more direct or obvious evidence of anxiety, ambivalence and attempts at meaning making in the participants' responses.

For instance, in terms of defence, the account of two of the young men in my eight core interviews contained identity claims that indicated the personal importance of the intellectual, 'being clever', which when considered in the context of their responses to the ape portraits is indicative. They both describe feeling discomfort in response to the portraits, as a result of what Paul terms the "humanisation" of the apes. Their reasons for this mirrored some of their earlier responses; they drew on philosophical interpretations, in the case of Paul, and sociocultural in the case of Patrick, these responses reflected their academic identity claims and allowed them to examine the portraits at an emotional distance. This is evidence of intellectualisation as a defence, which I will discuss further in Chapter 5. What was interesting is that in all descriptions the interview volunteers gave of the portraits, the language indicated a recognition of the resemblance of the apes to humans, but never were humans described as resembling the apes, another possible indication of a defence against our possible animal identity.

Therefore, I examined the transcripts for responses that indicated depressive anxiety, that which is in response to a *perceived* rather than an actual threat (Klein, 1998). Common examples were expressions of a fear for the future - personal futures, loved ones' futures and the future of humankind generally. Language used in the interview also often indicated discomfort in the instability of human identity, with fears expressed for the next stage of human evolution. However, I also noted language more openly indicative of concern or anxiety. For instance, looking at the timeline Jane described *"going from nice quiet areas"* to *"starts to get crazy and visual nuisance".* Some responses were more oblique and possibly defensive, such as describing parts of the timeline as *"empty"* or *"full"*, containing *"nothing"* and then "*something"*, "*growth"* and *"overgrowth"*. Some respondents also unconsciously personalised evolution in their descriptions, *"so you had to stumble through these, you had to be a fish, you got to be a human".* Psychoanalytical theory was still relevant to these responses as they were derived through free association, which may allow ideas to be expressed that may not be revealed otherwise.

Anxiety outwardly expressed by participants was at times accompanied by evidence of psychic defences, the two coming together. This was the case in the example of Dhruv, who was outwardly alarmed by the ape portraits, and saw aggression in the apes' faces, regardless of the absence of a real threat - a psychic projection of another fear.

I noticed in the interviews how participants' descriptions of time were sometimes odd even contradictory at certain points. Time was a very common theme, as was anxiety over the future as described in the previous paragraph. In further terms of defence, some people's responses indicated a wish for or belief in human specialness. For Melanie the depictions were about human evolution only; she also expressed a desire for a *"greater"* explanation than evolution, even though she did not doubt the theory. These common themes demonstrated what Reissman (1993) calls thematic coherence; they appeared over and over again in the interviews and were responsible for inspiring my final level of analysis using existential concern as a theme to carry out thematic coding and analysis.

The analysis in Cycle 3 examining the data for common themes related to anxiety, that were openly expressed or indicated by the identification of defended responses, was carried out via multiple readings of the data, highlighting key words, phrases and sections and labelling

with notes on defences identified and meaning of responses using coding. The codes were then coalesced into a smaller number of groups, these being the six lenses of existential concern.

At the end of this 1st level of analysis in Cycle 3 I transformed the eight core interviews into individual interview narratives, the pen portrait narratives which are in Appendix 7. This helped me interpret this data holistically and hermeneutically, as in hermeneutics parts of the text are examined to make meaning of the whole and the whole in turn examined to understand the parts, in a cyclical fashion (Alvesson and Skoldberg, 2000).

Second level of analysis in Cycle 4: Gestalt and pathways of association

The next section of this chapter describes the outcome of the Gestalt analysis of the eight core interviews, drawing on Hollway and Jefferson's (1997) notion of pathways of association and interview Gestalt. I did not apply psychoanalytical theory directly to the data as Hollway and Jefferson had done, and therefore I am not using the idea of free association in the data interpretation here. I more simply, following the first level of analysis, wished to provide a further holistic summary of the interview to complement the longer pen portrait narratives. I treated the interview texts hermeneutically, with an appreciation that to understand a part of the text I must find the meaning of the whole. Therefore, I aimed to identify their Gestalt or the core meaning that ran through each one by identifying discrete chronological sections of the interview. To do this I described the interview responses in the order they occurred using the outcomes of the previous analysis in my interpretation and then described their Gestalt. In hindsight, this could be seen as a redundant exercise as it is somewhat a repetition of the pen portrait narratives, but I hoped that by applying the idea of a pathway of associations I could distil the interview meaning, but also confirm my analysis by breaking down and then combining the meaning in the data. It was also very helpful in retaining that holistic view of each interview.

Gestalt analysis of eight core interviews

Paul

1. Paul began formal education at a young age, which although emotionally challenging for him at first went on to be a very positive experience of education and learning. He achieved good grades and had what he thought were good teachers. His parents were also teachers, and his home life supported his progress and his curiosity.
2. He had a love of mathematics but described himself as interested in everything and later developed a strong interest in language and philosophy. His intellect and academic progress were fundamental to his identity. Theoretical rather than practical knowledge has been the focus of his formal learning, but he felt he fully participated in his own education.
3. His memory of learning evolution focuses on human evolution and learning about the key features responsible for humankind's success – our brains and our hands. He particularly remembers concepts of mutation and selection, seeing this as a process of the successful surviving and the unsuccessful dying.
4. He seems a little overwhelmed by the amount of information in the timeline and is concerned with remembering the names of the periods.
5. He is intrigued by the elliptical nature of the timeline as he sees time as linear.
6. He likes the childlike quality of the illustration which reminds him of his childhood interests.
7. He remembers talking to his mother a lot about explanations of origins and existence. He felt he had to choose between a scientific and a spiritual explanation of these.
8. He considers he is quite singular in his motivation and later describes his values as his driving force in life.
9. To Paul, evolution is synonymous with change, but he sees beauty in that dynamism.
10. In looking at the video animation he sees an image of Gollum, two persons in one. Struggling, alienated, a victim of his past.
11. But he does not easily acknowledge the human in Gollum, in hobbits. He sees them as similar superficially, but not human.

12. He also does not feel comfortable seeing the human in apes, or perhaps the ape in humans. They do not have language; therefore, to humanise them is problematic to Paul. Human identity to him is forged in language.

Gestalt

Paul appreciates nature, sees beauty as something that should be protected, but sees humans as outside nature. His identity is tied up with those features that are specifically human, the rational intellect, language and logic. However, perhaps unconsciously, he is also describing the dual nature of humanity – the rational being and the irrational beast, the human and the animal. He sees this dual nature but does not openly acknowledge it. His is a complex position where science is accepted but the implications of the theory of evolution are to some degree denied.

Patrick

1. Patrick's experience of compulsory education was very negative, so much so that he often avoided school as a teenager. He experienced a lack of positive expectations of him as a child from school, but also to some extent from family too.
2. However, he had a fundamental interest in knowledge and loved reading and history. It was only when he went to college, somewhere he chose to be rather than had to be, that he saw the relevance of education for him personally. This was a highly instrumental view of learning in that he followed subjects he saw as being able to take him to "good places".
3. He at first denied any memory of learning about evolution at school, but this seemed to be a negation, a denial of what was in his account, which was a fairly comprehensive knowledge of both the biological ideas involved and the historical facts.
4. His was a position on evolution of both understanding and acceptance, it was "just like gravity".
5. On looking at the timeline he saw it as conveying a message about human progress which he disliked. He felt this was a narcissistic oversimplification. He referred to the

theory of gravity again, describing it as a 'truth', an unavoidable reality, just as evolution was to him, as was the fact that many organisms are now extinct.

6. In the video he saw metamorphosis, but denied at first seeing any message or meaning, putting down his ability to interpret such imagery, although he saw vulnerability in the final image of the man.
7. This led to a discussion of change which he initially accepted but also then rejected, mistrusting the motivation and understanding of those who instigate change.
8. This moved our conversation to his understanding of purpose, his belief that human complexity often obscures purpose.
9. This further led to him describing what he feels is the inevitability of not knowing or understanding another, his claim that it is not possible to know that many people well.
10. On looking at the ape portraits he was immediately distrustful of the motivations of the photographer; although probably laudable in its aim, he felt the photographs were manipulative, that they highlight the supposed humanity in the apes to provoke pity.
11. But he is a person of paradox as he simultaneously distrusted any human sense of superiority, returning to his position on the problematic nature of the timeline as a story of human progress.

Gestalt

Patrick is a deep thinker but does not always seem comfortable with this identity. He is also distrustful of having his thinking led by others. He distrusts what he sees as manipulation; he wants the freedom to think, to have ownership of his own ideas. These ideas coincide with the scientific explanation of evolution and he appreciates complexity and subtly in the complex reality of the natural world. However, in seeing anthropomorphic thinking as purely problematic, he also is at risk of denying the animal in humans and avoiding some of the potentially anxiety-provoking ideas implicit in evolution.

Jane

1. Jane described school as a contrasting experience of "scary" but then also "cool". She described her experience of transitions. Her fearfulness of moving to secondary school,

from being a “little kid” to someone expected to be independent. From a place to be with friends to a realisation of what needed to be achieved at school, namely GCSEs.

2. Finally, she described her biggest transition, an accelerated pathway to adulthood at 15 when she became pregnant with her daughter, changed schools again as a result, but left school without any GCSEs.
3. As an adult she then went and completed what she had started at school and was now taking a degree, but she still thought about those transitions, and described how family could make those easier.
4. Looking at the timeline, Jane’s descriptions at first were positive, she saw growth, “going from nothing to something” and “getting better as it goes on”.
5. This positive view then started to slip, describing huge and chaotic change. She alluded to a time of little life existing, a time when she herself did not exist, to then life getting “crazy” and the negative impact of humanity on the world.
6. When we viewed the video, she saw a fish being presented as our ancestor; this made her curious. She was familiar with the notion of ape ancestry, but any extrapolation to other animals was a new idea. However, she reconciled this with her understanding of fetal development, the human embryo’s early similarity to the fish.
7. Her ideas progressed further along the lines of human origins; she wished to know what the truth was about our history, who was the first person on Earth? The video presented questions, she wanted what she saw as the right answers, the answers she could give her own children.
8. From considering humanity’s past she moved on to concerns for our future, what might we evolve into next? What was the future for humanity? She considered this from a personal perspective, her children’s futures.
9. The video reminded her of pregnancy which she saw as positive and negative, describing it as growth but also overgrowth.
10. She alluded to the difficulties of her first pregnancy, the fear, the feeling of responsibility, also her physical unreadiness at 15. She described her baby as a foreign object, but also herself as building a person.
11. She returned to transitions, the fish to human left her questioning what is the real explanation? She understood her children’s origins but wanted to understand the origins of the first person, of humanity, which she felt she school had not told her.

12. For the apes in the portraits she felt compassion, she saw them as voiceless and suffering. She saw humanity in them and was surprised, but not discomfited, by seeing them as people.

Gestalt

Jane's Gestalt is characterised by ambivalence and a need for answers. She sees the transitions in nature as mirrored in her own life transitions. She sees positive development, progress possibly, but at the risk of this running out of control. She wants to know where we have come from and where we are going; she wants to understand, but also to be able to help her children understand. She feels a great responsibility in this regard. This responsibility extends to the apes; she sees our responsibility for them, for their suffering, which is focused through her view of their relationship to us.

Rosie

1. Rosie was German and had only recently completed her schooling before travelling to London to attend university.
2. She described school as "difficult", with so much to learn and remember. She explained that this was why she had not pursued science, there being so much to study, although she liked practical science.
3. She was happy with her education and felt prepared for university; she considered she was in some ways more prepared than her British peers.
4. She remembered learning a little about evolution at school, which she enjoyed. She saw it as an explanation of how we came to be "what we are now", but also made the link with our development and acquisition of technology which "we found along the way".
5. She considered herself part of the digital generation; she felt dependent on technology, it providing structure and so purpose.
6. She said she found evolution exciting, ideas exciting; she was accepting and curious.
7. On looking at the timeline she primarily noticed the late appearance of humans and marvelled at how much had happened before our existence. She described the early Earth as "empty".

8. She remarked on the disappearance of the dinosaurs and realised that could be our fate too. She felt a lot was at stake, what direction would we go in? How would we change the world?
9. She again described herself as excited, loving learning new things and new knowledge was synonymous with school and university.
10. She was excited by the video too. She described it as being a depiction of human evolution from fish. It reminded her of two things. The first was aging, which made her sad for time lost and time she would not see.
11. The second was the *Planet of the Apes*, as in this apes could talk which to her seemed make a lot of sense, not at all shocking as it had for the human characters in the film, as she saw humans as directly evolving from apes.
12. She loved the ape images, very quickly perceiving they were portraits which reminded her of an iconic human portrait. She felt the photographer was trying to show how human the apes are. However, she was surprised by the variation in this group of apes.
13. She associated certain emotions with each of the apes: happy/sad, friendly/unfriendly, some even angry. Some she would like to meet, but some not. One individual reminded of a homeless person she had seen, which triggered feelings of shame. She was ashamed she had associated him with an ape.

Gestalt

Rosie was enthusiastic about knowledge and learning. She was open-minded and curious. She sees human evolution, biological and cultural evolution, as a mixture of good and bad. She loves technology but worries about the impact of human technology on the Earth. She is excited by evolution as an idea but also perceives the frightening implications of evolution, potential extinction, death and nothingness, in the existential sense of the absence of self in the world. She feels a relationship with apes but also feels guilty in comparing a person to an ape. Her Gestalt is confusion, a tension between curiosity and a desire for knowledge, but also a realisation of the implications that the new knowledge reveals.

Melanie

1. Melanie's experience of science at school was affected by a strong Christian influence on education in the area where she grew up. Her attitude, although appearing positive, is actually somewhat ambivalent, exemplified by her seemingly contradictory response "I found it fascinating. It was very interesting. I quite enjoyed science".
2. She had liked chemistry at school, she had a good teacher and remembered impressive chemistry demonstrations of explosive and colourful chemical reactions.
3. She remembered little about being taught evolution; she said it had been "glossed over" at school as a result of the religious sensibilities in her community.
4. On looking at the timeline she described what she saw in detail but summarised it as being the evolution of human beings, culminating in the development of cities and human technology.
5. What she noticed in particular was the length of time involved; she remarked on how long the time span was between the existence of aquatic organisms and the emergence of land-based life forms.
6. When asked what the timeline reminded her of, Melanie said "movies" – science fiction, fantasy and children's films.
7. Her feelings about the timeline she stated were neutral: "It's just how it is".
8. She ended by returning to the enormous timescales depicted but added how small human history was in comparison.
9. In the video Melanie again saw a depiction of human evolution, a trend from simple to more complex life, culminating in humans. Her interpretation was that the artist was contradicting a creationist explanation of human origins and that it demonstrated how all life was connected.
10. The video reminded Melanie of Intelligent Design. She saw the artist in the video as making sketches, drawings of life that he improved upon until an end product was created in the form of a human. She put this perception down to her religious upbringing. She said she wanted to hold onto the idea that evolution was the how not the why.
11. Throughout the imagery in the video Melanie could see the human in the face. It was, she thought, there from the beginning.

12. In the ape photographs Melanie saw human emotion. She felt great empathy for them as she perceived sadness and suffering in the images which she saw as heightened by the focus in the images on their faces, their eyes in particular.
13. Overall, the message Melanie perceived in all the visual stimuli I had shown her was interconnectedness. She explained this was her understanding of existence, that all life and events are intimately interconnected. So that even small incidents can have a profoundly wide effect as a result; everything we do can impact on others. She again referred to fiction to explain her ideas.
14. This philosophy she felt should mean that people should take responsibility for the actions and make choices for the good of all. She saw change as a positive force that had the potential to make things better.
15. Although brought up as a Christian, Melanie described herself as agnostic, which she said reflected the fact she wanted "to believe that there is something out there, that there is something more".
16. She ended by saying she believed that other forms of life existed elsewhere in the universe and thought it would be sad and lonely for human beings if that were not the case.

Gestalt

Although not apparently concerned about the implications of scientific explanations for life on Earth and specifically evolution, Melanie does exhibit some ambivalence toward these explanations. She does not disagree with the science, and does not have creationist beliefs, but she wants there to be more, more meaning to what she understands. She sublimates existential concerns in various ways, though her interest in fiction, her desire to believe we are not alone in the universe, the evidence of a plan which she sees in the reworked sketches of life. However, most significantly I think is what she sees as the connections between all of life and how small events can engender significant and far-reaching change, rather like evolution by natural selection in fact, but in this case we have far more control. We can choose what action to take.

Susan

1. Susan described enjoying primary school although towards the end of school her periods started which she did not feel prepared for.
2. From then, the transition into secondary school began with anxiety but ultimately the experience was one of belonging. She had been worried about not being accepted to join her chosen school. It was a "good school" she would get a "good education" and she would be going with other family members, but she did "get into" that school, was popular with her fellow pupils and achieved academically.
3. She described her home life as "peaceful"; her family was close knit and supportive. Education was valued and promoted. However, this was undercut by feelings of self-doubt, her own and possibly those of her mother and aunts. A good education was the answer to this; they believed education led to success.
4. She enjoyed science at school, physics in particular. Biology she could do and relate to, it was about the human body, but she enjoyed physics more. She did not enjoy mathematics; she was not confident, which in part she put down to the teacher who was not able to control her class.
5. Susan did not remember learning about evolution at secondary school, at least not in biology, but she did remember learning about human origins, our relationship to apes. The well-known image of an ape changing in stages into a man was her primary memory. She described "battling" with that idea, not because it contradicted her worldview, but because she saw so many possibilities, she just was not sure what she thought was the correct one. She described herself as looking like a monkey as a baby, but this association was not offensive to her, as she said "I think monkeys are nice animals".
6. On looking at the timeline Susan at first started to look for human evolution, she was looking for our transition from ape to human, which was not clearly depicted. This puzzled her as did our late arrival; she wondered why we had not evolved earlier. However, she liked the drawing, it was a positive thing she wanted to show her young son. She wanted to learn more and share it with him.
7. The video got her thinking about human origins again, but this time from fish. This she saw as evidence of our earlier origins. She was looking for answers about where we

come from; she felt there must be an explanation but did not seem content with the explanations provided by her church as a child.

8. Susan was suspicious of the motivations of organised religion, she felt there was a motivation to control behind their message and was doubtful of religious explanations of human origins.
9. She considered how evolution was about survival; we had to adapt to a changing world, but humans being a success story, we did survive.
10. Susan saw our similarity to other animals in the video; she said it made her question, made her think. She liked the way the artist depicted the connection to other living things and the change, the transitions.
11. Of the ape photographs she was initially reminded of *Planet of the Apes*. She saw them as "kinda like humans" and was struck by their treatment as portraiture, their direct gaze, but she was not outwardly discomfited, more curious. She seemed confused by the implications of our common origin, they are apes, not human but the images made her think of them as human; this was puzzling, but she was happy to accept our common ancestry.
12. She repeated her suspicion of the church she had been brought up in; she questioned its authority, its explanations, but also the older people she associated it with who she felt were judgmental.

Gestalt

Susan's account is in part one of contradiction like the words 'peaceful' and 'battle' which she frequently used. She enjoyed school but she also experienced anxiety in the transitions of growing up. She seems content, settled, but she is questioning, searching for answers and suspicious of some explanations. She feels security in her family, in the guidance of matriarchal figures, but is suspicious of other authority, her church. Seeing the connection to other creatures in the timeline, video and portraits seems to help manage her anxiety regarding transitions, change and uncertainty. Like family, connections to other animals is reassuring.

Dhruv

1. Dhruv described going to good schools; his parents had sent him to independent schools with good reputations.
2. At primary school he had struggled with reading and did not enjoy it. He had been given a reading diary at school and remembered being the only child to be given this. However, he was very good at mathematics and so did not feel like he was failing.
3. He thought he must have been "naughty" as he was "told off a lot", but did not remember being defiant just not very engaged, talking too much and "flaky" with homework.
4. During his A-levels he remembered getting frustrated because the pace of teaching was, he thought, too slow. He remained good at mathematics at secondary school but continued to struggle with English saying "I never knew how to be good at it".
5. He excelled later in school in science when he began studying for his GCSEs. He remembered becoming more focused then, possibly he thought either to please his parents who were working hard to pay his school fees or because he began to see what was at stake. He looked into study techniques and applied himself to learning.
6. He could not remember learning about evolution at school. His memory of science lessons was mostly of physics and some practical lessons, but he felt confident he would be able to understand the science now if he read up on it.
7. His parents valued science education, perceiving it would lead to good employment opportunities, but his father's own university education as an engineer was disrupted due to political unrest in his home country. Dhruv was British Asian and his father was educated abroad. His mother had wanted to be a doctor but became a medical secretary.
8. On looking at the timeline he was at first worried about giving "the right answer" but then described the changes he saw and was struck by the spiral nature of the timeline, as he wondered "how is that related to evolution? Because I see evolution as a linear thing because I imagine it as it happens over time".
9. He was surprised by the relative positions of dinosaurs and humans on the timeline; he had imagined the dinosaurs would have appeared much earlier than they were shown

and was surprised at the relatively late evolution of humans. He described how it was difficult to have an appreciation of the numbers, of the timescales involved.

10. His feelings about the timeline were difficult and ambivalent. He saw in it human insignificance and time as “this big scary thing”. It also felt futuristic, like a prediction of something that was going to happen, which prompted him to contemplate the fate of humanity. It made him consider existence and he described his mind as going “blank” in the face of unknown change. However, he also felt it was futuristic in a way it might be depicted in a science fiction film which was a format through which he enjoyed considering future possibilities.
11. In the video he saw the human evolving from “a very basic creature”, the fish. It surprised him that we could have evolved from a creature alive today, and also one we eat. He had felt that the face had become more human and therefore more intelligent to him as it changed, he described “like it’s got a soul”.
12. It had reminded him of shape-shifting creatures in science fiction and fantasy films. He had seen aggression and intent in the “ape-like face” towards the end. In totality it was a “little bit scary” and “confusing” to Dhruv. In this video he felt like he was being confronted by a reality where we had “changed from those things” and he saw evolution being depicted as a “powerful force”.
13. Dhruv sees aggression in the apes at first; he described a calculating intelligence but without human values. He is surprised at their diversity and on looking at them further while we talk about them, he felt they were more human and he felt empathy for them.
14. The images remind him of *Planet of the Apes*. He remembers not knowing which side he was on when watching it, human or ape. He also noted that the film categorised the different apes but he saw “continuous evolution”.
15. Dhruv had been raised as a Jain, but was not observant. He was attracted to the philosophy of Jainism and its values, non-violence, striving for perfection. He said it was not asking you to believe anything but allowed the possibility of breaking out of a cycle to enlightenment.

Gestalt

It is a worrying future that Dhruv see in the three visual prompts. He is troubled by existential concerns over human insignificance and powerlessness. His Gestalt is possibly summed up in his last association on the pathway. The timeline and video represent the endless cycling and struggle of life, birth and death, suffering and violence. They present a restless image of endless, unresolved change, rather like the cycle of reincarnation an individual breaks free from when they achieve enlightenment, according to Jainian philosophy. Dhruv wants to understand and make sense of the world through science and mathematics but sometimes this does not produce the answers he is looking for and he is confronted by the aggression and power of nature and the relentlessness of time.

Zara

1. Zara began by describing her interest in biology and wanting to understand "how all this came about".
2. She experienced conflicting ideas about life and origins when at secondary school. She was brought up to have creationist Christian beliefs and remembered the confusion she felt when she learnt about evolution in biology.
3. Now she was training to be a science teacher she was confronted with those feelings again as they had been "tucked away for a very long time". She had felt that science was taking away from her something that she believed in that was important, which was her "understanding of how the world came about".
4. From the timeline Zara described what she saw, with some surprise at the timescales involved. She described finding humans "right at the end", but then commented that it didn't make sense to her.
5. The evolution timeline still made her sad as it contradicted what she had learned from the Bible. She again describes the confusion and sadness she had felt as a child confronted by the conflicting explanations given to her by trusted adults, but she was better able to rationalise this experience as an adult.
6. Zara felt a great weight of responsibility as a beginning teacher. She feared that she was becoming the person who confused her, that she would cause a child to have the same troubling experience she had.

7. Zara was reminded of her experience as an undergraduate biologist when she had felt her lecturers had been very dismissive of her beliefs, which had also at that time brought back those uncomfortable childhood memories.
8. She now felt that those experiences helped her find what she believes in, but she would be reluctant to share her beliefs with the children that she taught, because she was worried about creating confusion and concern if their beliefs were different from hers.
9. Zara questioned why humans have not evolved further, why apes are still in existence; "how did it all happen?".
10. In the video Zara perceived the artist as playing with explanations of our origins and thought that it would be a very plausible explanation to children which could in turn confuse those who have been given other explanations of human origins.
11. She remembered a seemingly parallel experience to her childhood encounter when observing in a primary school. During a Religious Education lesson she had talked to a child who was confused by her teacher's explanation of a Christian God as her mother had told her that God did not exist.
12. In the ape photographs Zara saw a resemblance to humans which she explained through the lens of her faith. The connection she saw also reminded her of the scientific explanation and our common ancestry.
13. They also remind of occasions when she had been the victim of racist insults.
14. But she saw a positive connection too, thinking about how she had observed a mother ape protect her baby and she felt we have a responsibility to protect them too.
15. She had also been teaching about space in physics and had felt that her students had many existential questions about the origins of life and the universe.

Gestalt

Zara remains disturbed by a childhood discovery that there is another explanation for human origins than the one she had been given. This experience has left its mark because the original explanation was not only a cherished idea, but also because both sources, although contradictory, were trusted adult authority figures – the parent and another in a similar role, i.e. a teacher. She could not reconcile the two and so suffered not just cognitive but also emotional conflict as a result. Now as a student teacher she identifies with her

childhood self again and fears that she will similarly confuse and disturb the children she is responsible for. She continues to struggle to reconcile these opposing positions; she continues in her search for answers to big questions.

Third level of analysis in Cycle 5: Thematic Content Analysis

Table 4.1 displays a summary of the Thematic Content Analysis of the same eight core interviews using the six existential lenses as themes to examine the data. Exemplar quotations are shown in the table with some notes on the analysis. Codes derived from the interview text were used to label sections of the text and the theme or lens that they represented highlighted, using the colour coding explained in Chapter 3 (Box 3.2). For example, responses that denoted an indication of human specialness were assigned the lens of death. Evidence of meaning making during the interview, in response to the ideas discussed, was generally assigned the lens of meaning, whilst established forms of meaning or belief that the interviewee brought to the interview were assigned the theme of responsibility; however the distinction is not always clear. There was a degree of overlap between all of these lenses, as they are not discrete but connected and at times multiple lenses were assigned to a meaning frame. Appendix 10 gives examples of coding of interview text.

A similar table of findings for the remaining nine interviews is to be found in Appendix 11 (for reasons of word count restriction). However, all the interviews are discussed in Chapter 5. A conceptual framework summarising the relationship between the six existential lenses is provided in Chapter 5 as Figure 5.1.

Directly below are summaries of the TCA for each interview, followed by Table 4.1. In the table I have indicated only which existential concept/concern(s) are most relevant for the part of the interview discussed.

Paul

Paul's interview is dominated by identity claims, 45 out of 74 meaning units being concerned with identity. This identity is that of an intelligent, academic young man, a scholar, an independent thinker, a solver of problems.

The next most common theme was freedom or responsibility, accounting for about a third of the meaning units, and then death at 15 meaning units. The other themes all accounted for less than 10 meaning units each. On viewing the timeline, the theme of freedom becomes evident as he tries to understand the elliptical nature of the timeline, as it does not fit with his mental image of linear evolutionary time. Freedom is also predominant in the meaning units that describe how he made decisions in his life that position him as an atheist, something he saw as a choice between religion and science. In this way it intersects with identity. The theme of death is mostly associated with meaning units that position humans in relation to other beings like hobbits and apes, through allusions to human specialness. In response to the apes he said "*my problem is the humanisation of them*". He saw the portraits as a deliberate attempt to anthropomorphise animals.

Patrick

Freedom dominates Patrick's meaning units, followed by the theme of meaning. This freedom is expressed as an active negotiation in the interview of the nature of existence as he sees it; he takes full responsibility for this and rejects the idea of relying on external agents to derive meaning from that existence; he owns his own world. On examining the timeline, he asserts this position, criticising it for implying there is a plan to evolution, with humans being the end point.

This insistence on making sense of his own world in his own terms breaks down a little when he looks at the video. In this case, at first he resists interpreting it, but does then reveal that he sees vulnerability in the man, which I interpreted under the theme of isolation; the human appears from the ape, naked and to Patrick looking vulnerable.

Jane

Meaning dominates Jane's account. In the timeline she sees growth, at first this being positive, but then going out of control. She is making sense of what she sees as we talk about it. Her meaning units for the timeline are specifically dominated by the theme of death. Early on in time she sees "*not much life*"; she comments "*I didn't live, I weren't alive here*", then a loss expressed though change: "*it is such a new change from nothing to such a mass of things going on now*". In the video she begins to question "*is it possible we evolved from a fish?*" and "*who was the first person?*" Death and meaning are also the themes of the meaning units at this point. New meanings and thoughts on a world without people, non-existence.

Although I sensed a feeling of responsibility for others in her responses, Jane's own sense of how she sees the world is not as clear as it is for some of the other interviewees. She is seeking meaning.

Rosie[4]

Rosie's interview also begins with the theme of identity, a person seeking knowledge, embracing all that is new, open to new ideas. Her identity is very positively expressed. It is in contrast with how she responds to the timeline and video. These are dominated by death and meaning themes. She notices parts of time that are "*empty*", but also is surprised by how far down the timeline humans appear. She comments "*It's quite a bit scary, there's a lot at stake, because the dinosaurs they have gone now*."

Time also features as a theme of the meaning units expressed through change and looking to the future: "*which direction is the world going to go now?"*

[4] I experienced a problem with the recording of Rosie's interview and only half of the conversation was successfully recorded; hence, I could not carry out a complete TCA. However, I did make extensive notes summarising the interview immediately afterward and was able to use these in the process of Gestalt analysis.

Melanie

Melanie had a lot to say, but she has fewer meaning units than all the other interviews. The themes that stand out are responsibility and meaning, accounting for over 75% of the meaning units between them. She is highly consistent in the themes she expresses. She has a well-formed personal philosophy, that of connection and the interdependence of lives, and human specialness, but she is still looking for meaning. As she says "*I like the idea that evolution is the how and not the why*". She describes herself as attracted to the idea of Intelligent Design, wanting to believe "*there is something more, something greater*".

At the end of the interview, the last meaning unit expresses isolation as she discusses her belief that life exists elsewhere in the universe: "*How sad and lonely does that make is if we are the only things there is*".

Susan

Identity is a theme often expressed in Susan's interview. A number of the meaning units relate to her family; she is part of a close-knit large family of women (male members are not mentioned). She also expressed the theme of meaning the most often, accounting for over half the meaning units, but also responsibility, isolation and death. She was seeking answers in response to the timeline and video, as she said battling with the "*many possibilities … the different perspectives that they say made the human*". She is looking for meaning externally: "*I know that there is not always an explanation but for something as important as to how we came there has to be an explanation.*" However, she is suspicious of religious explanations.

Under the theme of death, she considers human survival and is perplexed and unsettled by the idea that there was a time humanity did not exist.

Dhruv

Dhruv also positioned himself through identity claims at the start of the interview. A mathematically gifted boy, who struggled with reading, but was good at exams.

However, the predominant theme was death, accounting for about 50% of the meaning units, particularly in relation to the ape portraits, moving between expressions of human specialness to human insignificance and powerlessness, but also the instability of human identity, the possibility of our transformation into other forms. He saw the ape figure in the video and those in the photographs as threatening, with malevolent intent.

Time was also a theme of eight of his meaning units (out of a total of 38). Although not a large number it is a larger proportion than in other interviews. The theme was associated with ideas about the uncertainty of the future, science fiction and insignificance of the scale of human time compared to incomprehensible vastness of time on a universal scale.

Meaning was only strongly expressed when he described his upbringing as a Jain and how, although non-observant, he still believed in many of the values of Jainian philosophy.

Zara

The themes of meaning, responsibility and death are all expressed equally in Zara's interview, all three accounting for over half of the meaning units. Death was mostly expressed through loss, that being through a significant childhood incident when her faith and trust in adults was challenged. However, the anxiety she felt as a child is now projected onto the children she will teach. She fears for them. It can be summed up by her comment "*that is scary because the person that confused me once, almost, I am now becoming*". In this phrase and the meaning units it exemplifies she is expressing responsibility for her own worldview, a search still for answers, but also seeing herself as the possible destroyer of a child's world.

Death is also expressed as a theme of the meaning units concerned with our relationship with apes and meaning, as she questions "*why are some apes still apes?*"; "*why haven't humans evolved yet?*".

Thematic Analysis: core interviews

Table 4.1: Summarising the existential responses of the core interviewees in response to either the timeline, video animation or ape portraits with indicative quotes

PAUL

Existential concept	**Existential concern**	**Stimulus**	**Quotation**	**Notes**
Time	Responsibility	Timeline	I was thinking why is it elliptical, why is it a geometrical form here, because in my mind time is linear, but this is an ellipsis, so I was really thinking why is it elliptical if time is like that?	Groundlessness. Possibly searching for meaning also as it is questioning.
Identity	Responsibility	Video	There was a moment it reminded me of Gollum, Gollum in the Lord of the Rings. *Yes, but that is quite negative. No?* I am not sure, I like Gollum … Yes, there are 2 persons in 1, so there is Smeagol and Gollum, and there is always an internal fight between them, well not always but at some points it is explicit, like when Frodo and Sam they are with Gollum, but	Literary criticism of The Lord of The Rings has described Gollum as representing a receptacle for our repressions, this being as an archetype, the Shadow (Honegger, 2011). The concept of the collective unconscious with the inclusion of

			Frodo he sympathised with Smeagol and helped him. If you read the books Smeagol is and Frodo sort of (indistinct) Smeagol and Smeagol begins to be good to bring them food, rabbits, fishes, so they can eat proper food. He even refuses Gollum, that is the evil side of him, then when he feels betrayed by Frodo because he is captured then Gollum comes back to save him again, he becomes evil again. But then he is in a struggle again within himself very, very explicitly.	a notion of universal archetypes was developed by psychoanalyst Carl Jung (2014). Jung described the Shadow as the "negative side of the personality" (Jung in Campbell, 1976, p.147).
Identity	Death	Apes	if I take seriously this theory of language, I am trying to deal with it doesn't make a lot of sense to say that they are really suffering, because they are not in language so we cannot really understand what they are feeling or experiencing, because they are in a different realm sort of thing. So on the one hand I really like that photographer has done this, because it's, it makes a lot of people to think about what we are doing to animals that I think is horrible in a lot of senses. … My problem is the humanisation of them.	Human specialness. Intellectualisation.

PATRICK

Existential concept	**Existential concern**	**Stimulus**	**Quotation**	**Notes**
Time	1. Meaning/ Death 2. Responsibility / Meaning	Timeline	1. Like we are really full now but now but then we were really empty. That's what I get, that's what it looks like to me, oh we are dead full now, before we were really empty. 2. I think evolution can't be taught as the, as we were the plan, we were the end result. So, you had to stumble through these, you had to be a fish, you got to be a human. You know like this is what we were aiming for, this is the aim and the aim is to get smarter, but actually it just happened.	The depiction of human evolution on the timeline did not suggest we are insignificant, more that we are being described as the culmination of evolution: "we are the plan". This idea he rejected. He also rejected what he took to be a description of life that moves from "small" to "big", "simple" to "complex".
Identity	Isolation	Video	Like at the end, towards the end when the face starts to appear and stuff, the more human face, the guy looked very uncomfortable. I mean I would too if I was naked and on film. It looked very dark and I suppose it wasn't a happy video,	Projection – vulnerability. The uncanny, being not at home. Transitions, transience, change.

			it wasn't nice. It felt like it was supposed to make me uncomfortable.	
Identity	Death	Apes	*What first of all do you think the photographer is trying to convey through these images?* OK so, the thing he is trying to play on is the fact that humans always, always humanise everything they look at. I could tell you this pen's name is George and snap it and you would feel a bit sad. You wouldn't want to but you would. So, this is what he is doing, so like the idea is look how human they look and look how sad some of them look and this one looks a little bit cheeky and that's the idea, he is playing on that.	Manipulation, ambivalence. Humanisation of apes – human specialness. Uncanny valley effect?

JANE

Existential concept	**Existential concern**	**Stimulus**	**Quotation**	**Notes**
Time	Death/ Meaning	Timeline	So, there are positive and negative things there. You know if we weren't around here, but we are here. It is such a huge change from nothing to such a mass of things going on now.	Ambivalence. Change.
Time	Death/ Meaning	Video	Yes, again it is positive and negative. As we see with the spiral there is growth and there is overgrowth. There is a garden looking nice and there is a garden looking like it needs to be tended to. And it is like this road here is crazy, it is absolutely nuts sometimes. *Yes, it is a busy road.* Yeah there is growth and there is over growth. Like if it is we have evolved from fish are we going to carry on evolving? Will us humans evolve into something else? That's worrying. *Why is that worrying?*	Fear of the future, unseen threats, danger, endings, death of the human. Change, uncertainty. Projection – fear for the future of her children represented as fear of future of the Earth and humankind. Compression of time – explicit temporality (Fuchs, 2006).

			Not knowing, not knowing what could be there in 20 years. What our children could be faced with.	
Identity	Responsibility	Apes	They are animals, we are humans, how come I am looking at this picture like I am looking at that woman? She looks cold, like maybe she needs to go home, cup of tea, feet up, go to bed. This, I am looking at him in pretty much exactly the same way. It looks like he needs a cup of tea and a little sit down, you know what I mean, I think I am making sense in my own head.	Empathy. Identification with animals. Projection, personification, anthropomorphism.

ROSIE

Existential concept	**Existential concern**	**Stimulus**	**Quotation**	**Notes**
Time	1. Death/ Meaning 2. Death	Timeline	1. It is quite surprising how, how just, how late we actually got to play in the whole evolution game. We are just right at the end, they all had fun before us. It's a bit unfair isn't it?	1. Fear of the future, unseen threats, danger, endings, death of the human.

	3. Death		2. It's quite a bit scary, there's a lot at stake, because the dinosaurs they have gone now. 3. It's interesting; which direction is the world going to go now? Because we have tons of water. Are we going to lose all the water and have just land? That would be interesting, because we have changed everything already, it looks like water, ice age and everything and land and we have built skyscrapers, a pretty massive difference, just because it is humans.	2. Death of the dinosaurs – death equivalent. 3. Change, uncertainty.

SUSAN

Existential concept	**Existential concern**	**Stimulus**	**Quotation**	**Notes**
Time	Death	Timeline	Well, you just do wonder why we are only came here? Why we didn't come any time before? That probably is what I wonder. From here life emerges onto land so why couldn't we have evolved from then? Even	Susan was not disturbed by our relationship to apes nor, as she goes on to express, any other animal. We looked at the timeline and she seemed puzzled *"but I don't see the monkey"*.

			though obviously there are dinosaurs around which would have been quite dangerous but there's still mammoths then. There were still dangerous animals around then, so yeah that's probably the only thing that I would wonder why it took us so long.	Her thinking was still not wholly clear to me at first.
Time	Death	Video	It is interesting that we started off as fish in comparison to starting off as a monkey. Like I said, I'm very open-minded so I think that that is probably more possibility than us starting as monkeys because then that could explain that we have been around forever basically. I just don't know why we would have just come one day.	Nothingness – it was at this point I began to understand what was troubling her about the timeline. It was the idea that there was a time when humans did not yet exist. However, this was resolved for her, for if we have origins as fish then we have been on Earth longer then the timeline gave her cause to think, but in another form. We are the fish in the video to Susan at this moment. As was the case with Patrick, she is not differentiating between herself and the animal she was looking at.

Identity	1. Meaning 2. Meaning	Apes	1. In the sense of thinking of them like what always gets me is that if we evolved from them then how are they, what made them stop at apes, rather than becoming human. That's the sort of thing that I question. So you do sort of think of them as human because if you think of them in the sense that you evolved from them but at the same time, they are apes, they are not humans. 2. I don't see a problem with the idea that we might share an ancestor, I don't have a problem with that. I think some people as well might think of maybe when people say black people are monkeys maybe in the derogatory sense so they might be put off it like that, but I don't think like that. It's just small-minded people that say things like that. I kind of don't focus on that so much	1. Ambiguity – personification of apes or anthropomorphism. Possibly uncanny (she does not where she is). 2. Connection to natural world; Identification with animals.

MELANIE

Existential concept	Existential concern	Stimulus	Quotation	Notes
Time	1. Responsibility/ Meaning Death 2. Responsibility	Timeline	1. It is the evolution of human beings. 2. The only thing that jumps out is how long it took from the simplest sea formation for them to go from the sea to actually going onto land, but I knew that took a very long time. I didn't know exactly how long it took but it seems that it took a super long ridiculously long time.	1. Human specialness, part of a plan. 2. Rejection of uncertainty, purpose. Denial of insignificance.
Time	1. Responsibility/ Meaning Death 2. Responsibility/ Meaning	Video	1. It is basically looking at the evolution of man. 2. Evolution because clearly it's the formation of man, and to me it's the evolution of man, but also because part of me likes the idea of Intelligent Design. *How does it remind you of Intelligent Design?* I like to think that any artist that goes through multiple sketching, you start with a rough sketch and then you add on to that sketch and	1. Human specialness, part of a plan. 2. Rejection of uncertainty, purpose. Denial of insignificance. Evasion of reality?

			you make it more life-like, you make it better, you improve, you are constantly doing a new sketch. You start drawing this chair and it's looking very simplistic and then you throw that sketch away and then you try again. I quite like the idea, I guess it's my religious background, wanting to hold onto this great idea that there is something more, something greater.	
Identity	Meaning	Apes	When I look at their eyes and they just seem so sad. They do have some sparks of happiness. You can see some of them sort of smiling but their eyes just seem so sad. They look so sad and I don't think that you can look in their eyes and not feel the sadness that they feel.	Identification with animals. Personification/anthropomorphism. Identification/empathy.

DHRUV

Existential concept	Existential concern	Stimulus	Quotation	Notes
Time	Responsibility/ Death	Timeline	Insignificance because we have only been here such a short time. But then, yeah, insignificance, and time is this big scary thing. *Even though as a physicist you have to deal with time on an even larger scale?* But that's just calculations. This is kind of different because this is thinking about our existence. It just feels different. In a lot of Physics there is some dependency on time for something, so it's usually a lot of calculations, so your emotions never get involved in the calculations. *No, I don't suppose they do.* This seeing that the relative, so initially I thought it was something else, and then I realised, there was a realisation that OK, humans have only been there for that time and I could think about it in a	Existential groundlessness. Insignificance. Change, uncertainty. Projection – fear of the future, unseen threats, danger, endings, death equivalents (a time of non-existence).

			positive way and say, I feel like if there is only this much time then what is going to happen in the future. It makes me think about the future, how we are going to evolve and how human life will change, but it feels a bit scary at the same time. My mind is blank. I don't know what is going to happen. I don't know if that is because there is almost like a cliff there.	
Identity	1. Responsibility/ Meaning Death 2. Responsibility/ Death	Video	1. That we have evolved from very basic creature, but it is a creature that we have here today, and that's weird that we have come from fish and we now eat fish and we see them as primitive and we do what we like to them. Then the, as the thing was evolving, or metamorphosing, it kind of, I think I noticed it started looking at the camera. It was like it was being (indistinct), and I thought its face developed to more human-like, and the more towards a human face it became, I thought it was becoming more intelligent for some	1. Human specialness. The uncanny/uncanny valley effect. The grotesque. 2. Knowing and not knowing at the same time. Everyday repression of the forces of nature, here reality is not evaded, it is made clear.

			reason. I thought there's a, when I started recognising, it was looking at the camera and then it was becoming more human and I thought it was becoming more intelligent but also there is a personality there, there was a being, they have become a being, they have become ... It was becoming more and more human like and therefore it was becoming more intelligent, like a being, like it's got a soul. 2. But it's kind of, there is a bit of, I know evolution has happened and, but it is just seeing it in such a visual way and in such a short time span; it makes you feel like it's a very powerful force and that it is almost a realisation that even though you know it as facts, it's a realisation that it has happened. We have changed from those things.	
Identity	Death	Apes	They look like they are really smart and they look like they are planning something and they look like and you know that they are dangerous the way	Uncanny valley. Wild beasts, the grotesque.

			they can move and actually some apes are supposed to be three times stronger than men. But then at the same time it feels like there is a bit of a stone coldness, so there is intelligence but they don't have human values	Projection – aggression.

ZARA

Existential concept	**Existential concern**	**Stimulus**	**Quotation**	**Notes**
Time and Identity	Death	Video	*So, for that video, what do you think it is saying?* It is saying that, um, we all evolved. Well it is trying to say all organisms evolved really, like fish even plants. Like I don't see plants but it is showing that in a few years, not a few years, many years to come, we all evolved. I am using my scientific knowledge in terms of adaptation and whatever, but yeah.	Zara described her impression of the video; time seemed compressed in her mind. Despite noting the vast time involved when looking at the timeline, she also had then talked of evolution taking "several years". Then again, she described "a few years", then corrected this to "many years" of evolution. Was this an

			… Yeah, so it instantly brought a question to mind, why are some apes still apes? LAUGHS Why haven't they evolved yet to humans?	attempt to contain the idea? She talks about "we" all being evolved. We, as in us, personally, individually; perhaps this can this happen to an individual. Was she perceiving instability in human identity? Certainly, this could be a potential source of existential concern.
Identity	1. Death 2. Isolation	Apes	1. Again, they make me think about the fact that scientists say from theory, that we have some sort of connection with them. And I can see from looking at the close up that if you look really carefully you can see some sort of resemblance. I am not saying we look like monkeys but just the features like our lips and I have seen how even in documentaries the smile, the behaviour, I can see, I can understand, but from looking closely at them, I can… it just relates back to … yeah all I think about is scientists thinking that we have got some sort of connection with them.	1. Disconnection. Alienation from animals. 2. Monique Scott (2007) looked at responses of museum visitors to evolution narratives in exhibitions on human evolution. Her research indicated "many museum visitors interpret human evolution exhibitions as linear, teleological narratives of progress from bestial African

			2. They also remind me of some insults; it's really crazy I don't know why … *Anything is valid.* Yeah PAUSE. *Absolutely anything.* Um yeah. Like people referring to people looking as, like monkeys PAUSE. *OK so I have got to be careful I don't want to put words into your mouth, do you mean racist insults?* Yes. *OK.* That in a way is sort of really sad, but again I just appreciated the animals but I just remembered from being in secondary school some racist comments, then you know, yeah.	prehistory to a civilised, European present" (Scott, 2007, p.1). The implications of this "color-coded progress narrative" (Scott, 2007, p.118) are clear and part of the lived experience of people of colour, like Zara.

Chapter 5: Discussion

The discussion below provides an examination of the data analysis and the meaning derived from this, drawing on issues discussed in earlier chapters. For instance, I return to ideas such as Terror Management Theory (TMT), as well as drawing on existential psychoanalysis and other aspects of psychoanalytical theory. For instance, I discuss Susan's unease at the reality of a time before humans, through an understanding of object relations – the notion of the first loss or absence a person encounters as an infant, before they can rationalise it and the echo of that event expressed through anxiety. I also discuss how our identity as a human may be compromised by encountering the shape-shifting creature and the human-like ape in the visual stimuli, generating psychic defences against anxiety through denial and projection. I discussed the psychoanalytical concept of transference, for example, in my observation of transference in Zara's account - her experiences in the classroom and then how she re-experienced these as a student teacher through her identification with a child.

However, as I stated at the start of this thesis I have presented this research semi-chronologically and so additional literature is drawn on here as I followed up ideas that I encountered during data analysis. The cyclical nature of Intuitive Inquiry, moving repeatedly between theory and the data, supports this. Hence, it is in this chapter that I examine the notion of time in the context of existential concern. I also develop my observations of some participant's projection of their unconscious anxieties onto the visual images through a discussion of the concepts of the uncanny and monstrous. I examine all these psychic responses however through the lens of existential concern and these are often discussed through the lens of time or identity.

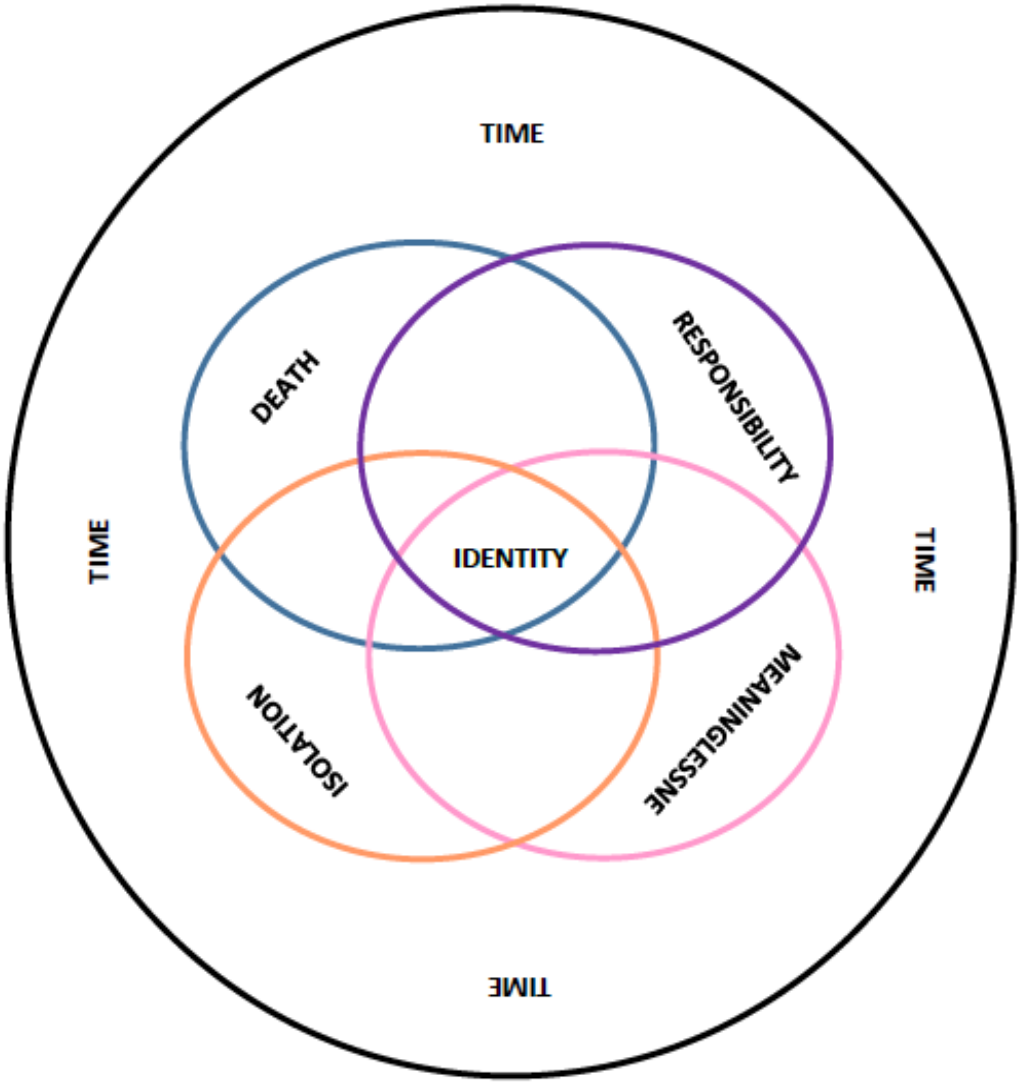
Existential and psychoanalytical theory has offered me a way of examining people's responses to evolution. The research to date has focused on the role of religious faith; considering the issue from an existential perspective has allowed me to ask new questions and I maintain that the responses the interviewees shared with me would not have been revealed through traditional narrative interviewing alone.

The cyclical nature of the approach I took through Intuitive Inquiry allowed me to revisit, refine and broaden the earlier themes or lenses of human significance, change and identity

as animal after data collection, and led to theory building around the impact of existential concerns on people's affective responses to evolutionary concepts. The lenses of time, identity, death, responsibility/freedom, meaninglessness and isolation exposed existential concerns in people's responses. The six lenses (themes) overlap, as the conceptual framework I have derived from reading and from the interview analysis demonstrates (see Figure 5.1). Time was in fact almost universal in its interview occurrence. Responsibility and meaninglessness also seemed to be expressed frequently in the data. However, I have tried to separate the discussion of each to a degree below. In considering and applying the six lenses and evidences of psychic defence, transference and other unconscious dynamics I also drew on the academic literature from psychology and even to some extent literary criticism, for instance, the idea of archetypes, the concept of the uncanny and the monstrous.

In the following discussion I consider how the existential concerns inform an understanding of the interviewees' responses and discuss the evidence of defence.

Figure 5.1: Conceptual framework of the relationship between the six existential lenses



Death and Time

Time was the most expressed existential theme in response to the timeline and the video. Both visual prompts represent time in some way and imply a direction. Time seemed to saturate the interview narratives at times. This was not often apparent during the interviews, but reflecting back on the experiences and reading and listening to transcripts it was palpable. It was a strange experience of time in some cases. In Jane's and Melanie's accounts, in particular, time seemed to oscillate, condensing and stretching, reversing and repeating in their accounts. In Zara's account time was mostly absent as a theme, which is

strange in itself. Patrick's account had a dream-like quality, one of reverie, a feeling out of time. Ogden (2009) describes the analytic and supervisory relationship as being a form of guided dreaming. Although the interview is neither of these relationships, my experience does reveal an analogous aspect. Bion (1984) also describes how emotional experiences occur at the level of the conscious and unconscious mind simultaneously. He saw dreaming as a feature of being awake as well as occurring during sleep, reverie and free association allowing the emergence of dream thoughts.

Dhruv had considered time in the depiction of evolution in the timeline. He had no notion of anything before the existence of the dinosaurs in his imagination. Then he struggled with the idea of time on an evolutionary scale, taking shelter in numbers.

> Dhruv: That is surprising. That would change what I thought initially. Yes, that is surprising. And I would remember that. I guess if I saw, were told about how many years ago the dinosaurs existed, that is numbers, and then you can compare it to, I don't know, when there was first life on Earth, you could compare the numbers and then go …
>
> Emma: But it's very abstract, isn't it?
>
> Dhruv: You can't have an appreciation of it.
>
> Emma: No.
>
> Dhruv: Because the relative thing tells you a lot.

He went on to consider time in the future:

> Dhruv: It felt futuristic, as if I am looking at something that is going to happen in the future?
>
> Emma: Well, this might seem like a strange question. How does it make you feel? Not just the image itself, but also what we have discussed about it. Do you feel anything? Do you have any emotion?
>
> Dhruv: Insignificance because we have only been here such a short time. But then, yeah, insignificance, and time is this big scary thing.

As he was a physicist, familiar with time as a concept and on a very large scale, I was surprised by his reaction but, as he explained, in physics time is represented by numbers,

calculations: "*your emotions never get involved in the calculations*". Now he confronted the words, the idea not numbers – time relative to human existence. Echoing Irvin Yalom's experience of existential freedom he saw through the rent in the curtain of his reality; a different reality emerged which seemed to leave him on a precipice:

> This seeing that the relative, so initially I thought it was something else, and then I realised, there was a realisation that, OK, humans have only been there for that time and I could think about it in a positive way and say, I feel like if there is only this much time then what is going to happen in the future? It makes me think about the future, how we are going to evolve and how human life will change, but it feels a bit scary at the same time. My mind is blank. I don't know what is going to happen. I don't know if that is because there is almost like a cliff there.

Dhruv continued to think about the implications of what he was seeing and saying and, like many other interviewees, he made a connection with science fiction. Now, the future is made fiction it felt safer, reality and fantasy blended, making his mind "*blank*"; he could expel those thoughts, or split them off, he no longer needed to think about existence.

For Melanie too the timeline evoked memories of science fiction films. Melanie described a film she had seen which presented a narrative where evolutionary time was condensed. It depicted something that needed an unimaginable amount of time, but occurred over a human timescale. This may be a more manageable depiction of time for her. She used fantasy to make time less of a *"big scary thing".*

So, time being finite is associated with the existential concern of death and therefore may trigger anxiety. Certainly, death was often the existential concern associated with time in the interviews. It was also often associated with origins. Jane wanted to know *"who was the first person?"* but then her concern turned to what will happen next:

> … are we going to carry on evolving? Will us humans evolve into something else? That's worrying. Not knowing, not knowing what could be in twenty years. What our children could be faced with.

Twenty years is insignificant in the evolution of the human race. It was as though the timescale involved in the processes of macroevolution, the sheer number of years, is not just incomprehensible, but disturbing, unsettling, not amenable to human thought. We

understand time as experienced personally, a human life span or two. If we are able to abstract the concept of time to a certain extent, it is perhaps still limited to that of recorded history, still a human timescale. Humans were able to record their existence once we could make artefacts and use language, but the time 'before' is a timeless, fathomless absence in our experience.

Zara also expressed a similar concern to Jane regarding the future: what will humans become? Naomi expressed it this way *"When I look at it now it makes me feel what is going to happen in the future now?"*.

Jane, Patrick, Rosie and Susan all focused on the fact that there was a huge period of time in evolutionary history when humans did not exist. Jane described there being *"nothing"*, then *"life"*, *"nothing"*, then *"something".* Patrick noted that the timeline was at first *"empty"* then *"full"*.

Jane was ambivalent at first then saw improvement in the timeline: *"So yes, it is a form of growth I think, evolution you could say is getting better as it goes on".* However, when I asked her how she felt about it, she explained how she felt both positive and negative about it. This exchange followed:

> Jane: Well, the positive side of it is, you can see there's not much life, not much going on at all here and as we go further in things are starting to evolve, from where I have no idea, and then as you can see it is, more life. But then look at this bit. I can see that we are going from some nice quiet areas (laughs). Looks lovely, you know there's not much human activity going on and then it starts to get crazy and visual nuisance. There's lots and lots of stuff happening, it is happening more and more, it increases as we are going further and then it seems like lots of tech, technology you can seem you've got the buildings. I live here now so I know what it is like, I didn't live, I weren't alive here.
>
> Emma: And how do you feel about what it is like?
>
> Jane: I don't know, I don't know if it is positive or negative, but we are kind of with all of our technology kind of taking away this part of what we have got, you know this bit.
>
> Emma: Do you mean the natural world?

Jane: Yes, I feel slightly worried.

Jane's reaction contains some disquiet, but it was tempered by her acknowledgement of a kind of human progress. She was worried; it seemed like she could feel overwhelmed by change, by growth, and regrets, felt a loss, of some Eden-like world in her imagination. Freud considered ambivalence as a state where both love and hate could be felt for the same object (Freud, 1955). Jane is ambivalent toward human progress, toward a changing world. Evolution implies change but of an unpredictable nature. For her, the implications of what the timeline represents is worrying.

On showing her the timeline, Rosie also described the early periods as *"empty"* but like Jane thought of what follows as growth. Her tone changed when she noticed the position of humans in the timeline. I had asked her if she noticed anything that surprised her and she responded:

> It is quite surprising how, how just, how late we actually got to play in the whole evolution game. We are just right at the end, they all had fun before us. It's a bit unfair isn't it … I keep forgetting how much evolution happened before we came along. It always surprises me over and over again how much happened before we got here.

She went on explicitly to voice the anxiety she seemed to be hinting at. *"It's quite a bit scary, there's a lot at stake, because the dinosaurs they have gone now".* Death as an existential concern was explicit; the simple line drawing connected with a frightening idea. Nothing is permanent, humans are vulnerable; one day we may no longer exist. Or more personally, one day 'I' will not exist.

Growth and development were not just seen in the visual prompts, they were quite often discussed in the interviews in response to the timeline and video. Naomi described a baby's development. Rosie thought the video brought to mind an image of a baby growing up, then aging to become an elderly person: a depiction of growth, development and decay. When I asked her how she felt about this, she said it made her feel sad as it showed how little time we had. She made the comparison with what she saw as the short amount of time humans have existed. Within this part of the conversation she also expressed worry regarding how would we continue to evolve in the future. Did the video prompt or reveal this anxiety in

Rosie and Jane? I suggest these responses represent fear of an unknown threat, a split-off anxiety normally compartmentalised and neutralised by the routine of everyday life. The free association of ideas prompted by evolutionary concepts depicted in the visual prompts allows a glimpse at fears not normally considered on a conscious level.

These interviews could suggest that in some cases, we cannot but help seeing the evolution story as about us, even if we also reject this idea. It is our past and our future. Jane, Rosie and Patrick personalised evolution. Rosie saw it as something happening to her; she associated the ideas with personal growth and development, but also with the possibility of death, decay and an uncertain future. Patrick described humans as the fish "*So you had to stumble through these, you had to be a fish, you got to be a human*". Although he rejected what he saw as an anthropocentric depiction, his language personified animals.

For Melanie the timeline was all about us: "*It is the evolution of human beings*". Melanie instantly saw the human in the diagram and for her this was our story, an anthropocentric view. There was a sense of direction and culmination in her account. She invested it with purpose. She drew on an idea of human specialness to evade reality, the implications for life, struggle and death in the march of evolutionary time.

Geological time can be unfathomable, feel unhuman, just too vast to grasp. Evolution challenges us to think about time and our existence. Time also represents a paradox existentially. First, let us consider Freud's thoughts on time; he thought of the unconscious as timeless (Freud, 1915). Timelessness suggests there is no before and no after, no past nor future. This implies unpredictability. Temporality confers some level of predictability, of control, a direction (Parsons, 2009). So, timelessness may represent chaos, like a dream where meaning is obscured. The timeline therefore may represent order and confer some meaning to existence, particularly if you see what as having a direction, a purpose – namely the creation of human beings, as was the case for some of those interviewed.

However, temporality also suggests the finite, death and its attendant anxiety. Historically, there was a time when we thought ourselves at the centre of the universe and that the skies represented an unchanging eternity, but "the discoveries of Copernicus and Galileo brought an end to this way of thinking about nature … we still hunger after evidence of the unchanging and timeless in our otherwise mutable universe" (Hanly, 2009, p.22). Hence, time is problematic in both its absence and its reality. We need to feel grounded in

existence, but we want to avoid the implication that for us individually existence is finite. No wonder the discussions of evolution in the interviews were at times subject to a shifting perception of time, as we moved from contemplation of disordered timelessness to a very mortal temporality.

Thomas Fuchs (2006) describes how when immersed in normal existence, in the busy flow of life, we are part of time but not consciously aware of it; we are absorbed in living. This is implicit temporality. He describes it also as embodied time as we are also not aware of our bodies as we engage in the tasks of life; we, our bodies, are "inside time" (Fuchs, 2006, p.196). However, under certain conditions we become aware of time, we come outside of it, and we become aware of our corporeality. Fuchs describes how this produces gaps between us and the future and the past; we become aware of what we have lost and what might be to come. Time is now explicit. He was considering the perception of time in psychopathology; however, I argue that boundary situations that challenge our reality as described by Irvin Yalom (1980), creating a feeling of groundlessness, also induce an explicit sense of temporality and with it an awareness of our corporeality, and so our vulnerability. The concept of time as depicted in the evolutionary timeline I suggest does for some people render time explicit and emphasises our corporeal nature, subject to the effects of time, with a past that is lost to us and a future that is uncertain. The responses of some of those I interviewed support this.

Death and Identity

Identity was the second existential concept that was associated with the four existential concerns. This was most obvious in the responses to the ape portraits. Paul and Patrick expressed similar issues with these images, being suspicious of the motives of the photographer. For Paul, human identity is highly specific. Paul's position was that humans understand the world through language; since animals have no language, we cannot claim any knowledge of the animal experience.

James Mollison, the photographer of the apes, did want to explore what he saw as "the grey area between humans and animals" (Mollison, 2005, https://www.jamesmollison.com/apes-exhibitions). Paul did not seem to be denying in our

discussion that there is such a grey area, but he did express a problem with seeing the human in animals. Ernest Becker, as I discussed in Chapter 2, proposed that we deny our creatureliness because this highlights our corporeal nature. If we are organic beings it therefore follows that we are vulnerable, mortal. We distance ourselves from our animal selves to deny death (Becker, 2007; Goldenberg et al, 2001).

An indication of defence was in Paul's justification for his stance. He emphasises a position based on an intellectual standpoint, rational, educated thought, which has come from his interest in philosophy and semantics. His emphasis throughout was on the importance of rational thought; this is fundamental to his worldview. Intellectualisation, and similarly rationalisation, is potentially a defence. Intellectualisation is far from uniformly described, defined or accepted in the literature, which makes it even more difficult to apply (Arnold, 2014). However, Arnold describes it as "the translation of emotional material into intellectual terms" (Arnold, 2014, p.630). It was described by Anna Freud in her work with adolescents and is see in the wider literature as "a defense against affective experience or affective modes of activity" (Kestenbaum, 1983, p.673), although the relationship between cognition and affect is disputed and complex. Anna Freud did not see intellectualisation as "A flight from drives" but "a turning toward them in thought" (Freud, A. in Kestenbaum, 1983, p.677).

Patrick's response to the ape portraits showed similarity with Paul's but from a different standpoint; he perceived them as anthropomorphic and was unhappy with this. He felt that the photographer is making the apes appear more human, that he, as viewer, is being manipulated to feel sympathy and then to take action; in his own *words*, "*I imagine under a lot of these pictures was 'please give now'".* Like Paul, I felt Patrick was missing also something; he was seeing how these apes are like us, but was not thinking about how we are like them. Patrick's conversation throughout revealed his wide reading and his deep thinking on political and social issues. I argue that, like Paul, he was retreating into an intellectual stance, not fleeing from the ideas but "turning toward" the things that disturb in thought, as Anna Freud described it (Freud, A. in Kestenbaum, 1983, p.677).

In the video, Dhruv saw instability of identity, drawing on science fiction, creatures that can "*transform into anything*", impermanence, illusion. The inference was – can you believe what you are seeing? Is the creature what you think it is? He found the ape photographs

threatening: "*they are looking right at you and you know that they are powerful beasts, you know that they are dangerous and so I feel defensive".* Others found their gaze disconcerting: Ria remarked *"Their eyes are scary. Because they are really looking straight".* There needs to be more research carried out into our attitudes to animals, but my findings are suggestive and indicate that existential associations with corporeality and death could influence our perspective on our place in nature and our potential relationship to other animals through evolution.

The uncanny

> Years later, my father made a passing reference to the uncanny-valley response – the human aversion to things that look almost but not quite like people. The uncanny-valley response is a hard thing to define, much less to test for. But if true, it explains why the faces of chimps so unsettle some of us.
>
> (Fowler, 2014, p.102)

Dhruv's response also can be thought of in terms of Freud's concept of wild beasts representing the bestial in humans, the untamed and irrational: "Wild beasts are as a rule employed by the dream-work to represent passionate impulses of which the dreamer is afraid" (Freud, 1953, p.410). But I was also reminded of the uncanny valley response, a person's response to human-like features, often discussed in the context of robotics, which abruptly shifts from affinity to revulsion when the features of a robot approach but fail to attain an actual human appearance (MacDorman and Ishiguro, 2006). The uncanny as a concept was written about by Freud and from a phenomenological standpoint by Heidegger. Heidegger describes a sense of the uncanny as being a feeling of not being at home, our world losing its sense of familiarity. He considers we are generally immersed in our everyday mode of existence or what he terms our *fallen* mode, but at times the surface appearance of things that we have constructed falls away and we become aware of death and isolation. Yalom interprets this as how "Experiences where one is alone, and everyday guidelines are suddenly stripped away, have the power to evoke a sense of the uncanny – of not being at home in the world" (Yalom, 1980, p.359).

Some of the responses in these interviews suggest that a confrontation with our animal identity, the animal in human, if not part of our personally constructed reality seems to provoke such a sensation. It may become a boundary experience. The concept of evolution as a possibility with its attendant concepts of extinction and struggle for existence, its potential association with natural disaster, can itself serve to "uproot the values, ethics, and morals that we have come to believe exist independently of ourselves … they inform us that nothing is as we have always thought it to be, that contingency reigns, that everything could be otherwise than it is; that everything we consider fixed, precious, good can suddenly vanish; that there is no solid ground; that we are "not-at-home"". (Yalom, 1980, p.361).

Freud defines the uncanny or *Das Unheimliche* in German as "all that is terrible-to all that arouses dread and creeping horror" (Freud, 1919, p.75). It is something that is contained in things that are frightening generally, but with a special quality. One of these qualities includes something familiar but tainted with uncertainty. The uncanny is "That class of terrifying which leads back to something long known to us" but "would always be that in which one does not know where one is" (Freud, 1919, p.76). In looking at apes and their obvious likeness but difference to us, in seeing a human evolve out of the form of another creature, the sense of the uncanny may be triggered. Freud argues that a fear of the uncanny is connected with primitive or infantile beliefs that have become repressed. The uncanny is something that rationally we should not fear, but sometimes these conquered fears are triggered in our adult selves. Evolution with its connotations of instability of the human species and descent from other creatures can unconsciously provoke a response in a similar way to that of the uncanny. Consider the Gollum-like figure in the video, which disturbed many of the interviewees. It may represent something like a human but not human – that is, uncanny. In the video he represents an ancestor, but he could also represent what we fear we will become; for instance, Jane's fear of what we might evolve into.

Monsters and the grotesque

> Haven't you thought about what there may be *under* the water? A monster? A huge carapace, half embedded in the mud? A dozen pairs of claws slowly furrow the slime. The monster raises itself a little, every now and then.
>
> (Sartre, 2000, p.116)

A similar notion to the uncanny that may help us understand people's responses in the interviews is that of the grotesque. In story and literature this idea is often played out through animal characters, for instance, in animal fables which involve projecting human qualities and situations onto other creatures. They depict "a world, order and life that is eerily reminiscent of our own, but is not our own" (Powell, 2008, p.130). Kafka in his writing used animals to evoke the grotesque to great effect; consider the cockroach protagonist in *Metamorphosis*. An argument discussed in some literary criticism is that he "recognised the ability of the grotesque to elicit the same response as that of the 'other'", something that is the self, but also is not, and which "produces terror and fascination simultaneously" (Powell, 2008, p.130). This is beautifully and most relevantly exemplified by Kafka's story of Red Peter in *A Report to an Academy*. Red Peter is an ape who through teaching is transformed into a human, or at least into something which resembles a human. The book is an autobiographical account by Red Peter of his "long and arduous journey from his days as an ape in the jungle to his present life as a member of society" (Powell, 2008, p.138). What Kafka makes clear is that Red Peter is no longer an ape, but he is also not human. It is a performance; he remains Other under the mask of humanity. "The grotesque, therefore, makes the invisible visible. It is what we see when the mask of the other is removed. The unmasking reveals a haunting and distorted reflection that the self finds both incomprehensible and inexplicable" (Powell, 2008, p.140). So, in the case of the ape portraits, some responses, those expressing denial or fear, indicate that James Mollison, the photographer, may be removing the mask of the Other from the apes. He is making the invisible visible through their similarity to us and us to them. He is showing us the Otherness within ourselves that we perhaps fear. These ideas can help us understand non-acceptance of our animal origins and animal nature and their possible contribution to some of the non-acceptance of evolution.

However, this is not the only response the ape photographs provoked. Many of the interviewees felt empathy towards these animals, they expressed a positive connection with them. Jane, Melanie and Rosie identified with them as though they were human. Susan seemed confused by their identity. Bion describes our ability to see from multiple perspectives, something he described as *binocular vision* (1984). Susan seemed to see both human and animal identities simultaneously in the images. The nature of human and ape identity seemed unstable to Susan:

> what always gets me is that if we evolved from them then how are they, what made them stop at apes, rather than becoming human. That's the sort of thing that I question. So you do sort of think of them as human because if you think of them in the sense that you evolved from them but at the same time they are apes, they are not humans.

Martina was concerned with strange, transitional forms:

> Well the kind of transitions that we don't recognise, that we don't know about, we can't associate with anything because they don't exist now. You see the human, you know that's a human, you see the fish, you know that's a fish but the kind of in between stage. I don't know what that is.

Zara also perceived instability in the human/ape identity as she asked "*why are some apes still apes? Why haven't they evolved yet to humans?*" Similarly, Zara asked "*why haven't humans evolved yet?*" The inference of these questions is who am I? Can I trust my own identity? Am I who I think I am? This has become a question of responsibility. I create myself, I am responsible for my identity. What does this mean if I discover I am animal, not special, just mortal.

Meaning and Responsibility

The interview discussions of the visual prompts and their evolutionary associations stimulated instances of meaning making. Through their talk, interviewees projected their own meaning or constructed new meaning in what they saw. They were free and responsible for their own identity and worldview as Irvin Yalom describes (1980).

Patrick experienced the timeline as a story where the punchline, the whole point of evolution, is the appearance of humans and this he found distasteful. We may feel the brevity of human history in geological time is indicative that our experience is not important on such a scale, that we are not the culmination of evolution but an afterthought. Patrick is not discomfited by this brevity; in fact, he feels humans have an overinflated perception of their own importance. This may connect to both his atheism and his acceptance of evolution. However, despite this, he still instinctively personalised the story; in the narrative he was the fish. He personified evolution, despite rejecting the anthropocentrism he thought the timeline implied.

Paul's experience of the animal metamorphosis video *Origin* provoked the most interesting part of his interview for me. He very much enjoyed it and did not find it odd, dark or uncomfortable, unlike some of my interviewees. He even described it as "*beautiful*". What he saw was that there is a point in the video when an unidentifiable intermediate form appears, a form that does not resemble any obvious animal, extant or extinct. This was noted by a number of interviewees and many found it uncanny or weird. Paul was positively attracted to it. He identified it as Gollum, but he did not perceive Gollum as a negative figure, a monster; as he said "*I like Gollum*".

Paul described Gollum as the evil side of this dual personality, a former hobbit who was corrupted by the ring and became a monster. Although Paul did not perceive Gollum as monstrous, he described him as isolated, weird, but extremely interesting. Gollum is an ambiguous character; he is not totally bad, he is a mixture of good and evil, a more complex, nuanced figure. He also symbolises the Kleinian idea of splitting. The evil, the dangerous, is spilt off in the personality; it is projected outwards through its evil deeds and separated from the Sméagol part of the personality. What is interesting in the context of this interview is that Paul was comfortable with this ambiguity. He also seemed to be comfortable with the tentative nature of scientific and philosophical explanations, which can be refuted, argued, subject to revision. He was attracted to an ambiguous, complex figure. He was not obviously discomfited by the unpredictability of the future. This brought to mind parallels with another of Klein's central concepts, the depressive position. In accepting ambiguity, complexity, Paul is accepting the constraints, needs and problems of the Other. Paul's acceptance of ambiguity may be a reason he is not uncomfortable with evolution as an

explanation, an idea with uncertainty at its heart. However, I would argue conversely that it cannot be assumed that lack of acceptance of evolution denotes a paranoid-schizoid position; the reality of what influences acceptance is far more complex than such an explanation acknowledges.

Melanie, although describing herself as agnostic, created meaning that drew on her Christian upbringing. She described the video as reminding her of Intelligent Design. She described the video artist as sketching, revising, creating. This idea appealed to her because she wanted "*to hold onto this great idea that there is something more, something greater*". She wanted to see evolution as the how not the why, as a process of creation with humans as the end product, using the metaphor of the sketchpad, the variety of life is "*just different sketches*". Existential psychoanalysis describes forms of secular personal meaning as fulfilling a human need to believe that that there is pattern and purpose in life, with goals to fulfil and roles to perform. Evolution is known to attack cosmic meaning systems; this is a potential basis of religious objections to evolution. Cosmic meaning infers a supernatural source, so refers to faith-based meaning systems. However, I suggest that responses such as Melanie's suggest evolution could also attack secular personal meaning. Existential thinking argues that we are not supplied with a meaning system; the universe is indifferent to our needs and as moral creatures we need to create our own meaning, to supply our own values (Yalom, 1980).

Concerns regarding both humanity's origins and endings were often evoked by the timeline and video, challenging existing senses of meaning. Susan remembered "*battling with that concept that we came from an ape*". Ria described the shock she felt as a child at the idea that we evolved from other animals:

> I would never forget the moment when we, when they started showing us human as a monkey and how it changes. I thought it was a dream because I was very little and to know this, the brain won't accept it as a child.

Naomi's response to the timeline was anxiety for the future of humanity:

> If time keeps going. What is going to happen with that coming and what will the world be like? Will there be humans? Are we still evolving? Is evolution still happening, I think still changing?

Confrontation with origins and futures we don't recognise, that are alien or unknown, and fraught with terrible possibilities are disenfranchising. They may leave us feeling groundless, aware of a time of past nothingness that will also be our future fate.

Amy crystallised both a sense of fear of the future and a disgust at our proposed past:

> … it's just saying that we are nothing better than a lizard … so if we have come from that now where can we go, according to you, where can we go from here? Cos if we came that from lizards so where else are we going to go, see? ... I don't understand why we have stopped at human.

Goldenberg et al (2001) suggest that a principal reaction to reminders of our biological and therefore mortal nature is disgust and describe it as "a symbolic means of coping with the problem of death", by distancing ourselves from biological processes and associations.

Irvin Yalom (1980) suggests that the need for personal meaning centres on the issue of transience, a concept implied by evolutionary change. As Rosie remarked, on considering the implications of the timeline, "*It's quite a bit scary, there's a lot at stake, because the dinosaurs they have gone now*". If we vanish how can our lives have meaning? How more desolate is this even than the realisation that all humanity is likely to be doomed to eventual extinction? This is what evolution implies and regardless of timescale we need to create meaning to counter this idea, to neutralise transience. Ernest Becker (1985) argues that death is our enemy and that we must transcend death by deciding what matters, by 'counting' while we are alive. The secular biologists I interviewed also created meaning in what they saw; they saw the interdependence of life. They could be said to be transcending death by understanding life:

> I feel that we really don't know what happened and I think it's a nice way to draw our attention to that. We think we have it all figured out but actually there are so many things we don't know … I think it's quite exciting really. (Sian: timeline)

> By saying the animals are like people, it's saying what is the difference? We are all animals. You can take a selfie of yourself; you can do the same with a gorilla. (Sindy: ape photographs)

Isolation and Death

Susan was happy with having animal origins; what did concern her is the when, the timing. Why did we appear on the timeline when we did? That means there has been a time when humans did not exist; this was disturbing to her, but the video implied our origins were earlier: we 'came from' other animals, fish. To Susan, this meant in some way we did always exist, which in turn was reassuring. This was such an intriguing response; I had anticipated the possibility of hearing discomfort at animal origins, but Susan's anxiety was centred on a previous non-existence which was ameliorated by our connection to other animal ancestors. Looking back, working through the data over and over, psychoanalytical theory, both object relations and from existentialist schools, gave insights into Susan's response. Not existing is a kind of death; it is a reminder of the impermanence of life and the fact that the day will arrive when we as individuals will not exist. Drawing on Klein and Winnicott's ideas, the infant at first is wholly dependent on the primary care giver, usually its mother. The mother, absorbed in the needs of the infant, responds and gives food, for example, the breast. The infant has the experience of conjuring up the fulfilment of his/her needs at will, but there is then a time when gratification is not instant; this is our first experience of loss, of absence. Joan Riviere, an analysand of Melanie Klein and a prominent British psychoanalyst, described this relational understanding of our first loss as "something like a death, a recognition of the non-existence of something, of an overwhelming loss" (Riviere and Klein, 1964, p.9). As we grow up and emerge into adulthood, we retain some link to this early state of dependence and so vulnerability (Phillips, 2007). The normal adult is at times fragile, oscillating between these states of independence and dependence, returning, at times unconsciously, to this first death. There is a connection here between the ideas of non-existence and death and unconscious fear of both.

Melanie saw the video as the story of us, human beings; it is "*the evolution of Man*". She viewed the artist's depiction as one of connectedness: "*we did form from other beings … we are all connected, everything is connected*". Melanie also saw connection in the ape photographs; she reacted to the images as though they were human; she felt sadness, empathy for their perceived plight, describing them as "*lost children*". She wanted to acknowledge a possible shared experience. Her description of them felt like a narrative, a highly anthropomorphic account of the thoughts and experiences of these animals, their

story. This connection could be seen to be at odds with her seeing human existence as the central, teleological outcome of evolution in the earlier image and video. However, this anthropocentric inclination does not exclude our connection with other creatures for Melanie, or is it that in seeing the apes as human, the story is in effect 'all about us' again? She was projecting or externalisng humanity in a way that gives meaning; they have feelings like us, they have a story, they can be saved. The omnipotence of humans could be seen as defensive; if it is 'all about us' there is meaning, there is purpose; perhaps there is a plan and we are central to this plan. Connection also protects against existential isolation. Melanie has constructed a worldview that helps her make sense of questions of existence by countering our fundamental isolation with the connection of livings things.

Zara: evolution, trauma and racism

I have chosen to consider Zara's interview separately and with a particular focus on personal meaning. Zara was the only fully observant person of faith that I included in my in-depth, Gestalt analysis. My intention was not to look at the role of faith in influencing people's attitudes to evolution, but to look beyond that to existential concerns. However, Zara's account, although coming from a creationist Christian perspective, revealed some important issues for educators about teaching students with a personal faith. Zara has helped me develop how I think about teaching and learning about evolution, the unspoken implications of belief in the science classroom, our responsibility as teachers with and without beliefs of our own; I have learned so much from my encounter with her.

Very quickly in the interview she revealed that she was feeling conflicted about evolution, but that this state was not new. She remembered learning about evolution at school and the issues she had with having to learn and understand something she did not accept. She remembered feeling confused at school and that as a science teacher herself she still found it a difficult issue. Her first instinct was not to allow her emotions to influence her as a teacher, but it became quite obvious in the context of this interview that her feelings about evolution were deep and that she was trying to find some form of reconciliation.

She went on to describe her experience at school and its ongoing impact:

> I felt confused and I also felt a bit sad I think, because after I had learnt about evolution at school, because I had built my own hopes up about what happened and I felt like it was being, it was almost being taken apart.

She was expressing a sense of hopelessness, loss of purpose, meaning and identity. She felt without foundation. She was questioning what is the truth? What is a real? Many Christians accept the creation story as a parable and are able to synthesise their faith and their understanding of the natural world into a coherent worldview. However, Zara was still struggling; so profound was her experience as a child that she still spoke for that child – "*When I was a child, I felt I was crushed because I was like, this what I believe in, you know*". These feelings as she was expressing them were very much still with her as though the child she had been was still with her. She was concerned as a teacher, but the fear was the child's; she was identifying with the child she had been and the children she will teach. I wondered if this were a form of positional identification, which is identification through fear (Slater, 1961). I believe psychoanalytical theory can suggest further insights. Deborah Britzman, recalling the work of Anna Freud and her interest in education, has discussed transference in the classroom. She suggests Freud is saying that the idea that past experiences and relationships are projected onto our experience of new interactions occurs in teaching: "Unexpectedly, new experiences conjure old ones" (Britzman and Pitt, 1996, p.117). Britzman goes on to explain "The classroom invites transferential relations because, for teachers, it is a familiar place, one that seems to welcome re-enactments of childhood memories" (Britzman and Pitt, 1996, p.117). Zara feared returning to that original classroom of her childhood. She feared becoming the person who had so confused her:

> I am also training to be a science teacher and that is scary because the person that confused me once, almost, I am now becoming … I think a few weeks ago we had to fill in an evolution sheet, whatever it was, and it just brought me back and I thought wow this is such a huge responsibility, how that science teacher made me feel. Not that she was a bad person or whatever, I may potentially make a child feel like that, just by introducing the topic of evolution, you know, and it is quite … I have been actually dreading the whole, dreading it when I have to teach evolution, because I just don't know how to.

What she was experiencing now was a kind of deferred action. Deferred action is a concept developed from Freud's work on trauma. Pitt and Britzman (2003, p.758) describe it as "a psychoanalytical concept that heightens the problem of how emotional significance and new ideas are made from past experiences". In short, it is the idea that the emotional significance of an event may not be fully felt at the time but that its effects are deferred. This may be because a person does not understand all the implications of the event, perhaps because they are too young. As an adult and a becoming teacher Zara may now understand the importance of her own experience and feel ready to examine this experience of evolution in school again.

Another crucial feature of her experience emerged when we turned to the ape portraits; it was evident that she was wrestling with some thoughts that she was unsure she could share. Eventually she said "*They also remind me of insults … like people referring to people looking as, like monkeys*". Zara was a person of colour and she was reluctant to recall this experience out loud and thought "*it's crazy*", but what she said actually makes so much sense. The victim of racist remarks, it is not surprising that these images of apes, so human and yet so Other, reminded her of the feeling of being made to feel Other herself.

Monique Scott's conversations with black museum visitors of a human evolution exhibition in the UK, USA and Kenya reveal a common perception, expressed very clearly by one visitor, "evolution is racist" (Scott, 2007, p.113). Her conversation with a group of three black school children in a London museum shockingly echoes Zara's experience. She had asked them to draw their impressions of what our ancestors looked like; the boys described these as ape men or cave men. One boy drew what his friend pointed out was a black man. Scott questioned this asking whether they thought it was a positive thing that the ape men, the ancestors, might be black. The child replied "No, 'cause they were monkeys. If you come up to white people in school, they call you a monkey" (Scott, 2007, p.123).

Onto any depiction of human evolution, we may project our own perceptions and feelings. Discourse about evolution occurs through a "dizzying kaleidoscope of signification" (Scott, 2007, p.4). It is common in depictions of human evolution to see reference to Africa as being the cradle of (hu)mankind (Scott, 2007). Monique Scott's work lays bare our assumptions and prejudices, how the leaving Africa trope can be interpreted as a "progress narrative" of "bestial African prehistory to a civilised, European present" (Scott, 2007, p.1-2). These ideas

about race and apes can also be seen in the reference in several of the interviews to the *Planet of the Apes* films. Scott describes how even in the ape depictions in these stories colour hierarchies are manifest; the paler-skinned and intelligent chimpanzees in comparison to the dark, aggressive gorillas. It is easy to see how such depictions of evolution or of our relationship to animals such as apes could be problematic to people of colour. There is so much unacknowledged about the intersubjectivity in our classrooms; how can learning begin when the curriculum suggests there is us and Other? Can teachers expose the prejudices that our accounts of science may reveal? Can they help students see that our relationship to nature is of interdependence, that we are not different if we are all nature? That we are not Other if we are all interconnected? We need to know where we came from if we are to understand where we might be going.

What Zara's interview revealed for me was that the complexity of the issue, teaching and learning about evolution, was far greater than I had once appreciated. This should not actually be that surprising given the complexity of human experience, identity and meaning making, but it felt like unknown layers upon layers of meaning were being exposed in a way not considered by myself previously or, I would argue, by the great majority of other studies on the subject. In only looking at the issue of non-acceptance of evolution in terms of faith, we risk limiting ourselves to a very unidimensional understanding.

Limitations of the study

This was a small-scale study of a group of people with an interest in education. Both of these features mean that it is not possible to generalise from my interpretation of this group of 17 conversations. I realise in reading the interview transcripts and listening back to the audio recordings that I was occasionally inadvertently leading in my questions. I was something of a novice and at times my interest and curiosity led me to ask questions that may have signalled those interests too explicitly. I am also aware I possibly shut down conversations that seemed to not be following the lines of thought that I was interested in. I was also always open about my research interests and these characteristics of my interviewing may have also caused some bias in the responses to the stimuli I presented. The stimuli themselves could also by their nature point towards certain ideas. The video artwork in particular could be viewed as deliberately designed to unnerve the viewer.

However, in the really very broad variety of responses I received, I see justification for the approach I took. If there was bias it was not in one direction, as people's reactions were diverse although common themes emerged. I was often taken by surprise, receiving a response that I would not have predicted – for instance, Dhruv's reaction to the ape portraits. Jainian philosophy might suggest that Dhruv would be likely to have a very positive relationship with living things.

Although the video was far from neutral in its depiction of change it still generated diverse responses and the ideas people encountered in it were very relevant to evolution. However, the word count limitations of the EdD precluded me from discussing the power and limitations of the visual prompts in any detail.

If another person had conducted the interviews, using my interview questions and the three visual prompts, would they have received similar responses? I suspect that with this set of interviewees this would have largely been the case, but the interpretation might have differed, depending on the extent to which another person used psychoanalytical or existential theory to interpret the data. In future research I would like to expand the study to a greater number and a more diverse set of people. I would also like to explore the implications of my ideas for teaching and learning about evolution in classrooms. I will touch upon this in the Conclusion (Chapter 6).

Chapter 6: Conclusion

In conclusion of this study I return to my research questions:

1. Do evolutionary concepts provoke affective existential responses in some people?

   The concepts associated with the three visual prompts concerned evolution directly or indirectly. They represented the original lenses (themes) with which I began to examine the role of affect (conscious and unconscious): human significance, change as something to fear and our identity as animal. The responses I encountered were often affective. They were not solely negative, but constituted a spectrum, reflecting the diverse backgrounds and worldviews of the volunteers I interviewed.

2. Does the application of Free Association during interviewing, coupled with the use of visual artefacts depicting relevant concepts allow affective existential responses to evolution to be examined?

   The personal narratives and my dialogue with the volunteers about their perceptions, emotions and feelings during each interview enabled transference in connection with the three visual stimuli, revealing existential concern through both repressed and worked through affect manifested in their responses. The six themes or lenses were effective in analysing the interview responses through an existential lens and revealed much about the participants' thoughts on existence, meaning and significance. Assuming that the interviewees are defended subjects (Hollway and Jefferson, 2012) allowed a consideration of thoughts of an existentially challenging nature that in our everyday experience may be repressed. Free association in interviewing with the support of visual prompts offered a means of examining responses from a less rational perspective, it allowed imaginative engagement with the ideas and fantasy to emerge.

3. Do such responses occur in people who do not hold creationist beliefs?

   Affective responses to the concepts discussed, evidence of a defended position in the face of those concepts and evidence of existential concern were evident in all the interviews to a greater or lesser extent. I was not looking for explanations of

non-acceptance, but for evidence of existential concern expressed as affective responses in people regardless of their position on evolution. This affective response, however, could be a potential cause of non-acceptance, overlaying or even separate from faith, but further study would be necessary to examine this phenomenon in a non-accepting population.

Interviewees who were self-described as agnostic, atheist or secular demonstrated existential concerns regarding mortality and meaning in the face of universal indifference and defence against isolation. Those who were biologists and atheist indicated the least existential concern in response to these particular stimuli. This group may find meaning and connection in the biology we discussed and possibly would be reconciled to associations with mortality. I do not suggest they are immune to existential concerns, but that these are more likely to be provoked by other types of experience.

I described this as a psychosocial study. My interest was in the psychic element of the psychosocial and psychoanalysis can allow us to conceptualise the unconscious. Object relations theory was the principal psychoanalytical idea through which I examined the interview narratives. I saw the interviewees' responses through a relational lens, as people relating unconsciously to objects, employing defences or working through defences in relation to the things we observed and discussed together. In psychoanalysis these objects represent the infant's fragmented world but in these adults I was interested in their relating to objects in nature, for instance other animals, including those that are extinct. Unconscious defences function between people, I have extended this notion to other types of entity, something I am aware is risky, but in the sense that they are related to as monsters or animal cousins I argue we are relating to them as aspects of ourselves, but also as Other.

Looking back at the interview narratives it seemed that evolution conjured up imaginary monsters or monsters that were in plain sight for some interviewed, but not openly acknowledged by me with my Darwinian world view. I saw a textbook diagram revealing a scientific idea; others saw dinosaurs, monsters of so many childhoods. The shapeshifting form took on a monstrous aspect, the creepy figure almost human but not quite. The

portraits conjured images of sci-fi monsters, talking apes. These monsters perhaps signify the monstrous in us, in the world, what we might become, what we are, as "in our own time one can find the monstrous everywhere" (Britzman, p.113, 2006).

The interviews reveal the problems of existence: Melanie who was looking for "*something more, something greater*", Susan's concern about a time when we did not exist, Rosie expressing jealousy and a sadness in imagining a time before and after her own existence, Jane's fears for the future of humanity and ultimately her children, were all prompted by a geological timeline, a video of metamorphosis and portraits of apes.

I began this research journey with a view of teaching and learning about evolution informed by my own experience and the literatures on the impact of faith and issues around problems with conceptual change. Darwin's tangled bank quotation hinted at something else; it truly claimed my imagination. I began to surmise that the idea of the struggle for existence may be generally disquieting, that fundamental existential and identity issues might be at work. Change is understood to be something people often resist. In fact, a whole industry of change management has arisen to help large organisations in the private and public sectors to manage changes such as mergers and restructurings (Tsoukas and Chia, 2002). Evolution is underpinned by the concept of change and arguably we are currently in an era of accelerating change and instability. Kress (2000) argued that we need to equip educators and learners with the tools to adapt and to cope with provisionality and change. So, in biology where evolution emphasises the instability all around us and in science generally where learners need to understand that scientific knowledge is itself inherently provisional, this would seem necessary indeed. If the reality is that school currently mainly offers an "avalanche of certainty", we are missing something (Britzman, 2009, p.2).

During the interview process a slow expansion of new ideas took place in my mind. I began to understand how others could see nature differently, seeing through the "rent in [my] curtain of daily reality" (Yalom, 1980, p.219) to not the beauty of the natural world but the war, famine and death of Darwin's tangled bank. As Adam Phillips says of bucolic sites "we are always relaxing in the killing-fields" (Phillips, 2000, p.37). Evolution makes explicit the struggle for existence, the unremitting transience of life, the provisional nature of living. Even the set-in-stone fossil record demonstrates what has been irrevocably lost. Darwin and

Freud both tell us that to be alive is to suffer. There is no hierarchy of life, no great chain of being; we are not special, we are animal and we will die (Phillips, 2000).

In not acknowledging the brutality in nature and the evolution story, we are defending ourselves against recognising our omnipotence as fantasy. This defence allows us to ignore the existential concerns that the idea of evolution throws in our way. One of those defences is that of seeking shelter in our intellect. This is a characteristic that may be encouraged in science teaching, seeing evolution as just a scientific theory and value neutral. Are we as teachers blinded by our particular way of experiencing or examining the world to the existential implications of so much of what science implies?

Teachers and teaching

As Rosemarie Anderson (2011) described in her account of intuitive inquiry, this problem truly claimed my imagination, not all at once but gradually, as the tip of the iceberg gave way to realisation over the hidden depths of the issue for teachers and learners. Deborah Britzman suggests that the classroom is a site of transference for teachers, a place where unresolved problems play out once more, because it is a familiar place, a site where childhood memories are so often located that teachers are drawn back to their childhoods (Britzman and Pitt, 1996). In taking interviewees back to their school education I was inviting them to remember those childhood experiences of classrooms and learning. In doing so, they are reconstructing them through the experience of the interview and the objects they relate to through the images and video that I used. The representations of evolution I showed them were seen through the filter of memories, those early representations of their world of objects to which they relate. Those existential concerns have their origins in those first anxieties and fantasies and what is striking is how different each person's response can be but at the same time how universal the overarching existential concerns seem to be.

So, the implications of Britzman's claim are that as teachers we are facing those first anxieties and phantasies again in the transference of the classroom. We may be able to rationalise them through the safety and security of a great body of scientific knowledge, but we risk then not seeing our students. To understand this from a psychoanalytical perspective we must return to object relations. Winnicott describes a process of

differentiation that happens in early child development, the differentiation between self (infant subject) and other (mother/parent object). This is when the subject's perception of the object is recognised as external to the self, a being in its own right (Winnicott, 2012). This is a reality, the subjectivity of others, which sometimes is forgotten in the pressure cooker of classrooms, where data and results are the signifier of all that seems to be important. It is understandable if this leads the teacher to feel a need for omnipotence, the source of truth of what is out there, only to be disillusioned by the reality that those students are not creations of the teacher but are separate, subjective beings with their own truths that they want to be acknowledged (Britzman, 2006).

Teaching, learning, emotion and affect

There is significant evidence that emotions affect learning, but the relationship between the two is not a simple one, particularly when you consider the possible unconscious origins of some of these affective experiences. Emotions in learning present a complex situation, and a number of models have been developed to explain how emotion may affect our experience of learning and our cognitive processing (Arghode, Yalvac and Liew, 2013; Sinatra, Broughton and Lombardi, 2014). There are, for instance, considered to be positive and negative emotions in response to learning, but layered on top of this is an idea that the experience of emotions can be activating or deactivating. Negative emotions such as anxiety can spur us on to understand, but negative deactivating emotions, including fear and hopelessness, are thought to reduce motivation and promote surface rather than deep learning. Anxiety may also lead to students rejecting new and therefore possibly threatening information if it contradicts how they have made sense of the world (Sinatra, Broughton and Lombardi, 2014). I argue that this does not need to be purely associated with religious worldviews; any existential understanding that we have constructed from infancy could be threatened by a scientific explanation such as biological evolution. What could this mean for understanding of evolution given what I am proposing, notwithstanding the even more problematic aim of acceptance?

Within science education, some authors have considered the impact of the topic being learnt suggesting the idea of *topic emotions*. These are emotions that are triggered in response to certain domains or topics studied (Broughton, Sinatra and Nussbaum, 2013;

Sinatra, Broughton and Lombardi, 2014). These are most associated with topics linked to a degree of controversy where faith, worldview and ethics may be integral. Evolution is an obvious example, but more research is needed to understand the highly complex landscape of emotions and learning.

Transformative approaches to education with their focus on active, context-based learning, which highlight the personal relevance of scientific ideas to students' lives, have been demonstrated to have a positive impact on student engagement with potentially controversial topics such as evolution (Pugh, 2010). It is not surprising that a movement away from didactic, abstract explanations could support higher levels of student engagement. Furthermore, in focusing on personal relevance and interest, a student's understanding of natural selection through learning about animal adaptations can also deepen an interest in the natural world (Pugh, 2010). However, I argue that if this is not approached in conjunction with an acknowledgement of the existential challenges that some scientific ideas elicit, then we will not fully address problems of superficial student understanding and we will fail to address deep-rooted alternative conceptions of biological phenomena.

What do the ideas I propose mean for teachers and their students? A common-sense approach would be to consider how to support students emotionally during their learning, but this requires teachers to have quite a deep understanding of the possible emotional demands of a classroom situation or topic. This is a difficult task in practice, particularly when set against a backdrop of a large and challenging curriculum to deliver, with the current focus on a body of factual knowledge and assessment rather on the skills of discussion and supportive debate (Gibb, 2017). There has been much valuable work on the importance of the concept of powerful knowledge in science and other disciplines (Young and Muller, 2013; Harland and Wald, 2018), but what must also be appreciated is the dual nature of the idea of power in the human psyche. Power can liberate and illuminate, but it can also imply oppression and something to fear. As teachers we need to reconsider evolution as being a sensitive rather than a controversial topic (Reiss, 2019). We must consider the existential issues hidden in knowledge and allow our students to explore their feelings about these. We need to provide guidance to help students understand what they need not fear, a degree of reality testing perhaps? Evolution as science explains it need not

be seen as a threat to individuals. In addition, shouldn't we also help to empower our students, to equip them to change their world for the positive when they can, and also not be paralysed when they can't?

This highlights the importance of teacher empathy. Empathy is being able to see from the perspective of another. For teachers it has been described as taking the perspective of the student but also being able communicate this to students (Cornelius-White, 2007; Arghode, Yalvac and Liew, 2013). Issues of affect, emotion and empathy have not been much discussed in science education, perhaps because of the high status of objective reasoning in science where emotions are set aside to avoid bias (Arghode, Yalvac and Liew, 2013; Sinatra, Broughton and Lombardi, 2014). Initial teacher education in science and science teacher CPD has often focused on subject knowledge and pedagogy rather than the affective experience of students or a consideration of the emotional impact of the topics students are exposed to (Arghode, Yalvac and Liew, 2013; Montgomery and Fernández-Cárdenas, 2018; Perry et al, 2019). A focus on how science and subjects such as Religious Education, the arts, social science, history and philosophy all provide a means of understanding our world and personal and collective experience might help students navigate between scientific and other explanations. This demands a cross-curricular approach to education which to date has been difficult to implement in practice (Billingsley, 2017). In addition, opportunities for students' imaginative engagement with the existential issues that science exposes, through role play, creative writing, storytelling and art, should be considered.

Teachers also have their own affective experiences in their teaching and learning which need to be acknowledged and supported. Teachers themselves have called for a safe space for discussions with colleagues about the implications of teaching evolution (Griffith and Brem, 2004). The issues of affect and learning become even more acute for those teachers and learners working in an environment hostile to the teaching of biological evolution. Woods and Scharmann (2001) reported on some of the difficulties experienced by such teachers and acknowledge "teachers may present evolutionary theory with a great deal of scientific integrity but do so at the expense of the psychological needs of their students" – and also at the expense of their own? They found an overemphasis on teacher-centred instruction in some US schools, as though teachers are expressing a need to contain possible emotions by avoiding open discussion that they see as problematic.

My encounter with Zara and her account of the shock of the competing explanations she had been given by those she trusted, as well as of the judgement and prejudice she had faced, bring into sharp relief the risks of not thinking about the implications of knowledge. Like Deborah Britzman's difficult knowledge, Alexakos et al (2016) discuss *troublesome knowledge* or *thorny issues* and the observation that teacher education does not fully equip teachers to deal these issues. They propose that we consider how we mindfully can understand our own and each other's closely held beliefs, to "create opportunities to not only share, learn and grow, but also to validate, respect, and show solidarity with those who may have identities, experiences, and perspectives unlike ours" (Alexakos et al, 2016, p.742). Mindfulness means being more aware, "welcoming different perspectives and learning from the "other"" (Alexakos et al, 2016, p.742). In their work, Alexakos and colleagues produced a heuristic device in the form of a set of statements for teachers to consider. In teaching and learning about evolution it is incumbent upon us to consider some of these. For instance:

- I am aware of my own prejudices and privileges, and critically reflect on my own habits, cultural practices, and how I create meaning.
- I try to create an environment that is inclusive, provides space for other voices, is mutually supportive, and is respectful to all.

(Alexakos et al, 2016, p.763)

These authors also discuss authentic practice which is a concept that has come to feel significant through this research journey, both in my attempt to give an authentic voice to the people I interviewed and also as a theme emerging from my data.

Authenticity

Influential object relations psychoanalyst Donald Winnicott described mental health as a spectrum, and discussed how we all struggle at times with being truly autonomous, free from doubts, illusory thoughts and anxieties (Winnicott, 1964; Phillips, 2007). To Winnicott, a healthy life is about 'being real'. What he meant by this was that a healthy emotional life is the result of that person feeling real, being themselves, authentic, but that it is also a state we may take for granted. Winnicott saw that for all of us that this can lead to the denial of

other possible realities, which is risky. This means that we are also living with the potential for being unreal and the attendant anxiety this brings. What happens when people come across ideas that challenge their notion of what is real to them? This does not mean they are delusional. I imagine this is something that quite often happens to all of us and we either integrate new or challenging ideas or we reject them, but if unconsciously our reality is challenged then may we unconsciously feel anxious, unsettled, angry even? This is something not much examined in education and not at all in the teaching and learning of evolution.

Nietzsche also wrote about authenticity and his work has significance for education and how we need to consider the controversy (Cooper, 1983). He argued that science infers that the human is not perfectible, that we are not special in any way, that there is no universal morality. What Nietzsche concludes is that if we do not critically examine the implications of this suggestion, we risk a passive nihilism, an unquestioning acceptance or indifference; we will negate, deny and avoid. From there, what could develop is unthinking consumerism, living in the moment alone, denial of mortality. To counter this, we need to examine how our beliefs have come about, to understand ourselves in order to be authentic (Cooper, 1983). Autonomy is a well-recognised aim of education and within this sits authenticity (Reiss, 2007). However, I suggest authenticity goes beyond merely being true to one's self. Authenticity, or the desire for it, is expressed through the interview narratives I present in this thesis, but with it comes a strong vein of responsibility. Each of us must take responsibility for our own worldview and understand its origins if we are to be authentic. This is required of us as educators if we are to support our students' emerging selves and their route to be responsible, authentic citizens.

We need to understand we are part of the world, of nature, to affirm our own human and therefore also animal nature. I was struck by how easy it is to deny this, when faced with existential threat, when listening to a recent radio broadcast. Claire Fox, writer and then MEP, responded to an audience question about recent flooding in the UK and the impact of human activity on the natural world in Autumn 2019. She replied in a reassuring vein to the concerns expressed by the audience with a response almost certainly meant as positive and hopeful, but to me depressing in its implication: "we have a fine record as humans of getting the better of nature" (BBC Radio 4 *Any Questions*, 15 Nov 2019). Her response reveals much

about how we may see nature, not as reflecting ourselves, but as Other, as the enemy that we must overcome.

Cornelius-White (2007) proposes that science education should learn from a person-centred counselling model that focuses on teacher-student relationships and a learner-centred approach. This argues for the role of the teacher facilitator based on a relationship of trust, acceptance and empathy. Although beyond the scope of this thesis I hope to follow up these ideas in my ongoing work as a science teacher educator. The person-centred approach was based on the work of psychologist Carl Rogers who recognised that this "may hold constructive, tentative, changing, process answers to some of the deepest perplexities that beset man today" (Rogers, 1969, p.105). This seems so highly appropriate a description of the issues invoked by teaching and learning in the context of evolution education and the controversy – a deeply complex and perplexing set of circumstances that teachers and their students have to negotiate.

I suggest we fundamentally need to rethink the aims of science education, to be more ambitious. Science in the classroom at times feels so divorced from life as it is lived by learners and their teachers, so abstract and presenting so many unacknowledged existential questions and conflicts. As Rogers puts it "learning becomes life" (Rogers, 1969, p.115) and so all that learning represents for human existence. We cannot separate our lives as we live them from learning, including learning about science. In fact, when learning about nature in particular we need to appreciate this, as I argue we and nature are inseparable; we are part of nature despite the technological worlds we create for ourselves. Anything we learn about the natural world must and does tell us something about ourselves.

Hope in humble origins

Sartre proposed that destruction can only exist as a result of being; it is our awareness of nothingness that creates anguish for "Nothingness lies coiled in the heart of being – like a worm" (Sartre, 2003, p.45). How can we live with this possibility? From Darwin we can begin to see how nature can provide some of the answers as well as questions. Darwin after all tells us that it is destruction that makes life possible. It creates new possibilities, the

potential for new life. How much better not to see nature as the adversary, but to appreciate our part in nature, our responsibility to sustain it as it does us.

It is interesting that Sartre described nothingness as a worm at our heart. Darwin saw in this small creature the power literally to shape the world through its activities, humility and greatness (Darwin, 1881). Even the smallest and most unassuming organisms are important and we can learn so much from studying them. Through understanding nature, its endless cycles that we too are part of, there is a possibility to help children feel part of something greater that is important and wonderful through an understanding of biological science.

Finally, the existential concern revealed in response to evolutionary theory in people who accept evolution may also point to an unexamined reason as to why it is rejected by a section of our society. This may be an additional source of rejection to one caused by religious faith, or it may be that existential concern could intersect with a person's faith position, unconsciously provoking anxiety and a need to shore up their worldview with beliefs in human specialness and a stable world; surely, this possibility warrants further investigation.

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Appendix 1

Glossary of key psychoanalytical terms

- **Denial** is a selective distortion of reality. It signifies an unconscious refusal to acknowledge the meaning of an event (Moore and Fine, 1990).
- **Splitting** is a concept developed by Melanie Klein (Hinshelwood, 1991; Klein, 2011). Melanie Klein's work has been influential in the construction of my ideas about a person's feelings towards evolution and their reaction to it. She was part of what is known as the Object Relations School in psychoanalysis, the term deriving from her model of early psychic development. Klein specialised in child analysis and it was from her experiences with children that she developed this fundamental psychoanalytical idea. She believed that the infant created object relations; that is, they actively related to the very earliest objects of their experience, this usually being at first parts of the mother's body, then eventually the mother as a whole. She exemplified this with the idea of the good breast / bad breast dichotomy. Imagine a baby feeling hungry; it has no conception of time and is not able to cope with waiting for satisfaction by rationalising that food will appear if it waits. Its response is to polarise its feelings and reaction. It either receives the breast and satisfaction or it does not, even if just temporarily. In the latter case, helplessness, fear, despair and anger may follow. Even if now offered, this breast is bad and rejected; it is now harmful, not to be trusted. So, the breast is either good or bad. As a child matures it comes to understand that the breast is part of a person, its mother, from there they develop an appreciation of the mother as separate, with her own subjectivity and containing both bad and good within herself. This example is symbolic of normal psychical development moving towards a mature and sophisticated understanding of another's subjectivity, a tolerance of uncertainty, ambiguity, ambivalence and the real complexity of life, those shades of grey. This is normal development, which Klein termed the *depressive position*. However, that potential for dichotomy, of perceiving only good or bad, but not the more complex and ambiguous reality, remains in all of us to a greater or lesser degree. This is the concept of splitting and in psychopathology is characterised by what Klein termed the *paranoid-schizoid position*.

- **Projection** is the process by which a person attributes something they find unacceptable about themselves to somebody or something else (Grant and Crawley, 2002; Hinshelwood, 1991).
- **Identification** used generically to refer to mental process by which an individual 'becomes' like another person; integrating another's attitudes, traits and values are integrated into a person's own identity (Moore and Fine, 1990).
- **Negation** is similar to denial but is a particular manifestation of repression or denial whereby negation allows repressed thoughts into the conscious mind but in a negative form (Moore and Fine, 1990).
- **Rationalisation** is a process of using reasonable, rational explanations which conceal unconscious motivations of a different kind (Moore and Fine, 1990).
- **Sublimation** is a defence that allows the impulses or ideas that cannot be expressed directly to be redirected into socially acceptable routes such as the creation or appreciation of cultural artefacts such as art (Frosh, 2012).
- **Transference** is another psychoanalytical concept of importance in psychoanalysis and psychosocial studies and is relevant to this research. Originating from Freud but further developed by object relations proponents such as Klein, it is from a relational view seen as a "repetition of early significant relationships. Feelings, phantasies and behaviours that belong with early relationships are reactivated" but in relation to the therapist in a therapeutic encounter and has been traditionally associated with psychopathology (Grant and Crawley, 2002, p. 8). However, it has been argued that it is not limited to psychopathology or the clinic but is a wider unconscious human response in an interpersonal setting. Hence, it is likely to occur during an in-depth interview process (Grant and Crawley, 2002). I did not specifically analyse the interviews for transference but was aware of its possibilities and in some of the responses its traces are felt, particularly in the discussions on the interview participants' own educational experiences.

Appendix 2

Interview guide and schedule

Interviewee Name:		
Start time of interview:	Start time of interview:	Date:

Opening statement

This is [name of interviewer] on [date of interview].

Thank you once again for agreeing to help with this research. Before we begin, there are just a few things I would like to explain and to check with you.

This interview is being conducted as part of my own research as a Doctoral Student enrolled on the Institute of Education's EdD programme. Evolution is a fundamental topic in school biology, but there is a great deal of research and anecdotal evidence that suggest it is a particularly difficult topic to learn. I am interested people's emotional responses to evolution and hope to investigate how our emotions may affect our perception and understanding of evolution.

I have a series of questions to ask you, some are general and others more specifically address evolution. We may talk about scientific knowledge but this is not a test, there are no right or wrong answers. The full interview has been designed to last no longer than 60 minutes, but I will also make sure there is time at the end to for you to raise any additional thoughts or questions of your own.

In order for us to get the most out of this interview I'd like to **record our full conversation** but can I first just **check that that is OK** with you? The recording, and any transcriptions later made from it, are considered **strictly confidential**. All individuals will be made **fully**

anonymous in any written text. It is also important that you know that your participation in this research is entirely voluntary – **if for any reason you want to stop the interview or withdraw from the research, please just let me know**.

If you have any concerns, questions or queries after today, please do not hesitate to contact me.

Is that clear? Would you like to ask any questions before we begin?

Interview schedule

PART 1

I would just like to start with a bit of background about you particularly about your educational experiences.

Please can you tell me about your experience of school.

Possible questions to use as prompts:

- What do you remember about school science?
- Do you remember learning about evolution? Do you remember how you felt about that?

PART 2

I would like to show you a drawing that depicts evolution (See appendix 1) and have a chat about your response to it. I don't have any specific questions, I am happy to talk about anything that comes up for you.

Possible questions to use as prompts:

- Can you describe it to me? What do you think it shows? What do you think it is saying?
- Does this remind you of anything?
- What do you notice about it?
- What do you think the artist was trying to convey?
- What do you associate it with? What does it make you think about?
- What does it represent to you?
- How does it make you feel? Can you tell me of other times in your life you have felt like this?
- Can you tell me a bit more about that: what was that like for you?

PART 3

I would like to show you a video and again have a chat about your response to it. It is a piece of artwork held in the Wellcome Trust collection.

Possible questions to use as prompts:

- Can you describe it to me? What do you think it shows? What do you think it is saying?
- Does this remind you of anything?
- What do you notice about it?
- What do you think it means?
- What do you associate it with? What does it make you think about?
- What do you think the artist to convey?
- How does it make you feel? Can you tell me of other times in your life you have felt like this?
- Can you tell me a bit more about that: what was that like for you?

PART 4

Finally I want to show you some photographs taken by conservationist James Mollison who works with primates in the Congo, principally Chimpanzees, Gorillas and Orang-utans. The images are of some of the apes he has worked with.

Possible questions to use as prompts:

- What do they make you think about?
- How do they make you feel? Can you tell me of other times in your life you have felt like this? Does the feeling remind you of anything?
- Do you think they have a message? What do you think of that message
- Can you tell me a bit more about that: what was that like for you?

PART 5

Do you have a religious faith? (If yes what is it?)

Possible questions to use as prompts:

Is your faith important to you?

Does it influence how you feel about evolution?

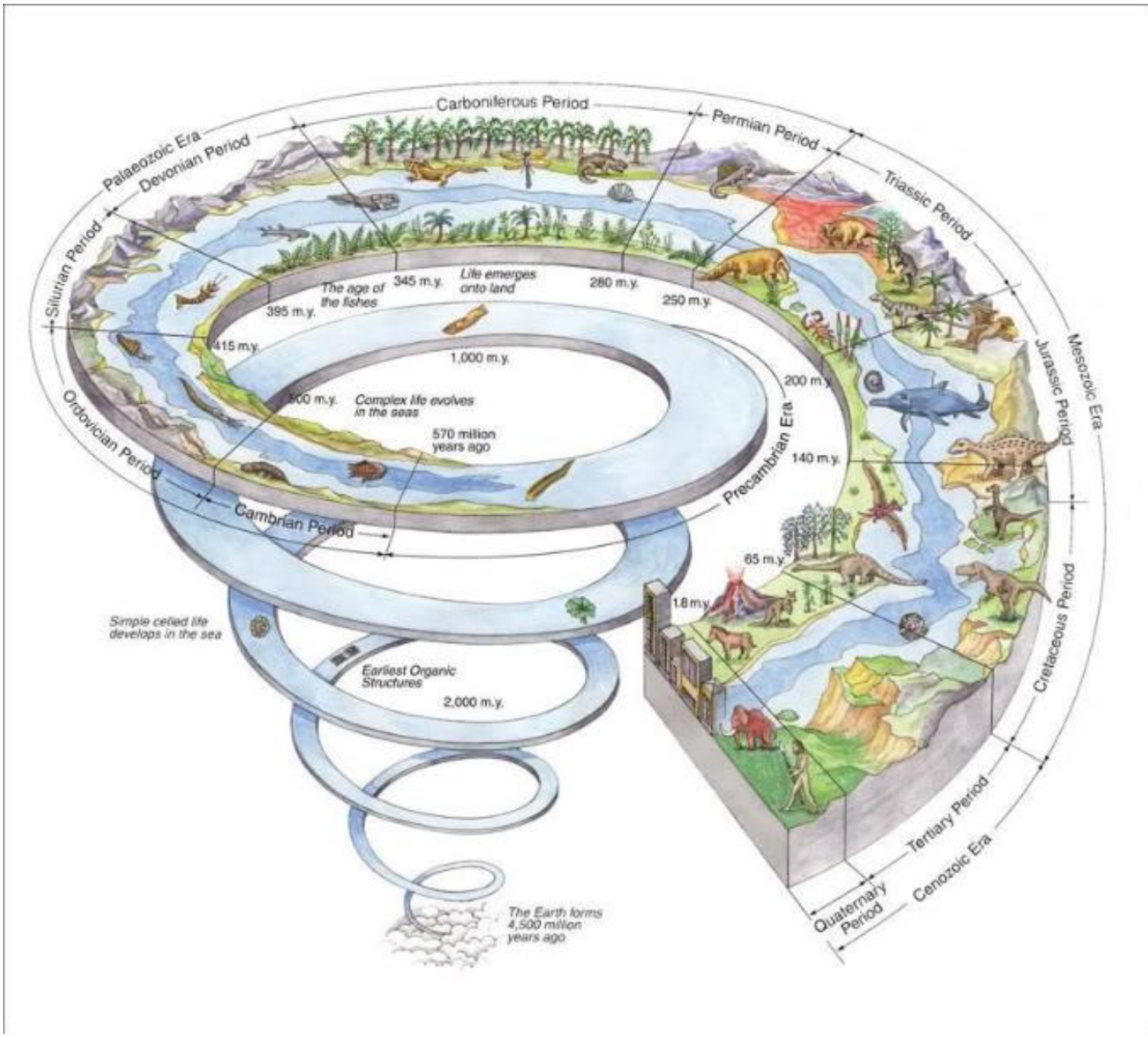
Do you have any alternative philosophies such as astrology?

Closing comments

Many thanks for your time. Do you have any questions or anything else you would like to say?

Appendix 3.1

Timeline image: A timeline of evolution



Taken from https://www.astrobio.net/climate/the-anthropocene-humankind-as-a-turning-point-for-earth/

Appendix 3.2

Video: Origin

Artist Daniel Lee

Shapeshifting creature representing evolutionary change

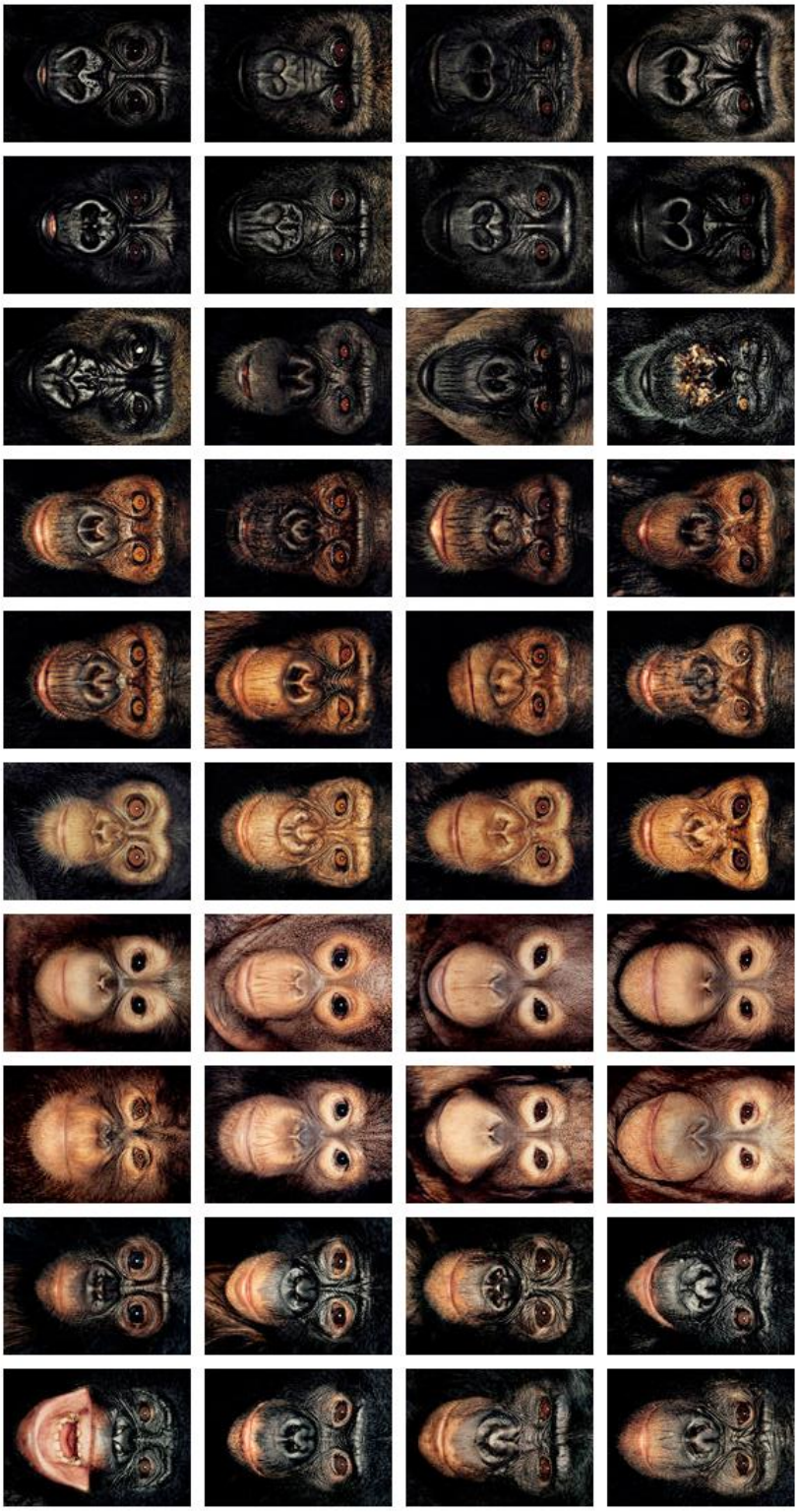
https://www.youtube.com/watch?v=WX87TkLTYN0

videoplayback.mp4

Appendix 3.3

James and Other Apes (sample)

Photographs reproduced with the kind permission of James Mollison, photographer.https://www.jamesmollison.com/james-other-apes



Appendix 4

Table: Interviewee characteristics

This table describes some of the characteristics of the interviewees that may have a bearing on their responses. I did not seek to collect demographic data but interviewees gave information unprompted during their interview. Some information, e.g. scientist/non-scientist, was also evident from the degree they were taking at the time of the interview, as all the interviewees were undergraduate or postgraduate students. I did ask each person if they had a personal faith and if so, what that was. I denoted secular if they responded they did not practise a faith and atheist only if they explicitly described themselves as such.

Interviewee	**Scientist/non-scientist**	**Attitude to science**	**Attitude to evolution**	**Attitude to apes**	**Course studied**	**Faith**	**Declared country of origin**	**Notes**
Core interviews: 3 levels of analysis								
Paul	Non-scientist (but with some scientific training beyond	Positive	Positive	Neither positive nor negative	MA Education	Atheist	Spain (Catalan)	Scientifically literate

	compulsory education)							
Patrick	Scientist	Positive	Positive	Neither positive nor negative	PGCE Science	Atheist	UK	Physicist
Jane	Non-scientist	Neutral	Ambivalent	Positive	BA Education	Secular	UK	
Rosie	Non-scientist	Positive	Ambivalent	Positive	BA Education	Secular (raised Catholic)	Germany	
Susan	Non-scientist	Positive	Neither positive nor negative	Positive	BA Education	Christian but non-observant	UK	
Melanie	Non-scientist	Positive	Neither positive nor negative	Positive	BA Education	Secular (raised Christian)	USA	

Zara	Scientist	Positive	Negative	Ambivalent	PGCE Science	Christian (Baptist)	UK	Biologist Creationist beliefs
Dhruv	Scientist	Positive	Positive	Ambivalent	PGCE Science	Secular but raised as a Jain	UK	Engineer
Interviews – thematic analysis only								
Naomi	Non-scientist	Neutral	Ambivalent	Positive	BA Education	Christian and indigenous African beliefs	Uganda	Married to person of another faith
Ria	Non-scientist	Positive	Ambivalent	Negative	MA Education	Muslim but non-observant	Lebanon	
Richard	Scientist	Positive	Ambivalent	Neither negative or positive	PGCE science	Christian (Pentecostal)	UK	Geologist Some creationist beliefs

Martina	Non-scientist	Neutral	Ambivalent	Ambivalent	MA Education	Secular	Not identified	
Sian	Scientist	Positive	Positive	Positive	PGCE Science	Atheist	UK	Zoologist
Sindy	Scientist	Positive	Positive	Positive	PGCE Science	Atheist raised Catholic	UK	
Lewis	Scientist	Positive	Positive	Positive	PGCE Science	Atheist	UK	Biologist
Sam	Non-scientist	Positive	Positive	Positive	BA Education	Secular raised Catholic	UK	
Amy	Non-scientist	Neutral	Negative	Neither positive nor negative	BA Education	Christian	UK	Creationist beliefs

Appendix 5

This transcript was not created for the purposes of discursive or linguistic analysis and as such does not use the coded conventions of such research. I have indicated informally using punctuation and bracketed descriptions pauses, emphasis and some non-verbal expressions. Each interview was analysed using a combination of the transcript, the original audio file and my notes to capture the richness of the participant's affective responses.

Interview transcript sample: Patrick

I went to a comprehensive up North, looking back now it is more obvious it was themed as a failing school and I know the head teacher was fired while I was there, we weren't told that he was fired but the whole SLT staff just left, we assumed they just left, but looking back it was obvious, cos there was inspectors in there very regularly and stuff, and looking back I didn't really enjoy school, that is putting it very mildly, I only had about 30% attendance throughout school primary and secondary. Then I left with my GCSE results and I did OK and then I went to college and did A levels and the college was completely different. It was all about what you could do, it felt very different. They pushed you. They said you can do better than that, so do better. That was a massively different situation and I think I appreciated it as well, it was the little things. Everyone was on a first name basis. It was Mike and it was Steve, there wasn't uniforms it was come as you like. There was a regiment day, there wasn't form period in the morning. Your lesson is at 2 so you have nothing in the morning, do as you like. That really worked for me and that convince me to go to university, because I wasn't going to go. That was the big change for me, going somewhere where there was expectations, you were expected to do well. I hadn't felt that way before.

What about at home did your mum and dad encourage you? Were they supportive of you taking your education further.

I don't know my dad but my mum is always supportive. If I was to put it the easiest way, the bluntest way, she is lovely and everything, put it this way, she isn't massive on, everything I did would be fine. It would always be good, it wouldn't matter. So like if I did great, I have had instances of doing great, I have had instances of doing bad, it comes to the same thing.

She's your mum?

Yes, so, it was never pushed. I am the first person in my family to go to university, it wasn't expected.

What about science in particular, did you like science?

It wasn't that I liked science, it was like I didn't really like school at all, any lessons, I didn't like being there. At school the thing I liked the most was History. Because I liked to read, I always read, I read a lot. I was lucky with that because I can read so quickly now. I had like an assessment with an educational psychologist and that was one of the things that showed through, that I read a really fast reading speed. So one of the things I liked was History, I could just do. I read books, I had read so much about things, but when it came to making decisions I chose science because I knew I could go to good places with that.

OK so it was quite a pragmatic decision?

Yeah, so I hate maths, I detest maths …

But you are doing Physics?

I did Engineering at university because I knew that would go to good places.

Do you remember being taught evolution at school?

No.

You don't remember at all?

Well OK so … I am stretching my memory, I remember something about moths. I remember a big thing about moths. Different coloured moths being something about evolution. Yes two different coloured moths, yes that's it, there's two different coloured moths, in smoky cities, one coloured moth survives more, but that's not evolution that is just like a predatory thing, because it is only a short term thing. I may be completely misunderstanding that, but I think that is right, yes there is two different coloured moths, one is white and one black, but in smoky covered areas the black moth survives more than the white moth, but that doesn't count as evolution, that is just a current thing. It would take time before you would have an institutional..you would have a change. That is not deemed as evolution. I think that is one of the big lessons about evolution. I remember making a poster about the Beagle and Darwin. I don't remember evolution, but I remember Beagle and Darwin.

Do you remember how you felt about it at all?

I think I just took it like as the rest of science, it was just like gravity.

You just took it for granted? The teacher told you (so)…

Yeah, it was true, and I was just like yes, that is the way it is.

TIMELINE (my full explanation of the timeline is not included in this transcript sample)

This is a diagram out of the Biology text book. What do you think it is showing?

Is it supposed to be showing like a time line? This is like we have only been around for a little tiny bit, it is that thing, if you put your arms out and that is history of the Earth then only the edge of your finger nail is like humans. Like we are really full now but now but then we were really empty. That's what I get, that's what it looks like to me, oh we are dead full now, before we were really empty.

Does it remind you of anything?

It kinda looks a bit like a tornado I suppose.

What about what it is showing? Does that trigger any thoughts?

It strikes me there's a lot of dinosaurs but it doesn't really remind me of anything. I haven't seen anything similar I don't think.

What do you think is overall message of that picture, what is it trying to convey? You said one thing that we haven't been here very long. Anything else?

The thing I think it is trying to convey is which I would disagree with, is that it is getting more complex. So you see what I am saying. We used to be really simple but we are now so much more complex. Like look it was only little things over here but now there are big things.

Why would you disagree with that?

Because I don't think that is how evolution works. It is true that things got big, but things get smaller again, there are instances in the biological timetable of things getting more complex then less complex. I think evolution can be taught as the, as we were the plan, we were the end result. So you had to stumble through these, you had to be a fish, you got to be a human. You know like this is what we were aiming for, this is the aim and the aim is to get smarter, but actually it just happened. It is equally valid for the aim to, like if single celled organisms worked best now and nothing else worked then that would be what you would have.

So you disagree with that point of view? And you think that is what that kind of image is sort of propagating?

Yes.

Well how do you feel about that then?

I don't think it is bad, I feel the problem with it is, it's like, cos you said it's like from a Biology textbook.

Yes a US one not a UK one, I don't know if that makes any difference?

No that's fine, but the, so there is an understanding here. They are trying to teach a complex idea to a kid and you know with Physics you don't start with string theory, but I think you are in-building a precon (PAUSE) the person who built this had an obvious prejudice, that humans are the best. It is great being a human, it must have been awful being other things. You are using this model to explain evolution and you are building in a misconception and if the student who learns this now decides to go on and do Biology at university, they are going to have a real tough time understanding the truth, because you have used a very, very obvious flawed model to hammer in an idea. So I think annoyed is a bit of a strong word, but I, this strikes me as lazy teaching.

A bit irritated?

Yeah, this strikes me as this was easier to do this, because the truth is more complicated.

How could you describe the truth in short and simple terms?

In short and simple terms, the big thing is that we have ended up with humans, that we have ended up with the smartest animals now. It didn't have to be that way, smartest animals didn't have to survive, a lot of things happened that made this situation for smart animals to be fortunate enough to be in the situation where they can survive and it could have just as likely been a situation where bigger animals survive and all the smart animals were useless and I think it is important to have that distinction.

How do you feel about that idea then? That everything is at the mercy of chance? Are you OK with that?

Yeah, it's like, OK I am going to use an analogy, it's like there's a whole conversation about free will in (biology?), there's a whole thing about free will, do you decide to do what you do or is it all predetermined? Well it doesn't matter which one of you is correct, it doesn't change. Like if I told you, because if you absolutely, if you 100% prove to me right now there is no free will, I am not going to act differently tomorrow, because acting differently tomorrow doesn't affect that. I think this is the same, because it is absolute chance it doesn't bother me because why would it like, if I acted like it did it doesn't change, that doesn't make the fact less true. I really, really, really don't like falling over, but in really not liking falling over doesn't stop gravity working.

So you can rationalise it?

I suppose so yeah.

What about the fact, I dunno know, the dinosaurs they aren't here anymore.

Yeah (pause).I would argue that is a whole different point of charismatic megafauna, because there is lots of other stuff that isn't here anymore.

That is true I am being extremely biased picking on the dinosaurs, but they are quite obvious aren't they. OK well done, you picked me up on that one. (Laughs)

VIDEO (my full explanation of the video is not included in this transcript sample)

Do you want my initial impression? So it is an interesting way to show, like it charts one route doesn't it? That's the idea, we used to be this, then we were this. There's a lot of interesting ideas there, like when does one species become another species? You know, is there an intermediary point? Like you classify it, it was Homo this, Homo that and you end up with Homo sapiens, but there is no point where you can… it is more of a fluid process and I think that is quite interesting, but I think again it is very interesting to show that but on the same not you'd want other ones, you'd want look there's an elephant, look they used to be a lot bigger, then they got smaller, elephants in different places and look there's this dog sized elephant and that kind of stuff. Yeah I think that was really interesting, I think educationally it would work best in tandem with a lot more.

It isn't for education though, it is a piece of art. You could have a whole debate about what you think of video art, but that is what is for. That is definitely for education, this not so much. I would like to show it again, have a really close look. OK so does it remind you of anything?

Err…no….it reminds me of a Guinness advert, that's what it does.

Which one?

It reminds me of a Guinness advert where like, there's a fish that crawls out of the sea and then it turns into something else, then something else, something else, something else. Then it will be human it will be a guy walking into a pub drinking Guinness "Good things come to those who wait."

I remember it. Well putting aside any educational purposes it may have or it may not, what do you think of it as a message? What do you think the artist is trying to get across to people?

Ermm……I don't know……Is it something about transformations. We are all fish into…I honestly don't know. You are asking the wrong person, this is the guy who looked at the Picasso and said this is nice, I wouldn't have it on my wall though. I honestly couldn't tell you, I wouldn't know, I mean I wouldn't know at all, I am looking at and like I haven't got a clue.

Well in whatever context you look at it, educational or, how does it make you feel? How do you feel about it?

The guy looked vet vulnerable, it looked a bit weird.

What do you mean? Can you tell me a bit more about that?

Like at the end, towards the end when the face starts to appear and stuff, the more human face, the guy looked very uncomfortable. I mean I would too if I was naked and on film. It looked very dark and I suppose it wasn't a happy video, it wasn't nice. It felt like it was supposed to make me uncomfortable.

OK, did it?

Not really, but that like is how I was supposed to feel. OK, I did notice for the first time and I have watched that loads of times that at the very end he has a slight smile, none of the other faces have any smile, but when he becomes a human, he ever so slightly starts smiling.

I don't know either, I assume it is something about change and about us being animals, but you are right it is quite dark, it isn't cheerful and happy, everybody singing and dancing into the sunset, but why would he make like that do you think? Why do you think he would want to portray change in that way?

Some people, some people, especially in my experience, especially older people, the older you get you see change as bad. May be he is pushing his own feelings about change onto the change that he is showing in there, maybe he is showing he thinks change is bad, because a lot of people do feel uncomfortable with change, they don't like change they like things to stay the same. Even if they don't like how things are they don't want them to change so maybe he is trying to show his own feelings around change in general.

How do you feel about change?

I think like, I don't mind change so much. I think purpose is very important, it is all about purpose. If we change things for no purpose then that doesn't really make sense, but if you have a purpose, a plan, an idea of why you are going to change things, especially if you don't like things. If you like things then no problem, but even if you like things you can leave them, but then you should try new things, I am going to try this…but then I don't like tat so we are not going to keep it, that is fine, but change for no reason, change without evaluation, change without feedback loop that is the difference.

Can you give me an example?

Erm, well yeah I can. Before I worked for, before teaching I worked in banking, I worked in resource management, for Bank of America, that is what I did and there was change there, weekly, weekly without purpose. There was always a new idea to help, but it never did. Oh we are using just the West doors now because that way everyone can see each other on the way into the building and they can all talk. Have you met people at 7.30 in the morning? No one wants to talk, everyone wants to get to their desk where their coffee is, that idea was

terrible. They closed off all the doors so we could only use one door, so we could all see other in the way in. I think they thought we were going to talk about stuff "Hey Barry I have had an idea about the thing" and you have saved each other a meeting, I don't know. There you go there was a change without purpose.

But that might have felt like you were being manipulated as well, you know forced to be jovial with your colleagues.

It didn't bother me you know the west door was the one I used, I don't know I was resenting the fact that the west door used to be really empty and now and now I had to queue now that, now I was, yeah, but yeah, that… I think, I think maybe I misspoke here because but most, usually if there is a change someone thought there was a purpose.

Politically it can sometimes not be very obvious what the purpose is.

Yeah, you don't see the purpose or you don't agree with it, or the purpose is so hidden in other people's ma… OK I think it all comes down to one topic, not imagining other people complexly, most people, because it is impossible, you can only know 100 people. You can't know more than that and if you think you do you don't that's the simple truth. Erm it's been proven numerous times, but you mostly don't imagine other people complexly so you only give a base reason, why people do things. If someone does something and you don't really know. You assume that they do it because they are evil or because they are good, because they are smart or because they are stupid, you never think oh they did it because this morning their daughter slipped and rip in her dress, then this happened and this is why they have done, you never think that because it's impossible, because if you imagine, if you think you could go on the tube today 300 other people on that tube every one of them has hopes dreams and ideals. Every single one of them has something that happened to them this morning something that happened to them last night, something that was good, something that was bad, you can't imagine all that it is impossible, because your brain just isn't designed to do that. You go and queue for a coffee now, you're around more people than a Homo sapien hunter gatherer ever met in their entire life and you will never speak to those people.

I don't think they would cope with London.

Yeah and that's the simple truth. Sorry I realise that I have just gone massively off topic.

PHOTOGRAPHS (my explanation of the photographs is not included in this transcript sample)

No, nothing is off topic, nothing (Laughs). Anything, but I don't know, I have no idea, it is all afterwards and then I think about it, it might be not relevant at all but, anything is

potentially relevant. These are great apes … What first of all do you think the photographer is trying to convey through these images?

OK so, the thing he is trying to play on is the fact that humans always, always humanise everything they look at. I could tell you this pen's name is George and snap it and you would feel a bit sad. You wouldn't want to but you would. So this is what he is doing, so like the idea is look how human they look and look how sad some of them look and this one looks a little bit cheeky and that's the idea, he is playing on that. He wants you to feel bad or he wants you to feel protective. Because they share a lot of features with children as well, so you know big eyes for instance, kind of an innocent look you would ascribe to children and I think he is trying to play on that so he wants you to feel protective. I imagine under a lot of these pictures was please give now is my feeling.

OK, well how do you feel about that?

I feel fine because I think it is a very, very important and very worthy cause, but I think when you start looking into a lot of stuff that advertisers use to get you to do things, it starts to become very obvious and this is just literally comes from the fact that quite recently I read a book about what advertisers do and about what different, how different people make you feel about things and how they use it. And then when as soon as you have done that, it becomes very obvious. It that thing where it's like turning on a light. It's like, so OK the big one for me, you know that supermarkets make 80% of their profits off the things that are on the end of the aisles?

Uhuh.

That's where all the profit comes from, and as soon as you realise that and as soon as you realise the tricks they employ, it's like turning on, you can't not see it. And it is the same with things like this, so I think that was that was for. I may be wrong, but that was that was for.

You don't mind that?

No because like, I was rather someone was playing on my compassion than my fear.

The, it's, it's from a book, a book of photographs a coffee table art book.

Right.

And they are actually full size, so they lose a bit of impact like this, they are like this big.

Right, OK.

I am interested that you think they look like children and they look happy.

I don't think they look happy, that one looks mischievous that's what I thought. When I say they look like children, they share features.

Big eyes.

The big eyes is the big one, the noses like children, like babies have weird like noses.

That's true little noses, look at them all, now look particularly these guys on this page.

Yeah but I would say the same thing, again, it is obvious they are old because of the wrinkles and the grey hair, but again it is the same kind of thing, big eyes little noses and it, and it, a part of your brain will always will see that that way. Yeah I think I stand by that, I think I like yeah.

Do you think he is trying to make us realise that we are more like them or they are more like us or both? Than we think you know.

Erm, yeah I think it is probably more both, I think it is probably they're smarter than you think and you are stupider than you think, you think you are. I think it is a bit of both. I don't really like to *upset, to give off ()* because you don't know, but yeah I think it is a bit of both isn't it, so a bit of both.

Well how do you feel about that, how do you feel about their humanity essentially? Because what struck me is they are portraits and usually the only subjects of portraits.

Are humans.

…are people.

Yeah, I see what you are saying, um.

So it is a very unusual treatment of photography.

I didn't even think of that, of that. I wonder how he got them to sit still?

I don't know, they young ones or actually the older ones probably just would sit, but the younger ones.

You try to take a photograph of your cat.

Yeah but cats are different than apes.

That's true but still. Dogs are really easy to you know, self thing, you put it on top of your phone and you put a tennis ball on it and your dog, it's brilliant.

Cats move as soon as you get the camera out. They sleep for hours and then as soon as you get the camera out they will walk off.

Erm you know I didn't even think of the fact that it was um, do you know what, now that you mention it, do you know what it does make me… have you seen the erm, the picture of the monkey that took his own photo?

No? Is it a You Tube thing or an internet thing?

It's on the internet, but it got prominence recently because there is a big court battle about it. I will go into the court battle in a second but the err photographer left his camera and the monkey picked it up and took his, I don't know what you call, selfie, looking, he obviously doesn't know what he is doing but looking into the camera he has pressed the button. So monkey really big cheeky grin right in the camera, if you haven't seen it it is a brilliant photo, but it comes into the fact that, erm so the court battle is the photographer says the photo is his.

Yeah (Laughs), *does somebody say it is the monkey's?* (Laughs)

Well, the problem is well, everyone else says its, because, it sounds funny but you realise that if it belongs to the monkey everyone who has been sharing it, look at this cool photo of this monkey, they are allowed to do that, because the monkey isn't allowed to own, but if it belongs to the photographer everyone who has been shown it, all the newspapers, now have to pay the photographer. So a lot of people point out, no you didn't take it, it's your camera but you didn't take it.

Oh, oh, but monkeys don't have human rights so don't have ownership of anything.

Which I agree with as well, but it is also not his.

No because he didn't take it.

So if he…

It is not his creative work.

If you drop the camera and the camera went off.

Well if a pigeon stood on it.

That's one of photographs, so I don't know…

And pressed the button by accident.

I would argue that the photo is the monkey's but…

OK alright.

Erm

Interesting.

Yeah but it reminds me a bit of that, but I didn't think at all of like you would rarely see photographs like this of other animals.

What do you think about that, what do you feel about them being portrayed in a human way.

I think that's fine, I mean, you only think humans diff, you only think being human's different because you are one. If you were a crow, you would be like, why … why is that human in a nest is what I was going to say but, but yeah like it's, you only think it is weird because you're a human. If you are a monkey you would be like, well yeah why haven't I been in photos, no one's taken my photo, look at that that girl's got 26000 selfies on Instagram, no one has taken a selfie of me you know. I am fine with it, I think it is right, like it's normal. Like we have just de-normalised it by saying this is just for us because we are human. We deemed being human as a different thing for whatever reason.

And you are alright with that?

No I don't see why you would. Crows have funerals, right.

You are not anthropomorphic either though?

What do you mean?

Um, well no basically that is what you said actually. Saying that we are projecting human values, thoughts, emotions onto these animals.

Yeah.

So we are anthropomorphising them.

Yeah.

So yeah, we are giving them like kind of qualities that have nothing to do with them.

Oh yeah, we give them, because it is an internal bias. We are pushing qualities onto them that we think are important, you know subconsciously and at the same time then we're deeming them less so because they don't have our values.

OK yeah, yeah. Everybody I show this to, I get totally different reactions. Any way my last thing I want to ask you then, Do you have any faith, do you practise a faith?

No.

Were you brought up in any faith tradition?

So my family is pretty like Christian, kind of they go to Church occasionally and they like the Christmassy stuff.

Roman Catholic, Church of England?

Church of England, I suppose I should say. Protestant? Yeah protestant, converted to C of E. But no I am an avowed atheist.

OK and this may seem like a weird question, but do you have any beliefs in erm sort of alternatives spiritual stuff like astrology for instance?

No. Do you want to know a trick, right because people always get astrology and astronomy confused.

Eh not me I don't ! I'm a scientist (Laughs).

But people do. This is how you tell the difference right, astrology log as in a unit of poo (Laughs).

Appendix 6

A text that claimed my imagination: Darwin's *Tangled Bank*.

And of the species now living very few will transmit progeny of any kind to a far distant futurity; for the manner in which all organic beings are grouped, shows that the greater number of species in each genus, and all the species in many genera, have left no descendants, but have become utterly extinct. We can so far take a prophetic glance into futurity as to foretell that it will be the common and widely-spread species, belonging to the larger and dominant groups within each class, which will ultimately prevail and procreate new and dominant species. As all the living forms of life are the lineal descendants of those which lived long before the Silurian epoch, we may feel certain that the ordinary succession by generation has never once been broken, and that no cataclysm has desolated the whole world. Hence we may look with some confidence to a secure future of equally inappreciable length. And as natural selection works solely by and for the good of each being, all corporeal and mental endowments will tend to progress towards perfection.

It is interesting to contemplate a tangled bank, clothed with many plants of many kinds, with birds singing on the bushes, with various insects flitting about, and with worms crawling through the damp earth, and to reflect that these elaborately constructed forms, so different from each other, and dependent on each other in so complex a manner, have all been produced by laws acting around us. These laws, taken in the largest sense, being Growth with Reproduction; Inheritance which is almost implied by reproduction; Variability from the indirect and direct action of the conditions of life, and from use and disuse; a Ratio of Increase so high as to lead to a Struggle for Life, and as a consequence to Natural Selection, entailing Divergence of Character and the Extinction of less-improved forms. Thus, from the war of nature, from famine and death, the most exalted object which we are capable of conceiving, namely, the production of the higher animals, directly follows. There is grandeur in this view of life, with its several powers, having been originally breathed by the Creator into a few forms or into one; and that, whilst this planet has gone cycling on according to the fixed law of gravity, from so simple a beginning endless forms most beautiful and most wonderful have been, and are being, evolved.

Darwin C., 1859, p. 490.

Appendix 7

The Pen Portrait Narratives

The following eight narratives are derived by Gestalt analysis of the eight core interviews. During data collection and in early reflections some of these interviews seemed to belong together, either because similar ideas emerged from them or because of some quality of the interview that felt similar. This last reason sounds vague but it reflects the sometimes odd, dreamlike quality of the interviews. Paul and Patrick became associated in my memory as did Jane and Rosie, so they are considered in part together, as combined they contribute in a way that enriched my understanding and highlighted potential common but still personal experiences.

Paul and Patrick

1. *Paul*

Paul is Catalan and was educated in Spain. His experience of school was positive, although he encountered some challenges early on. His first memory at three was of not wanting to go to school and he describes *"I felt in the first lesson … very uncomfortable about being in school"*, but then he reveals how things changed *"and then I always got quite good grades in school".* Paul's account of his schooling reflects his experience of receiving positive affirmation through doing well in his studies, and indicates he had good relationships with his teachers. His experience chimed with Winnicott's ideas, although not of the mother but the teacher in *loco parentis*. It could be said that he experienced "good enough" teachers (Winnicott, 1965, p. 17). He describes a formal approach to teaching in his own schooling, with lecture-style classrooms and little practical work in science, but he describes how he *"participated a lot"*. He was able to express his own ideas and ask questions and this he recalls greatly enjoying. He also was exposed to philosophy as a discipline and this has very much informed his adult interests and ways of thinking. His other great academic interest was mathematics; the problem solving, working things out, was very appealing to him.

Paul's experience of science in school was also positive, although he preferred physics to biology and had sketchy memories of learning about evolution. What he did remember was learning about human evolution and he had some technical knowledge, linking evolution to changes in genes *"and then we evolved like and I remember quite well that it should be by mutations*", but then his account became somewhat confused and he began to use the word mutation in a different way, *"so we are mutating in particular ways, by selection"*. He begins to use mutation in a more general sense to denote change, but remembers the importance of selection and quite starkly, but very much matter-of-factly, describes the struggle for existence:

> *There is a selection process, selective. So, the successful ones would survive, sort of the unsuccessful ones would die … so yes that's the evolutionary theory isn't it, in short, I guess* (laughs).

He then goes on to talk about the evolution of the human brain, expressing ideas about walking upright and the brain size of human ancestors. What I noticed was the fact that his account did not seem to indicate any level of discomfort with these ideas; he was accepting of the science, he was interested and wanted to make sense of it. For instance, what he chose to recount was his understanding that scientists do not know why humans survived and Neanderthals became extinct, and this seemed to intrigue him. However, certain features of his account warrant discussion. His description above of natural selection did not shy away from the potential for death, but his language did start to become somewhat equivocal. The unsuccessful became *"sort of"* unsuccessful as if he wished to soften that blow of failure. He also focused on ideas about human intelligence and began a theme that I observed in both his and Patrick's discourse, the importance of the intellectual, 'being clever'.

Paul described himself as an atheist and remembered having many questions, when he was a child, about God and the origins of the universe and life, which he was able to discuss with his parents, who encouraged him. He remembered being very excited on learning about the Miller-Urey primordial soup experiment, which proposed a theory for the beginnings of life on Earth (Miller and Urey, 1959). It made sense and provided acceptable answers for him.

I showed him the evolution timeline diagram and he spent some time describing it to me, but it also felt like it was to himself, as if he was telling himself a story. His interest focused on the different geological periods described, the names of the periods and dates; he was testing his own memory. He was not responsive to my pointing out the late arrival of humans; this was not controversial to him. However, the spiral shape puzzled him and although I explained that it was to allow the use of a single page to describe a long sequence of events, he kept returning to the use of this shape and its links in his mind to geometry. It did not match his memory of learning about geological time periods at school and he was not going simply to accept my explanation; he needed to make sense of it on his own first.

> *… why is it elliptical, why is it a geometrical form here? Because in my mind time is linear, but this is an ellipsis, so I was really thinking why is it elliptical if time is like that.*

This mention of linear time is interesting; this would be the view of science, albeit with the addition of ideas about relativity. However, philosophy, religion, other disciplines and worldviews sometimes offer different ideas about time, sadly beyond the scope of this thesis. I would argue that time is to some degree subjective, at least our experience of it is. We can experience it directly in the present, but we carry the past around with us; it is something we can always look at but never experience again, except in transference. We can anticipate our future, but cannot conclusively predict it, apart from the fact that one day we will travel to that "undiscovered country from whose bourn no traveler returns" (*Hamlet*, Act 3, Scene 1) – we will all one day die. Time moves towards the future, but the pace seems to vary, generally speeding up as we advance in age. In addition, we live with time on a human timescale but the time required to account for the evolution of life on Earth is immense, deep time, and very difficult to appreciate. From the perspective of human subjectivity, time may not always be simply linear; it may manifest a deeper complexity in human experience, and this idea itself may be mildly troubling to Paul.

The childlike illustration in the diagram appealed to him; in all, it is its presentation that struck him far more than its content. He was not outwardly worried about any of the ideas, which would fit with his ontology, an interested observer of science, a worldview he is

comfortable with; specifically, he is an acceptor of evolution. His account again went back to his childhood memories of discussions about big questions with his parents; his father was a mathematics teacher, and Paul was encouraged to think about ideas such as origins of life and evolution, albeit with an emphasis on scientific or rational explanations. At the same time, Paul felt that he was very much able to make up his own mind about things such as the existence of God and the Big Bang, although he acknowledged the influence of his parents, particularly his mother. The explanations he chose that made sense to him were those derived from science and philosophy; he rejected religious ideas. He sought explanations that could be tested, used logic, relied on our senses – had explanatory power. A very notable part of his account was his memories of choosing between two pathways at school. He could choose a pathway that incorporated Catholicism or one with a more secular emphasis; he described this as "*alternative religion*". Most of his fellow students chose Catholicism to study, but he, perhaps unsurprisingly, chose alternative religion. However, what is interesting was his emphasis on the choice. He argues that this was truly his own choice, not his parents, as was he claims the experience of most students:

Paul *Yes, but I had a trait for instance which was distinctive compared to my classmates, because my classmates didn't choose anything.*

Emma *What did they do?*

Paul *Well their parents chose the subject.*

Emma *Oh so you got to choose it yourself?*

Paul *Yes and almost all my classmates' parents chose religion for them. I was quite different I think.*

This again is an emerging theme in Paul's interview, and as will be seen later in another interviewee: Patrick. They both gave the impression that they are not passive in life, but expressed a need for self-determination, the ability to make their own decisions, be masters of their own fate, not follow, but be prepared to stand alone. Although the self-determination Paul ascribed could be argued to be somewhat optimistic, as Paul is perhaps just following his parents' views, but this is not how he experienced it.

Paul's experience of the animal metamorphosis video *Origin* provoked the most interesting part of his interview for me. He very much enjoyed it and did not find it odd, dark or uncomfortable, unlike some of my interviewees. He even described it as "*beautiful*". What he pointed out is that there is a point in the video when an unidentifiable intermediate form appears, a form that does not resemble any obvious animal alive or extinct. This is noted by a number of interviewees and many found it uncanny or weird. Paul was positively attracted to it. He identified it as Gollum from Tolkien's fantasy *The Lord of the Rings* (Tolkien, 2012). Again, a number of participants also made this connection, but for Paul this was very positive; he did not perceive Gollum as a negative figure, a monster, as most seemed to, but as he said *"I like Gollum".*

Paul had read and watched the film versions of *The Lord of The Rings* many times and was knowledgeable about the characters and plot. He described Gollum as being two persons in one, Sméagol and Gollum, between whom there is an internal fight. He explained that Gollum is the evil side of this dual personality, a former hobbit who was corrupted by the ring and became a monster. Although Paul did not perceive Gollum as monstrous, he described him as isolated, weird, but found him extremely interesting.

Emma *You don't seem to see Gollum and Sméagol as a monster?*

Paul *No I don't think he is at all.*

Emma *You see him, you see his humanity, is that correct?*

Paul *His humanity, his hobbit side, it's there.*

Gollum is a character that does not conform and Paul drew the parallels with Bilbo who also does not conform to hobbit society. Gollum is an ambiguous character; he is not totally bad, he is a mixture of good and evil, a more complex, nuanced figure, reflective of real personalities to a degree. Paul was not discomfited by this co-existence of good and evil and the inherent uncertainty that brings. We can note that people are a combination of light and dark, personality is ambiguous, there is uncertainty in human relationships, in human experience. There is fluidity and the potential for change in Gollum's identity and, possibly by extension, in ours too.

Literary criticism of *The Lord of The Rings* has described Gollum as representing a receptacle for our repressions, this being as an archetype, the Shadow (Honegger, 2011). Although not an uncontroversial view in the field, there are claims that Tolkien's writing was influenced by unconscious ideas, tapped into by writing throughout the night, and that some of his symbolism originated in the collective unconscious. It is not possible for me to confirm or refute this idea but it is an interesting one in this context.

The concept of the collective unconscious with the inclusion of a notion of universal archetypes was developed by psychoanalyst Carl Jung (2014). Jung described the Shadow as the "negative side of the personality" (Jung in Campbell, 1976, p. 147). The Shadow could also be said to represent the Kleinian idea of splitting that I described in Chapter 4. The evil, the dangerous, is spilt off in the personality; it is projected outwards through its evil deeds and separated from the Sméagol part of the personality. What is interesting in the context of this interview is that Paul was comfortable with this ambiguity. He also seemed to be comfortable with the tentative nature of scientific and philosophical explanations, which can be refuted, argued, subject to revision. He was attracted to an ambiguous, complex figure. He was not obviously discomfited by the unpredictability of the future. Perhaps he had confidence in science; it is not possible to say with any semblance of certainty from this short encounter, but it brings to mind parallels with another of Klein's central concepts, the depressive position. In terms of the ideas discussed here could it be said that this is what Paul is expressing? Is he seeing these concepts from this position? In accepting ambiguity, complexity, is he accepting the constraints, needs and problems of the Other? Is Paul's acceptance of ambiguity a reason he is not uncomfortable with evolution as an explanation, an idea with uncertainty at its heart? However, I would argue conversely that it cannot be assumed that lack of acceptance of evolution denotes a paranoid-schizoid position; the reality of what influences acceptance is far more complex than such an explanation acknowledges.

Paul's interpretation of the ape portraits was interesting again and, as he described it as, *"very particular".* He was suspicious of the motives of the photographer, but also, interestingly, saw admitting this as risky: *"It may be risky to say this but I think he is trying to humanize apes".*

His argument was that we understand the world and our experiences through language and therefore, as animals have no language, we cannot claim any knowledge of the animal experience. This may be true, but it is, as he says, a very particular point. The ape photographs can be interpreted in a number of ways. This was Paul's interpretation and I think it is possibly significant. The photographer wanted to explore what he saw as "the grey area between humans and animals" (Mollison, 2005, https://www.jamesmollison.com/apes-exhibitions). Paul did not seem to be denying in our discussion that there is such a grey area, but he did express a problem with seeing the human in animals, but from a very particular perspective.

There is a strong argument for being critical of the human tendency to anthropomorphic thinking, but what Paul was perhaps missing, or possibly avoiding, is that the photographs also throw a spotlight on the converse, on the animal in humans. Not that long ago, I attended an academic seminar where the speaker's position was that there is evidence that animals do have a mind, do have some form of consciousness. What was interesting to me was the polarised and heated nature of the questions and debate after the talk. The discussion focused on language and conceptual understanding, as did Paul's. Both sides of the debate were passionate in defence in their position and those who spoke did so either in strong defence of or opposition to the speaker's position. One audience member seemed to be saying that considering animals as conscious devalued human intellect. However, those more sympathetic to the idea of animal consciousness were also quite vehement and, it could be argued, rather anthropomorphic in their position. My observations during and reflections after this event prompted me to wonder why people have such emotional investments in the status of humans and other animals. Does this explain why some react so strongly either for or against the idea of animal minds? Ernest Becker proposed that we deny our creatureliness because this highlights our corporeal nature. If we are organic beings it therefore follows that we are vulnerable, mortal. We distance ourselves from our animal selves to deny death (Becker, 1974; Goldenberg et al, 2001).

Is this an indication of a defence in Paul's reaction to the portraits? If so, it would appear to be common (Goldenberg et al, 2001). Another possible indication of defence was in his justification for his stance. Paul emphasises a position based on an intellectual standpoint,

rational, educated thought, which has come from his interest in philosophy and semantics. His emphasis throughout was on the importance of rational thought; this is fundamental to his worldview. Intellectualisation is also potentially a defence. Intellectualisation is far from uniformly described, defined or accepted in the literature, which makes it even more difficult to apply (Arnold, 2014). However, Arnold describes it as "the translation of emotional material into intellectual terms" (Arnold, 2014, p. 630). It was described by Anna Freud in her work with adolescents (Freud, A. 1992) and is see in the wider literature as "a defense against affective experience or affective modes of activity" (Kestenbaum, 1983, p. 673), although the relationship between cognition and affect is disputed and complex. Anna Freud did not see intellectualisation as "A flight from drives" but "a turning toward them in thought" (Freud, A. in Kestenbaum, 1983, p. 677). Some psychoanalysts describe a mutual exclusion model, which proposes that thinking and affect do not occur together. "Thinking invariably restricts one's ability to feel; inversely, to allow oneself an unfettered affective experience is to exclude the experience of cognitive functioning and to make thinking difficult" (Kestenbaum, 1983, p. 685). I cannot say from a single interview that what I witnessed in Paul's response to animal portraits was defensive. However there is some evidence in his response to suggest that he instinctively separates humans from other animals.

2. *Patrick*

Certain interviewees left their mark on me; I was changed by the experience of talking to them. We often take words and conversation at face value in our everyday interactions. Patrick's interview made me think, but not just in that interview with him; still now, that thinking continues.

Another aspect of our interview that only struck me much later was the dream-like quality it had and which I felt on listening back to it. This was the case for a small number of interviews, Jane being the other most memorable in these terms. I came to understand the odd feeling it invoked after reading Thomas Ogden in his essays on psychoanalytical style

and the work of Wilfred Bion (Ogden, 2009). Ogden draws on Borges to describe the analytic relationship as being like "guided dreaming" (Ogden, 2009, p. 31). Although I am not an analyst and the relationship is not therapeutic, this idea seems to describe aspects of my interview experience. In addition, Ogden goes on to say that in a psychoanalyst's supervisory session, the analyst represents a fictitious patient to their supervisor, not the actual living person. That is not to say that the analyst is lying, but that the patient in the supervision has become an interpretation produced by the analyst. This, as I understand it, feels very similar to my experience with these interviewees. I am dreaming too; I have dreamed up these individuals in the interview analysis, in this thesis. In this way, I hope to see things differently.

Patrick's experience of school was not at all positive, although this did change when he went to college to complete his A-levels. He described how the informality, trust and non-hierarchical relationships between students and teachers at college very much appealed to him. He had autonomy and because it was now his own decision, he chose to learn. He also felt for the first time that people had positive expectations of him: *"That was the big change for me, going somewhere where there was expectations, you were expected to do well. I hadn't felt that way before".* This expectation was in contrast to other experiences; I noted he used the word again: *"I am the first person in my family to go to university, it wasn't expected"* (my emphasis). He did describe an enduring love of reading and a desire for knowledge as a child; he had curiosity and wanted to enter new worlds, be exposed to new ideas, although it was history not science that was his first interest and he studied engineering at university for quite pragmatic reasons: *"I did engineering at university because I knew I would go to good places".*

I asked Patrick if he remembered being taught evolution at school and this is where I began to feel the dreaming. He at first claimed he did not remember being taught evolution at all, but then he remembered the story of the melanistic moths of industrial regions[5]. He not only gave an accurate description of micro evolution but also explained why this example

[5] Kettlewell, (1958).

was, at least for a time, considered to be a problematic one to teach. Finally, he added that he remembered making a poster about Darwin and *The Beagle* voyage but continued to claim *"I don't remember evolution, but I remember Beagle and Darwin".* This felt an odd contradiction and one he did not seem to be aware of. It seems he is describing something that did happen by telling me it didn't and with an unusual level of sophistication.

We looked at the timeline diagram together. His first impressions were of emptiness being filled up: *"Like, we are really full now, but now, but then we were really empty. That's what I get, that's what it looks like to me, oh we are dead full now, before we were really empty".*

And he noticed immediately the late arrival of humans. His attitude toward the depiction was negative, and focused on what he saw as the human-centric impression of evolution and time it conveys. To him the depiction of human evolution on the timeline did not suggest we are insignificant, more that we are being described as the culmination of evolution: *"we are the plan".* This idea he rejected. He also rejected what he took to be a description of life that moves from *"small"* to *"big"*, *"simple"* to *"complex"*. He demonstrated an understanding of the misconception that evolution proceeds in certain directions, but he also slipped into personalising his account of what he saw happening: *"So you had to stumble through these,* you *had to be a fish,* you *got to be a human".*

Patrick was speaking teleologically in this interpretation; he experienced the timeline as a story where the punchline, the whole point of evolution, is the appearance of humans and this he found distasteful. This I find particularly interesting. My hypothesis was that some people may feel the brevity of human history in geological time as indicative that our experience is not important on such a scale, that we are not the culmination of evolution but an afterthought. Patrick is not discomfited by this brevity; in fact, he feels humans have an overinflated perception of their own importance. This may connect to both his atheism and his acceptance of evolution. However, despite this, he still instinctively personalised the story he sees; in the narrative he was the fish. Naturally, he did not believe that to be 'true', but I would argue he was unconsciously seeing it as his own possible experience. This hints at a potential problem for some. If, as I would argue, most of us are likely instinctively to think in this way, to personalise the story of life, what is the result if, unlike Patrick, you are

not comfortable with humans being missing from most of Earth's history? How would you feel if you were repelled by the idea you are the fish, you are the ape?

After looking at the video, Patrick differed in his responses from Paul. He felt it was not *"a happy video, it wasn't nice"*; he felt the man at the end of the transformation looked vulnerable, uncomfortable. He stated he did not feel uncomfortable himself watching it, but claimed *"I felt like it was supposed to make me feel uncomfortable".* I brought up the subject of change, deviating from free association interviewing, in retrospect possibly leading Patrick, but I wanted to have his view on this aspect of the video portrayal of transformation. This prompted a really interesting reflection on change and complexity. Patrick declared that he didn't *"mind change so much",* but *"it is all about purpose"*; he needed to feel there was a point to change. This made me consider change in the evolutionary sense; evolution *is* change without purpose, it could be argued that adaptation is the purpose, although purpose suggests a plan. For biological evolution there is no plan. This, again, I had supposed might disturb some people who might feel this interpretation of life suggests pointlessness, but Patrick goes on to turn it on its head:

> *… you should try new things, I am going to try this, but then I don't like that so we are not going to keep it, that is fine, but change for no reason, change without evaluation, change without feedback loop, that is the difference.*

Here, Patrick embraced change as long as it is tested, the feedback loop; rather like natural selection itself, the change only prospers if it confers advantage at that time and in that place. 'Bad' changes are selected out if they don't provide that advantage. He fought against pointless change; he felt imposed upon by it, and what comes next in conversation throws some light on all his responses:

> *OK, I think it all comes down to one topic, not imagining other people complexly, most people, because it is impossible, you can only know 100 people. You can't know more than that and if you think you do you don't, that's the simple truth. Erm it's been proven numerous times, but you mostly don't imagine other people complexly so you only give a base reason, why people do things. If someone does something and you don't really know, you assume that they do it because they are evil or*

because they are good, because they are smart or because they are stupid, you never think oh they did it because this morning their daughter she slipped, and rip in her dress, then this happened and this is why they have done, you never think that because it's impossible, because if you imagine, if you think you could go on the tube today 300 other people on that tube every one of them has hopes, dreams and ideals. Every single one of them has something that happened to them this morning something that happened to them last night, something that was good, something that was bad; you can't imagine all that, it is impossible, because your brain just isn't designed to do that.

Here, Paul and Patrick seem to demonstrate the same state of mind, when it comes to the ideas I am discussing at least. Patrick appeared to be accepting complexity and the inability to control or even really know others. He saw others holistically, each with their own subjectivity. This again made me think about Klein's idea of the depressive position. Was Patrick demonstrating this in his reactions to ideas that are inherent in evolution? Is this why he was able to tolerate such ideas?

Patrick's response to the ape portraits again showed similarity with Paul's; he perceived them as anthropomorphic and was unhappy with this. He felt that the photographer is making the apes appear more human, that he, as viewer, is being manipulated to feel sympathy and then to take action; in his own words, *"I imagine under a lot of these pictures was 'please give now'".*

Patrick went on talk about the manipulation by advertisers, talking about the reading he had done on the subject. Like Paul, I felt he was missing something; he was seeing how these apes are like us, but was not thinking about how we are like them. Is this too disturbing? I do not know, but I think it is an observation with some significance. Our conversation began now to lose its dream-like aspects; the real and prosaic resurfaced and we went on to talk generally about animal rights. Patrick's conversation throughout revealed his wide reading and his deep thinking on political and social issues. I cannot help wondering if, possibly like Paul, he was retreating into an intellectual stance, not fleeing from the ideas but "turning

toward" the things that disturb in thought, as Anna Freud described it (Freud, A. in Kestenbaum, 1983, p. 677).

Jane and Rosie

3. Jane

Ambivalence, responsibility, identification, empathy. I begin with these four words as they drifted into my consciousness, starting during Jane's interview; her sense of responsibility seemed to be palpable when analysing the transcript. I felt as though those words rose up and hung in the air before my eyes. Jane's story at school was one of early promise replaced by trauma, when she became pregnant at 15. She had liked science at school, but schooling then ended for her very abruptly. She went on later to learn as an adult student, focusing on art and design and was now, at 30, studying for a BA in Education Studies.

As with Patrick, Jane's interview had a dream-like quality both at the time and upon repeated listenings to the recording. I felt she was very open and following the free association of ideas through the interview in a kind of reverie with me. Her account of time, both her personal time, experiences when young, and her reaction to time in the evolutionary sense, was strange. She compressed time and gave contradictory statements; time did not feel linear I think for either of us in the telling of her narrative. Freud asserted that "The unconscious is quite timeless" (Freud, 1901 p. 274). Unconscious communication may have in part created the dream-like quality of her narrative; time in her accounts made little sense from a rational perspective. This made me think about the difficulty time presents when attempting to understand evolution, which I will go on to explore further on in her account.

We looked at the evolutionary timeline together and for Jane it appeared to provoke ambivalence. She began positively at first, talking about *"growth"* with references to there being *"nothing"*, then *"life"*, *"nothing"*, then *"something"* and, as Patrick had suggested the

diagram implied in his interview, Jane at first saw improvement: *"So yes, it is a form of growth I think, evolution you could say is getting better as it goes on".*

However, when I asked her how she felt about it, she explained how she felt both positive and negative about it. This exchange followed:

Jane *Well, the positive side of it is, you can see there's not much life, not much going on at all here and as we go further in things are starting to evolve, from where I have no idea, and then as you can see it is, more life. But then look at this bit. I can see that we are going from some nice quiet areas (laughs). Looks lovely, you know there's not much human activity going on and then it starts to get crazy and visual nuisance. There's lots and lots of stuff happening, it is happening more and more, it increases as we are going further and then it seems like lots of tech, technology you can seem you've got the buildings. I live here now so I know what it is like, I didn't live, I weren't alive here.*

Emma *And how do you feel about what it is like?*

Jane *I don't know, I don't know if it is positive or negative, but we are kind of with all of our technology kind of taking away this part of what we have got, you know this bit.*

Emma *Do you mean the natural world?*

Jane *Yes, I feel slightly worried.*

Emma *Ok so there's some worrying elements to this picture?*

Jane *Yes, but then it is positive to because with the technology we have now. How like now, you get your phone and record this.*

Emma *True, that is much easier now.*

Jane *It's more convenient, but look how lovely this used to be.* (laughs)

Emma *Yes but then again there were dinosaurs that could have eaten you.*

Jane *Yes, sure, we could have lived together* (laughs). *So there are positive and negative things there. You know if we weren't around here, but we are here. It is such a huge change from nothing to such a mass of things going on now.*

Jane's reaction contains some disquiet, but it was tempered by her acknowledgement of a kind of human progress. She was worried; she seemed like she could feel overwhelmed by change, by growth, and regrets, felt a loss, of some Eden-like world in her imagination. Freud considered ambivalence as a state where both love and hate could be felt for the same object (Freud, 1957). There were muted echoes of this in Jane's reaction, although I cannot argue that it is not just a case of mixed feelings; there is evidence of anxiety, which goes on to reach a focus later in her need to know our origins, to be able to explain these to her children and concerns over her children's future.

We watched Daniel Lee's video and Jane is surprised. As she said *"I have seen we the whole, we've come from apes"*, but she wondered at the possibility of our origins in fish. She made a direct and literal link between humans and fish: *"Is it possible we evolved from a fish?"*, as any child in the classroom might. The video could be intuitively interpreted in this way; direct descent from contemporary organisms, usually monkeys, is a common misconception (Heddy and Sinatra, 2013). In comparison to Paul and Patrick, Jane had limited experience of science education and had not thought about it to any extent until now, but the video claimed her imagination and she began to wonder about origins: "*who was the first person?*". An unanswerable question. One of her reasons for wanting to know the answer was to be able to explain to her children. They asked existential questions and she felt unable to answer them. This seemed to weigh on her and at this and other similar points I felt the burden of her perceived responsibility. The two anxieties then began to blend, the worry of "*overgrowth*" of life that she expressed and our own human evolution*: "… are we going to carry on evolving? Will us humans evolve into something else? That's worrying … Not knowing, not knowing what could be in twenty years. What our children could be faced with".*

In this moment she had distorted time again; she was conflating her worries for her children's future in an uncertain and dangerous world (twenty years from now) with the far

distant future for human evolution. Twenty years is insignificant in the evolution of the human race. It was as though the timescale involved in the processes of macroevolution, the sheer number of years, is not just incomprehensible, but disturbing, unsettling, not amenable to human thought. We understand time as experienced personally, a human life span or two. If we are able to abstract the concept of time to a certain extent, it is perhaps still limited to that of recorded history, still a human timescale. Humans were able to record their existence once we could make artefacts and use language, but the time 'before' is a timeless, fathomless absence in our experience, as Zara, my last interviewee in this chapter, notes in the revealing statement "*the monkeys could not record their own evolution*".

Jane also seemed to associate human evolution with worries that would usually come under concerns for the environment and sustainability, and there is again this ambivalence – progress and peril:

> *Yes, again it is positive and negative. As we see with the spiral there is growth and there is overgrowth. There is a garden looking nice and there is a garden looking like it needs to be tended to. And it is like this road here is crazy, it is absolutely nuts sometimes.*

She expressed her own existential feelings towards what she had seen; it had left her thinking – is that where we came from and where are we going? Something a mother is likely to concern herself with. And she began to remember, something was awoken perhaps, was it held in her unconscious until this time? She now remembered studying these ideas, human origins, which she had not when I first asked her. However, she felt that the telling at school was tentative; in her memory she had not been told anything that she could describe as certain and still she wondered "*where did the first person come from?*". She thought "*it would be pretty awesome if we did know".* In a way, we do if we accept the scientific explanation, but I am not sure that was really what she was asking. I think it was more personal than that for her.

Jane's thoughtful mood continued when looking at the ape images. She immediately saw distress in these and felt a need to help. Her first reaction was empathy; here there was no ambivalence and her feelings were very different from those of Paul and Patrick, both of

whom felt manipulated and distrusted something in these images. Jane saw them as human absolutely; she identified with them, but not in the sense of a defence, as in identifying with an aggressor, but the opposite, identifying with those she saw as the oppressed (Freud, 2015). She far from rationalised her response but freely shared her feelings. She again felt responsibility and then guilt. She wondered if the photographer was trying to provoke these feelings; it is not clear he was, but nonetheless she did not seem to resent this possibility. Jane very perceptively realised that the images were like passport or ID photographs; James Mollison, the photographer, very deliberately used this approach, and did not use special lighting or processing of the images. They are candid shots and possibly the more human for it.

4. Rosie

Rosie was a very lively and expressive young German student, who was raised as a Catholic, but did not feel bound to Catholic doctrine. She had a religious faith, but was not observant. She liked science and saw it as a way of understanding and revealing knowledge through proof. Religion she saw as wholly separate not requiring proof, but faith alone. She was happy to compartmentalise the two, did not see them as in conflict but as separate.

She seemed enthusiastic, even excited as the interview began. She briefly described school, which she mostly liked although the later years and her exams she found stressful. She liked biology, but was not very interested in mathematics or physics, finding them difficult. She did not pursue biology when given a choice, but was still somewhat interested in it. She enjoyed learning about evolution, could not remember much of what she learned, but remembered how she felt which was excited, although that was not specific to the topic; she described herself as being *"excited by everything".*

Her account of evolution is specifically about humans and soon focused on human development and the role of technology; she described herself as one of *"the digital generation"*. She used a digital planner, explaining this as a need for structure. Interestingly,

she imagines life without her digital planner and responds *"We'd just be stuck in time, we wouldn't know what to do"*. Interesting also that the "*I* "had now become "*we"* in her account. Was she now seeing this from a wider shared, human perspective?

On showing her the timeline, like many other interviewees, she first noted the structure, its spiral form. She then described the early periods as *"empty"* but like Jane thought of what follows as growth. Her tone changed when she noticed the position of humans in the timeline. I had asked her if she noticed anything that surprised her and she responded:

> *It is quite surprising how, how just, how late we actually got to play in the whole evolution game. We are just right at the end, they all had fun before us. It's a bit unfair isn't it … I keep forgetting how much evolution happened before we came along. It always surprises me over and over again how much happened before we got here.*

What was interesting was her description of her continual surprise at the relatively recent evolution of humans, as though she has thought about such a thing often. This is unlikely to be literally true, she had not studied biology beyond compulsory education, but perhaps it connected to other unconscious ideas? Was it so surprising, perhaps worrying, that it was now associated with some other more familiar concern? She went on explicitly to voice the anxiety she seemed to be hinting at. *"It's quite a bit scary, there's a lot at stake, because the dinosaurs they have gone now."*

Now she expresses an existential concern, the simple line drawing connects with a critical and potentially frightening idea. Nothing is permanent, humans are vulnerable; one day we may no longer exist. Or perhaps more personally, one day I will not exist. *We* and I are again linked perhaps?

She then seemed to connect the ideas with environmental concerns:

> *It's interesting; which direction is the world going to go now? Because we have tons of water. Are we going to lose all the water and have just land? That would be interesting, because we have changed everything already, it looks like water, ice age and everything and land and we have built skyscrapers, a pretty massive difference,*

just because it is humans. Yeah, we have been here the least amount of time and we have already changed a lot.

On watching the Daniel Lee video, Rosie's first reaction was again one of excitement, enthusiasm. She saw it as depicting the evolution of humans from fish. On asking her if it reminded her of anything she said it brought to mind an image of a baby growing up, then aging to become an elderly person: a depiction of growth, development and decay. When I asked her how she felt about this, she said it made her feel sad as it was showed how little time we had. She made the comparison with what she saw as the short amount of time humans have existed. Then she revealed something surprising and very interesting, she confessed that she felt jealous of the next generation, who would experience life when she was gone. This was a bleak and sad note and at the time surprising from someone so seemingly enthusiastic and positive in her outlook and relatively young. She went on to talk about the future of human kind; how would we continue to evolve? As Jane had done in her interview, Rosie was worried by this, but explicitly put it into the context of environmental issues: would we destroy the Earth?

Like other interviewees, Jane being a significant example, she personalised evolution, Rosie saw it as something happening to her; she associated the ideas with personal growth and development, but also with the possibility of death, decay and an uncertain future.

When I showed her the photographs of the apes she expressed excitement once more. She loved the photographs and thought she would love to show them to her friends. She very soon noticed the unusual format of portraiture and expressed delight in the artist's choice of a presentation usually reserved for people. It reminded her of a full page portrait of Steve Jobs, CEO of Apple Inc., on a magazine cover and she felt these images deserved their own magazine cover. She said that the artist was attempting to show how like us apes are, but she was in no obvious way discomfited by this and did not deplore the possibly implied anthropomorphic nature of this depiction as Paul and Patrick had. In fact, she embraced the apes' humanity, as she perceived it, and was interested in the variety of emotion she felt she saw in the apes' faces. She described them as happy, sad, friendly, unfriendly, and angry even. There was some sense of discomfort, however; their humanity did not seem wholly

positive to her and she felt that some of the apes' portraits were alarming, saying she would not want to meet certain individuals, who appeared threatening in some way. In addition, she expressed some shame as one portrait reminded her of a local homeless man she had seen. She explained how she felt shame because she had associated the two, and she felt this was not a flattering comparison for the man. So, comparison of human and apes is not always welcomed, even for a person like Rosie.

5. Susan

Susan came across as a bright and chatty person. In her interview she was also thoughtful, tentatively questioning, I felt, sensitively in search of something. We began with her thoughts on primary school, Susan the little girl. She enjoyed school, was happy, with one briefly referred to and then later negated setback. She had started her periods in year 6, one of only two girls then starting that transition from child to woman, along with the other universal transition to secondary school. However, this is when her sense of belonging, sense of connectedness, started to become evident. She had been raised in an aspirational family. Her mother and aunts (no male relatives were mentioned) had few educational opportunities growing up, but had very optimistic ambitions for the next generation. Susan felt they believed in her and imbued her with a positive sense of her own responsibility and potential. She described her home life and family as *"peaceful"* and *"close-knit".* She was brought up in a Christian family but was no longer regularly observant. She had a young son and was very interested in education for his sake, as well as for own career. Family stories were important and she even had family members at school with her, in the form of her cousins. She was outwardly confident, describing herself as "*one of the most popular girls*" at secondary school, who looked out for others, seeing her strong family ties as almost obligating her to help others who perhaps did not have such strong support. However, she also expressed self-doubt in the interview both in the context of school and later. There was some contradiction; she was not wholly a "*peaceful*" person.

Like many other interviewees, she did not immediately remember learning about evolution at school but, again like some others, with prompting she did go on to remember Darwin and "*I remember the apes or monkeys and the picture. I do definitely remember the picture of the ape turning into a man*", although it is not clear if the source of this memory was school or wider experience. She went on to describe how she remembered "*battling with the concept that we came from an ape*". I interpreted this at first as her being uncomfortable with our potential close relationship to apes; however, what emerged was more interesting. She used the word "*battle*" now and later.

Emma *Do you remember that? Do you remember feeling that?*

Susan *Yes, I do remember. Even now I still think about it, the possibility, because as you get older you realise that there are so many possibilities so I do still battle with it, whether it's maybe it's a bit of all the different perspectives that they say made the human. Do you get what I'm saying?*

Emma *So, you are aware of the controversy then?*

Susan *Yes, the science, the big bang, evolution or …*

Emma *How do you feel about that though? How do you feel about the possibility?*

Susan *That we came from apes?*

Emma *That this idea that there is a link, that we haven't always been as we are.*

Susan *I believe that there is a possibility and I think they are, like I would say that I have pictures of me as a baby that reminds me of a baby monkey (laughs) so yeah, I wouldn't find it so hard to believe.*

Emma *Are you happy with that though?*

Susan *Yes, it doesn't actually bother me, I think monkeys are nice animals.*

Susan was not disturbed by our relationship to apes nor, as she goes on to express, any other animal. We looked at the timeline and she seemed puzzled "*but I don't see the*

monkey". I agreed there is no monkey or ape depicted but point out other animals. I asked her what she notices and if she has questions. She responded:

> *Well, you just do wonder why we are only came here? Why we didn't come any time before? That probably is what I wonder. From here, life emerges onto land so why couldn't we have evolved from then? Even though obviously there are dinosaurs around which would have been quite dangerous but there's still mammoths then. There were still dangerous animals around then, so yeah that's probably the only thing that I would wonder why it took us so long.*

Her thinking was still not wholly clear to me, but when we watch the video transformation together she returned to this idea. She was struck with the artist's interpretation of human origins. The transformation began with a fish and this seemed to resolve some of the disquiet she felt looking at the timeline and our late appearance in the world. She again revealed a feeling of belonging, a connection, but this time with other animals. What is unusual is the literal nature this connection seemed to take on. It was at this point I began to understand what was troubling her about the timeline. It was the idea that there was a time when humans did not yet exist. However, this was resolved for her, for if we have origins as fish then we have been on Earth longer then the timeline gave her cause to think, but in another form. We are the fish in the video to Susan at this moment. As was the case with Patrick, she is not differentiating between herself and the animal she was looking at:

> *It is interesting that we started off as fish in comparison to starting off as a monkey. Like I said, I'm very open-minded so I think that that is probably more possibility than us starting as monkeys because then that could explain that we have been around forever basically. I just don't know why we would have just come one day.*

It is clear from her further responses both that she was looking for answers and that she no longer finds the answers she found through her Christian upbringing satisfactory; again, the words "*peaceful*" and *"battle"* are used. She expressed a certain amount of disillusionment, which she attributed in part to her developing understanding of sociological ideas in her social policy studies.

I think because of so much of what you hear goes on in the churches and they are doing things for financial gain and sometimes that's just a nature of human thing but at the same time when something that's meant to be as religious as church, I think that's a bit too corrupt to be going on in somewhere that is meant to be so peaceful as such, so then that's why I now battle with, well, did we maybe just come from the bones of Christ (… indistinct word)? Is that really what I should believe?

I asked her if she is OK with considering other possibilities and she said she was happy with having animal origins; what did concern her is the when, the timing. Why did we appear at that time? That means there has been a time when humans did not exist; this is disturbing, but if we 'came from' other animals, then in some way we did always exist to Susan, which was reassuring. This was such an intriguing response; I had anticipated the possibility of hearing discomfort at animal origins, but Susan's anxiety was centred on not existing at all.

Looking back, working through the data over and over, psychoanalytical theory, both object relations and from existentialist schools, gives insights into Susan's response. Not existing is a kind of death; it is a reminder of the impermanence of life and the fact that the day will arrive when we as individuals will not exist. Drawing on Klein and Winnicott's ideas, the infant at first is wholly dependent on the primary care giver, usually the baby's mother. The mother, absorbed in the needs of the infant, responds and gives food, for example, the breast. The infant has the experience of conjuring up the fulfilment of his/her needs at will, but there is then a time when gratification is not instant; this is our first experience of loss, of absence. Joan Riviere, an analysand of Melanie Klein and a prominent British psychoanalyst, described this relational understanding of our first loss as "something like a death, a recognition of the non-existence of something, of an overwhelming loss" (Klein and Riviere, 1967, p. 9). As we grow up and emerge into adulthood we retain some link to this early state of dependence and so vulnerability (Phillips, 2007). The normal adult is at times fragile, oscillating between these states of independence and dependence, returning, at times unconsciously, to this first death. There is a connection here between the ideas of non-existence and death and unconscious fear of both.

I was intrigued by Susan's frequent use of the words 'peaceful' and 'battle'. Putting them together, I found a reference to 18th Century Jewish teaching by the Rabbi Schneur Zalman (www.chabad.org). The term 'peaceful battle' emerges from his teachings as a reference to "transcending the internal struggle which is the lot of all human beings". This struggle is between the divine and our animal souls. Susan's peaceful battle is of a different nature but equally profound for her; she does not fear the animal, but she is seeking meaning through a notion of animal ancestry, an explanation she can live with and pass on to her son.

6. Melanie

Melanie was a bright and articulate student in her 20s. She began her account with positive memories of science although with some indications of problems, which she went on to explain. She enjoyed school science and her interest was encouraged by her mother. However, she felt some glossing over or avoidance of science, particularly evolution, in her formal education, which she put down to the religious influence on education which she grew up with. She stated that she did not remember being taught specifically about evolution at school, but she was exposed to scientific ideas at home. The language she chose was notable; she found science "*fascinating*", "*interesting*" but in the same sentence this was moderated to "*quite enjoyed*" science. There was interest but also ambivalence.

When I introduced the timeline her first response was "*It is the evolution of human beings*". Melanie instantly saw the human in the diagram and for her this was all about us, an anthropocentric view. However, she went on to give a detailed and accurate description of the whole timeline. She noticed a great deal, far more detail than many interviewees, and there was a sense of direction and culmination in her account. She invested it with purpose. The culmination was human beings, with a "*massive jump from the formation of man into what we would consider the city*". The jump was small in evolutionary time but to Melanie large in significance.

I asked her if there was anything that struck her about the image. At this point she seemed excitable, speaking quickly and laughing nervously as she described her real surprise at the

length of time depicted in the timeline. What follows is a description of what she directly sees and her interpretation of it. She both described time as stretched to be "*super long, ridiculously long*" and then highly condensed in her description and associations:

> *The only thing that jumps out is how long it took from the simplest sea formation for them to go from the sea to actually going onto land, but I knew that took a very long time. I didn't know exactly how long it took but it seems that it took a super long, ridiculously long time.*

She then starts to apply some of her biological knowledge in an interesting way, in a temporal sense; she describes mutation and inheritance, short steps in the process of natural selection, not elements requiring huge periods of time, just one generation. However, she understands that for the new trait to become common it then takes time; short and long time periods merge in her account.

> *Yes, well that's the whole form of evolution and why we talk about how it takes millions upon millions upon millions upon millions of years for certain traits to evolve and for Man to evolve or for anything to evolve because how long it takes for one single mutation to form and where you can actually have that trait be passed on to the evolved state where it is now something that happens all the time.*

When I ask her what it reminds her of, she described a science fiction film. In her description time was condensed, she saw something that needs an unimaginable amount of time, now occur over a human timescale:

> *Have you ever seen the movie* Evolution*? That's what it reminds me of. It is a very funny movie. Very condensed movie. It kind of reminds me of that. It is basically an alien asteroid falls down to earth, goes into a cave, fills the cave with toxic carbon gas and basically this whole of evolution that should have taken millions upon millions upon millions of years happens in a couple of days. It's a sci-fi film but it's a comedy sci-fi and it reminds me of that. Going from the very simple formed organism to sea creatures within a matter of days as opposed to the millions of years that it*

should have. These creatures evolved far, far, far, far quicker than they should be able to. I see that and I think of the movie.

The film is "*condensed*"; is this a more manageable depiction of time? She denied any emotional response to the diagram "*It's just how it is*", but this was to some degree, at least, contradicted by her sense of excitement. Although I am not able to say with any certainty if this response was positive, negative or even definitely connected to the picture, her account was frenetic at times. Like her description of time, I felt a stretching and a condensation of her thoughts like a rapidly oscillating waveform.

We watch the video together and again she sees the story of us, human beings; it is "*the evolution of Man*". Again, she gave a rich and detailed description of what she saw. She viewed the artist's intention initially as one of denying a creator; however, very insightfully, she probably gets closer to the truth when she explained she sees it as a depiction of connectedness: "*we did form from other beings … we are all connected, everything is connected*". What she said next took me by surprise. I asked her if it reminded of her anything and she explained it reminded her of Intelligent Design, which she put down to her religious (Christian) upbringing. She described herself now as agnostic, but said that she had been brought up in a religious family and a wider conservatively Christian culture. She described the video artist, sketching, revising, creating. This idea appealed to her because she wanted "*to hold onto this great idea that there is something more, something greater*". She wanted to see evolution as the how not the why, as a process of creation with humans as the end product, using the metaphor of the sketchpad, the variety of life is "*just different sketches*".

When we go on to look at the ape photographs, Melanie became calm and thoughtful. I asked her what she thought the photographer was trying to achieve. Similarly to other interviewees, Melanie saw an appeal, to her with the aim of stopping poaching. However, in my introduction to the images I had mentioned the context in which they were taken, so this was a likely connection for her to make. Her reaction to the appeal she saw was in contrast to some of the other interviewees, particularly Paul and Patrick, who had felt manipulated and had had an issue with what they saw as anthropomorphism. Melanie saw

a human connection; she reacted to the images as though they were human; she felt sadness, empathy for their perceived plight, describing them as "*lost children*". She wanted to acknowledge a possible shared experience. Her description of them as she thought began to feel like a narrative, a highly anthropomorphic account of the thoughts and experiences of these animals, their story. I ask her if she has feelings about any particular individuals:

Melanie *I guess a particular one, one that is going to stand out, was going back to that one.*

Emma *Why that one?*

Melanie *Because it seems lonely and it seems very … in the same way that a person would have this look if they have had so much sadness going on they just accept the way things are. It seems that, but on the other hand it is just going, well that's just kind of how life is. And then you have this one that's kind of really happy. Even in its eyes you can see that it is really happy.*

Emma *Which one?*

Melanie *That one right there.*

Emma *Oh yes.*

Melanie *You have some of them that's overcome sadness. You can see that they are trying to find the happiness in everything, but they all just seem very sad, very lonely, very lost. I think it's emotions that anyone could connect to. You kind of feel angry in a way that this could happen to them.*

This connection could be seen to be at odds with her seeing human existence as the central, teleological outcome of evolution in the earlier image and video. However, this anthropocentric inclination does not exclude our connection with other creatures for Melanie, or is it that in seeing the apes as human, the story is in effect 'all about us' again? She was projecting or externalizing humanity in a way that gives purpose, gives meaning; they have feelings like us, they have a story, they can be saved. The omnipotence of humans

could be seen as defensive, if it is 'all about us' there is meaning, there is purpose; maybe there is a plan and we are central to this plan.

I asked Melanie if she had any overarching feelings about what she had seen today. She immediately responded:

> *I guess inter-connection. That everything is an inter-connection. That you can't have all the history, all the evolution, all the feelings, all the emotions, everything is connected. It is an overall loop of continual loop of evolution and evolving and emotion from the very simplest form we are still connected*.

For Melanie, the meaning is in the connection; there is a sense of purpose. The flip side to this connection and the humanity she sees in the apes is the sense of responsibility. If we are connected to other beings, other things in this way, if apes feel like us, then we have a responsibility. Melanie is comfortable with this; she finds comfort in the connection. Time makes itself felt again.

She explained her thinking by describing the plot of a book:

> Melanie *I'll talk about a book. It's called* The Sound of Thunder *and it's basically a man is in a certain time and they have time machines and they can go back into history and they can hunt big game, they can kill dinosaurs. But they only kill dinosaurs that are destined to die anyway. So they check that the dinosaur is going to die within a few minutes. They are very careful. Everything is laid out. You have to be on a certain path. The bullets have to be collected after you have killed the dinosaur. The dinosaur has to fall in the same place it would have died naturally. At the beginning of the story someone has been elected and everyone is like, 'Oh thank God that this person has been elected; the world would have been horrible if that other guy had been elected'. They go back, he gets scared because the dinosaur scares him, he steps off the path, and he steps on a butterfly. Just one simple butterfly.*
>
> Emma *Oh, and the butterfly dies.*

Melanie *The butterfly dies and is crushed on his foot. They don't think that anything has been changed; they think it's fine, that all is good. They go back to their time and everything of their history has been changed. The guy that they didn't want elected has been elected; everyone is so happy that he has been elected because he is going to bring about this form of change and it is so great. The whole entire universe has been changed simply by the fact that he stepped on one butterfly. One butterfly, nothing else. One simple butterfly. And everything has been changed. And it just goes to show that one butterfly with a single flap of its wings has an effect on everything that we know.*

In this fictional account humans can control time and even a small action of ours can have tremendous consequences. However, our power is limited; we cannot control the outcome, everything is connected so everything/everybody is important, we should take care. This seems to me to encapsulate how Melanie has made sense of the existential issues a concept like evolution confronts us with. I think it could be argued that although she no longer adheres to the Christian faith in which she was brought up, it can still be felt in her personal philosophy: our connectedness, our responsibility for each other, the need be a good person. She finds comfort in the story of interrelatedness; she says "*I find it a thought that should provoke you to be better*".

We all struggle at times to make sense of things that seem senseless. Melanie no longer has a defined faith but she wants to think there is more than just existing: "*I want to believe that there is something out there, that there is something more*". Like Paul, she is comfortable with complexity; it is for her this complexity, the subjectivity of others, that gives meaning and keeps isolation at bay. We are individual but we are also all one, so we are never alone.

7. Dhruv

Dhruv was a physicist and trainee science teacher. Listening back to his interview he unconsciously identified himself as the latter in his first sentence "*OK, I am trying to answer*

this question, why is evolution difficult to learn in my head. I want to answer it for you." We had just met and I had given him only a brief introduction to my research project and the interview. However, from the very start he wanted to answer a question, but also most specifically answer it for me. This seems so significant when I listen again to his interview. I felt that he was signalling that as the scientist he wants to 'work out' the answer, but then use that knowledge to help me, give me information, in other words, take the role of teacher. Britzman and Pitt (1996), in their own study of beginning teachers, note how the student teachers they worked with, when discomfited by unconscious feelings and reactions towards knowledge and learning, enact a "rush to application" (Britzman and Pitt, 1996, p. 123). Such student teachers immediately play out their teacher identity, seeking a solution, the correct answer in the face of a perceived demand for knowledge. Britzman and Pitt regard this as response "provoked by the press [sic] to master identity" as the former child-student wrestles with the reality they are now the teacher (Britzman and Pitt, 1996, p. 123). This is a form of transference as the past experience of education is unconsciously conjured up by new experiences. The timeline of learning constantly moves backward and forward; childhood memories of school live alongside the adult teacher's reality of the classroom.

On reflection, I am also wrestling with my identity as teacher, interviewer and student, which led me I suggest to make a mistake at this point. Taking back the role of teacher, the desire to maintain control, I recount the scholarly understanding of why evolution is difficult to learn, with ideas drawn from the literature for his edification. I shut down his desire to find the answer and to teach. However, the initial interchange still persisted in our minds, like a dream floating at the limits of our conscious thinking, and made itself felt in the remaining interview.

Dhruv went to what he described as "*good schools*". These were a fee-paying prep school then a well-known independent boys' school. He had just finished a piece of writing for his university course reflecting on his own school experiences. He explained he had left this to the very last minute to complete and had written it quickly in one sitting. Although he did not describe it this way, it was as though it had caused him pain and he had wanted to get it over with. He certainly recognised the emotional experience of education, of learning: "*I just*

wrote from my feelings, my emotions, I didn't think about it too much". As he said "*maybe that was good*".

Thoughts can be painful. The psychoanalytical theorist Wilfred Bion developed a theory of thinking built on the idea that "the capacity for thinking is developed in order to come to terms with thoughts derived from one's disturbing emotional experience" (Ogden, 2014, p. 91). It was Bion's notion that thinking is developed in order to cope with thoughts. At times these thoughts are too much for us and we resist thinking. Thoughts in this sense are primitive sense experiences, fragmentary and incoherent, disturbing and anxiety provoking. They are ideas in a raw form not understood, not yet worked through, difficult and sometimes resisted. In Dhruv this came across as a resistance to words themselves, to completing that working through and putting his school memories down on paper. This idea intensified as he talked about his memories of struggling with language at school. He was a mathematically gifted student, but he struggled with reading at primary school, found English lessons at secondary school challenging: "*I never knew how to be good at It … I didn't know how to make my essays better*".

However, science was good; he felt his strength in the subject lay in his ability to appreciate the interconnectedness of ideas; he could creatively find links which really helped him excel. However, like so many of the interviewees I talked to he could not remember learning about evolution at school, even after prompting. What he remembered was physics, "*glimpses of practicals*", this seemed consistent with someone who found words difficult, the practical and hands-on activities constituted his strongest memories.

We looked at the timeline together and at first he seemed very confused and unsure of what he was seeing, as though he could not take it all in. He was a very intelligent, scientifically literate person undergoing teacher training to become a science teacher himself, but listening to his description and reaction to the timeline, it was as though he was seeing something for the first time. His understanding of evolution was fundamentally challenged. He spent a moment assimilating what it revealed to him; like Paul, he was puzzled by the spiral form; he thought about evolutionary time as linear, thinking in straight lines. Then it began to take shape and he followed the story it was describing, life in the sea,

then life on the land, "*life getting more built up … busier towards the end*". In his imagination the process would have started with the dinosaurs, he had no notion of anything before. I ask him if he is surprised that we appear so late. He responded:

> Dhruv *That is surprising. That would change what I thought initially. Yes, that is surprising. And I would remember that. I guess if I saw, were told about how many years ago the dinosaurs existed, that is numbers, and then you can compare it to, I don't know, when there was first life on Earth, you could compare the numbers and then go …*
>
> Emma *But it's very abstract, isn't it?*
>
> Dhruv *You can't have an appreciation of it.*
>
> Emma *No.*
>
> Dhruv *Because the relative thing tells you a lot.*

Dhruv took shelter in numbers. I asked him if it reminds him of anything; he responded:

> Dhruv *It felt futuristic, as if I am looking at something that is going to happen in the future?*
>
> Emma *Well, this might seem like a strange question. How does it make you feel? Not just the image itself, but also what we have discussed about it. Do you feel anything? Do you have any emotion?*
>
> Dhruv *Insignificance because we have only been here such a short time. But then, yeah, insignificance, and time is this big scary thing.*

As he was a physicist, who would be familiar with time as a concept and on a very large scale, I was surprised by his reaction, but as he explained, in physics time is represented by numbers, calculations: "*your emotions never get involved in the calculations*". Now he confronted the words, the idea not numbers – time relative to human existence. Like Jane he saw through the rent in the curtain of his reality, a different reality emerged which seemed to leave him on a precipice:

> *This seeing that the relative, so initially I thought it was something else, and then I realised, there was a realisation that OK, humans have only been there for that time and I could think about it in a positive way and say, I feel like if there is only this much time then what is going to happen in the future? It makes me think about the future, how we are going to evolve and how human life will change, but it feels a bit scary at the same time. My mind is blank. I don't know what is going to happen. I don't know if that is because there is almost like a cliff there*.

Dhruv continued to think about the implications of what he was seeing and saying and, like many other interviewees, he made a connection with science fiction, which he enjoyed, liking "*the fantasy element of the future*". Now, the future is made fiction it felt safer, reality and fantasy blend, making his mind "*blank*"; he could expel those thoughts, he no longer needed to think about existence.

We move on to the video and I asked him what he thinks it is about. Once again he was puzzled.

> *That we have evolved from very basic creature, but it is a creature that we have here today, and that's weird that we have come from fish and we now eat fish and we see them as primitive and we do what we like to them. Then the, as the thing was evolving, or metamorphosing, it kind of, I think I noticed it started looking at the camera. It was like it was being (*indistinct*), and I thought its face developed to more human-like, and the more towards a human face it became, I thought it was becoming more intelligent for some reason. I thought there's a, when I started recognising, it was looking at the camera and then it was becoming more human and I thought it was becoming more intelligent but also there is a personality there, there was a being, they have become a being, they have become …*

He found it difficult to resolve the idea of being related to fish and eating fish. Dhruv was raised as Jain; although not fully observant his understanding of life on Earth has been shaped by its philosophy, including vegetarianism, and may account for his personal identification with something that many humans eat. We were fish and now we eat fish;

that is potentially problematic for him. However, intelligence is still synonymous with being human; we are still different. We have being, we have become.

When I asked him if it reminds him of anything. he talked about science fiction again, creatures that can "*transform into anything*", impermanence, illusion. The inference was can you believe what you are seeing; is the creature what you think it is? However, he took a different direction next. The face of the ape-like creature became aggressive, had intent, a plan; he thought about the *Planet of the Apes*. I asked him how he was feeling and he says confused:

> *But it's kind of, there is a bit of, I know evolution has happened and, but it is just seeing it in such a visual way and in such a short time span; it makes you feel like it's a very powerful force and that it is almost a realisation that even though you know it as facts, it's a realisation that it has happened. We have changed from those things*.

Finally. we looked at ape portraits together. His initial reaction was defensive:

Dhruv *So maybe I feel defence. And I don't know if those always happen together. I think there is aggression there so I feel defensive.*

Emma *I don't know. But you feel that some of them at least, that there is an aggression in their expression?*

Dhruv *Yes, because they are looking right at you and you know that they are powerful beasts, you know that they are dangerous and so I feel defensive and some of them look friendly.*

Emma *Who looks friendly?*

Dhruv *This one.*

Emma *Yes.*

Dhruv *And these two look like they have had taken something. They look like they are really smart and they look like they are planning something and they look like and you know that they are dangerous the way they can move and*

> *actually some apes are supposed to be three times stronger than men. But then at the same time it feels like there is a bit of a stone coldness, so there is intelligence but they don't have human values.*

I think of Freud's wild beasts representing the bestial in humans, the untamed and irrational. "Wild beasts are as a rule employed by the dream-work to represent passionate impulses of which the dreamer is afraid" (Freud, 2001, p. 410). But I also thought of the uncanny valley response, a person's response to human-like features, often discussed in the context of robotics, which abruptly shifts from affinity to revulsion when the features approach but fail to attain an actual human appearance (Feng et al, 2018). However, as we continued to examine and discuss the images, Dhruv began to see the apes' diversity and they seemed less threatening:

> *I mean it seems that there is a lot of diversity. I guess that you think of monkeys and apes and then there's chimpanzees as well, but you kind of group them all in one almost. There seems to be a lot of diversity within that species and maybe you could put a human face next to that and you know, the difference between that face and that face might be the same as the difference between that and a human face.*

He brought up *Planet of the Apes* again, a theme in my interviews identified by a number of interviewees. Once again, Dhruv linked intelligence with human values. Caesar the intelligent ape in the film is distinct from the purely aggressive apes that take up arms against the human race in his interpretation of the film.

Finally, I asked him if he has a personal faith, which is when he revealed he was brought up as a Jain. He was no longer observant but admired much of the philosophy. He said he felt "*like I can be agnostic*". Jainism does not require belief in a deity. However, Dhruv seemed to want to believe in something, he was still looking for the answers "*I believe there is something. I feel like Jainism doesn't ask you to believe in something*".

Our interview ends. Dhruv was a scientist and a teacher, as am I. Human identities are at times fragile; we sometimes feel the need to reassert them or to hide by our professional persona. Existential questions about time and human existence challenge our sense of

selves, but we were thinking, dealing with thoughts together in this interview. I have learned much from him; I hope he would say the same.

8. Zara

Zara was my first interviewee and possibly the most difficult and also the most memorable. I found her insights and ideas profoundly moving, disturbing and enlightening in equal measure. She has helped me develop how I think about teaching and learning about evolution, the unspoken implications of belief in the science classroom, our responsibility as teachers with and without beliefs of our own. We each come from very different experiences and positions concerning biological evolution. Zara was a devout Christian with fundamentalist beliefs; I am an atheist and find nothing but joy and wonder in the idea of evolution and its role in creating the diversity of the natural world. Nonetheless, we also had common ground; we are both biologists and teachers. Most importantly, I have learned so much from my encounter with her. Zara is the only fully observant person of faith that I have included in my in-depth, Gestalt analysis. My intention was not to look at the role of faith in influencing people's attitudes to evolution, but to look beyond that to existential concerns. However, Zara's account, although coming from a creationist Christian perspective, which reveals some important issues for educators about teaching students with a personal faith, also itself signifies important universal issues.

Zara was a biology PGCE student, completing teacher training in secondary school science. She expressed a love of biology, focusing a particular interest on "*how things come about*" and "*where did all this, where did it all come from?*" She was questioning, looking for answers. I cannot say whether this was a natural aspect of her personality or not, but I suspect that being faced with aspects of science that she would be required to teach that did not match her own worldview may have played a part in her questioning and seeking answers at this time.

Very quickly in the interview she revealed that she was feeling conflicted about evolution, but that this state was not new. She remembered learning about evolution at school and the issues she had with having to learn and understand something she did not accept, in order to pass an exam. She remembered feeling confused at school and that now as a science teacher herself she still finds it a difficult issue. Her first instinct was not to allow her emotions to influence her as a teacher, but it became quite obvious in the context of this interview that her feelings about evolution were deep and profound and that she was trying to find some form of reconciliation. I think the interview itself and the act of teaching science as a student teacher both confronted her with "*something I have tucked away for a very long time*".

She went on to describe her experience at school and its ongoing impact:

Zara *I felt confused and I also felt a bit sad I think, because after I had learnt about evolution at school, because I had built my own hopes up about what happened and I felt like it was being, it was almost being taken apart.*

Emma *Yes, yes.*

Zara *If that makes any sense, because I felt this is what built my faith up and science was taking it apart, taking it away from me. If I am really honest.*

Emma *Sad … Would you go as far as saying, like a bereavement, because there is a loss?*

Zara *Um yeah, because it, I had to, almost because I had to build up my faith, because that bereavement or loss leads you to start questioning. It leads you to start questioning why does the Bible say this and why does science say this? It's like there is some sort of gap, a loss, someone is taking something away from me which I value, which was my understanding of how the world came about. Because from the Bible and from what I was taught in Sunday school, it didn't stem from this evolution of organisms happening millions and millions of years later. It was almost like everything happened at once, so then it's such a massive switch …*

> *I think what I was trying to say was science was almost taking away, uh my idea of what I thought life was. And taking it apart and introducing this new concept of evolution and in a way if you explain that to a child who has grown up in a very religious home, it's sort of taking that away from them, like their foundation, what they have built life on, if that makes sense.*

Listening back to this I ask myself, am I pushing my own interpretation of her words onto Zara, when I liken her feelings to bereavement? I feel I had taken a risk, but listening to her account, her feeling of loss is so palpable. She was expressing a sense of hopelessness, loss of purpose, meaning and identity. She felt without foundation. She was questioning what is the truth? What is a real? And, I think, she was experiencing a sense of responsibility. She has been exposed to a reality different from her own and apprehended that she is responsible for finding her own answers to the questions this experience brings.

Zara also ended here with a question for me. Did what she says make sense? As she was describing it, to me it made perfect sense. That a child whose foundation had been removed would feel confused and sad, would feel loss. However, I think she was also asking herself that question, trying still to make sense of her experience.

We looked at the timeline together; she described activity in stages, seemed surprised – like so many of the interviewees – that there was so very much time involved. She noticed humans on the timeline: "*I have found us right at the end*". Something about the way she said this makes me feel that it was an end in other ways too, an ending of something for her. She reflected that "*it doesn't make sense to me*". Then she stated "*I am a scientist and a biologist and I will teach it because I do not ever disrespect someone else's views*". Here, she seemed to be worried by her own response; felt a conflict between her identities as a Christian, as a teacher and as a scientist. She said she was now able, at least to a certain extent, to integrate her own beliefs with the ideas of science. So, for instance, she explained that God time may be different from human time, a day for God something different from human experience, thus allowing more time for creation than seven human days. Many Christians accept the creation story as a parable and are able to synthesise their faith and their understanding of the natural world into a coherent worldview. However, Zara was still

struggling; so profound was her experience as a child that she still spoke for that child "*When I was a child I felt I was crushed because I was like, this what I believe in, you know*".

Ironically, some of Zara's conflict appeared to originate from her positive, significant relationships. She felt that important adults, her mum and her science teacher, both of whom she respected and trusted, were telling her very different truths. For a child this could imply a trusted adult was lying to her, things were not necessarily as they seemed. The complexity of the adult world was intruding into her existence. As a child the subjective nature of the experience and knowledge of others may not be fully appreciated, and the splitting of concepts into dichotomous categories – good and evil, truth and lies – is more likely, rather than seeing the complex reality of belief and knowledge. It is therefore more difficult for a child to make the adaptation to incorporate and synthesise seemingly differing ideas, particularly if these ideas are fundamental to their understanding of their world and their identity. This account made a lasting impact on me as it gave me a new appreciation of our responsibility as educators which Zara herself went on to describe:

Zara *I am also training to be a science teacher and that is scary because the person that confused me once, almost, I am now becoming.*

Emma *Do you feel responsible then*?

Zara *I feel a huge responsibility. I think a few weeks ago we had to fill in an evolution sheet, whatever it was, and it just brought me back and I thought wow this is such a huge responsibility, how that science teacher made me feel. Not that she was a bad person or whatever, I may potentially make a child feel like that, just by introducing the topic of evolution, you know, and it is quite … I have been actually dreading the whole, dreading it when I have to teach evolution, because I just don't know how to.*

I asked Zara how she will deal with the topic in her own teaching. Her response was that she will detach her emotions to do this. At the same time she was acutely aware of the potential emotions of her learners – a possible contradiction, a denial of her own feelings but an acknowledgement of others. I wonder; will this in turn lead to the splitting of the

curriculum? Is there by implication such a thing as good knowledge and bad or dangerous knowledge? Tamara Bibby suggests that "Education splits good and bad knowledge". She goes on to say that a prescribed curriculum "can feel relatively safe to engage with. Owning our own notions of what is worth or unworthy of being known can give more trouble" (Bibby, 2011, p. 108-109). By implication, we may all be making unconscious decisions as to what constitutes good and bad knowledge, something worthy of teaching and learning. It would not be surprising if evolution was felt to be bad knowledge to someone like Zara.

I believe psychoanalytical theory can suggest further insights. Deborah Britzman, recalling the work of Anna Freud and her interest in education, has discussed transference in the classroom. She suggests Freud is saying that the idea that past experiences and relationships are projected onto our experience of new interactions occurs in teaching: "Unexpectedly, new experiences conjure old ones" (Britzman and Pitt, 1996, p. 117). Britzman goes on to explain "The classroom invites transferential relations because, for teachers, it is a familiar place, one that seems to welcome re-enactments of childhood memories" (Brtzman and Pitt, 1996, p. 117). Was Zara hoping to put right a wrong she herself experienced? Is teaching an act of transference for her? She was certainly very aware of the need to respect differing opinions and was happy to discuss these in the classroom, but was cautious regarding sharing her own views, not wanting to impose her own ideas:

> Zara *If we are all going round saying what we believe in and they ask me, then fair enough but if I can see a child is trying to seek some sort of, I dunno, seek some sort of answers and in terms of what they need to be, I will be very apprehensive in telling them because I don't want to be responsible. As much as I would have loved to share my faith and what I believe in, in that setting I wouldn't feel comfortable in imposing my ideas.*

We moved on to the video and as I am setting this up, Zara remarked "*Nobody has actually spoken to me about it like this*". I have the sense that becoming a science teacher is conjuring up an old experience and Zara was valuing the opportunity to explore how she felt about it.

After watching the video we talked about the implications it may suggest for the future of humans, a common theme in my interviewees' responses. Zara asked "*What will we become*?". She linked this question to knowledge that is difficult for her to comprehend – that we are related to apes: "*the whole evolving from apes to humans*" and "*why are apes still apes*?". This implied a fundamental misconception about the process of evolution which was unusual in a biologist, but was more understandable when one appreciates Zara's ambivalence toward this topic. She had assimilated scientific ideas into her worldview but the gap in her knowledge indicated that this assimilation was not complete. I suggest that she may have repressed these ideas, at least to some degree, and what she was experiencing now was a kind of deferred action. Deferred action is a concept developed from Freud's work on trauma. Pitt and Britzman describe it as "a psychoanalytical concept that heightens the problem of how emotional significance and new ideas are made from past experiences" (Pitt and Britzman, 2003, p. 758). In short, it is the idea that the emotional significance of an event may not be fully felt at the time but that its effects are deferred. This may be because a person does not understand all the implications of the event, perhaps because they are too young. As an adult and a becoming teacher Zara may now understand the importance of her own experience and feel ready to examine this experience of evolution in school again.

Zara described her impression of the video; time seemed compressed in her mind. Despite noting the vast time involved when looking at the timeline, she also had then talked of evolution taking "*several years*". Then again she described "*a few years*", then corrected this to "*many years*" of evolution. Was this an attempt to contain the idea? She talks about "*we*" all being evolved. We, as in us, personally, individually; perhaps this can this happen to an individual. Was she perceiving instability in human identity? Certainly, this could be a potential source of existential concern.

I asked for her impressions of the film and the artist's intentions as she perceived them. She said she thought "*he is just throwing ideas out there*". She explained she is not discomfited by what it could suggest but again worried about a child viewing it; she was concerned that a child who has been brought up to think something else will be "*confused*". There was projection of her experience onto another potential child. She very insightfully then used an

example from the opposite perspective of atheism, an experience she had in a primary school when observing a lesson.

Zara *When I did my placement in a primary school I had this amazing girl.*

Emma *Child?*

Zara *Yeah, child in my classroom. They did RE and she told me her parents are atheists. I was in the class and obviously I don't show my religious views in my classes but um she was just literally like "Miss, my parents, my mum says there is no God". She was only about eight in primary and then she said "but they are teaching about God and all these things".*

Emma *That is confusing in the same way really.*

Zara *Oh my gosh, when I left that lesson I was so confused. I didn't know what to tell the child and she was like "They're telling, this teacher is telling me so much about God and my mum is saying no it didn't happen like that, so miss what should I believe?".*

As a result of her own experiences, Zara probably appreciated more than most teachers the responsibility incumbent on her in these circumstances and as a novice teacher felt quite overwhelmed as a result. This interview was memorable, in part because of the questions it generated, for instance, questions about how educators should help children negotiate difficult knowledge and how can we recognise and positively use the transferential episodes experienced in the classroom (Britzman, 1998; Britzman and Pitt, 2003).

I showed Zara the portraits of the apes. I asked what they make her think about. She was somewhat hesitant in her response; she made the connection with evolution, probably because that had been our topic of conversation. She said "*they make me think about the fact that scientists say from theory that we have some sort of connection with them*". Scientists were saying this, but she is not so sure. She also was lukewarm in her acknowledgement of the apes' similarity to humans, whereas for some of my interviewees, this similarity is remarkable. Zara only goes as far as to say "*If you look carefully you can see*

some sort of resemblance". The likely reason for this becomes clear in what she went on to reveal next.

I asked her what they remind her of and it is evident that she was wrestling with some thoughts that she was unsure she could share. Eventually she said "*They also remind me of insults … like people referring to people looking as, like monkeys*". Zara was a person of colour and she was reluctant to recall this experience out loud and thought "*it's crazy*", but what she said actually makes so much sense. The victim of racist remarks, it is not surprising that these images of apes, so human and yet so Other, reminded her of the feeling of being made to feel Other herself.

Monique Scott (2007) looked at responses of museum visitors to evolution narratives in exhibitions on human evolution. Scott's findings revealed troublesome aspects of the 'leaving Africa' trope that are relevant to Zara's experience. Her research indicated "many museum visitors interpret human evolution exhibitions as linear, teleological narratives of progress from bestial African prehistory to a civilised, European present" (Scott, 2007, p. 1). The implications of this "color-coded progress narrative" (Scott, 2007, p. 118) are clear and part of the lived experience of people of colour, like Zara.

Scott's conversations with black museum visitors in the UK, USA and Kenya reveal a common perception, expressed very clearly by one visitor, that "evolution is racist" (Scott, 2007, p. 113). Scott's conversation with a group of three black school children in a London museum shockingly echoes Zara's experience. She had asked them to draw their impressions of what our ancestors looked like; the boys described these as ape men or cave men. One boy drew what his friend pointed out was a black man. Scott questioned this asking whether they thought it was a positive thing that the ape men, the ancestors, might be black. The child replied "No, 'cause they were monkeys. If you come up to white people in school, they call you a monkey" (Scott, 2007, p. 123).

What Zara's interview revealed for me was that the complexity of the issue, teaching and learning about evolution, was far greater than I had once appreciated. This should not actually be that surprising given the complexity of human experience, identity and meaning making, but it felt like unknown layers upon layers of meaning were being exposed in a way

not considered by myself previously or, I would argue, by the great majority of other studies on the subject. In only looking at the issue of non-acceptance of evolution in terms of faith, we risk limiting ourselves to a very unidimensional understanding.

Appendix 8

Interviewer reflections post-analysis

These notes are not exhaustive but encompass my reflections following the Gestalt analysis. They give an indication of some of my thinking during the process of analysis.

Paul

I experienced Paul's interview as a coherent narrative, a sense of a whole person in Paul's ideas, descriptions and reflections. However, intuitive inquiry, an approach that focuses the mind on all the senses allowed me to use intuitive thinking in response to his words. I am hesitant still to acknowledge this but it led to me feeling something was obscured in Paul's account. This may just reflect a failure in communication or my understanding, but intuitively I feel he denies the idea of the animal aspect of human nature, but in the most subtle and intelligent way.

Patrick

Patrick was an interesting and complex character, but I felt he was also hiding in complexity, hiding in thought. The essence or Gestalt of his interview encounter was difficult to pin down; he was elusive, not wishing to be known? In reading my interview I feel I tried to pin him down to put him in a box, which I am glad he evaded. I see this is an error on my part, I was too directive but ironically in this case, it may have encouraged his own meaning and identity to be revealed even more strongly.

Jane

Jane allowed me to see her vulnerability, which showed an amazing trust for which I am very grateful. This vulnerability seemed to open up her thinking, revealing a window on her thoughts about life and origins. I felt her overwhelming feeling of responsibility for others, primarily her children; the word responsibility kept coming to me during and following our meeting. On looking back and analysing her interview another word, transitions, seemed to sum up much of what she described. I also remembered my own transitions, the fear of

growing up, through transitions at school, but also on becoming a mother myself; for me motherhood symbolises the ultimate leave taking of childhood.

Rosie

Rosie was a contradiction to me, manifesting excitement but also anxiety. Her enthusiasm felt at odds with her descriptions of her fears for humanity, her consideration of her own mortality. At the time, I felt the enthusiasm and excitement most strongly, but reading and listening back to her interview, I was more aware of something I cannot quite put my finger on. She seemed very open, instinctively responding and curious, but I have a sense of something obscured. It may just be the mismatch between her words and her demeanour, light and shade.

Melanie

I was slightly late for Melanie's interview which meant we started from a less positive position than my other interviews. She was bothered by my lateness and I felt a little detached from what she was saying at the time. However, on the repeated readings of and listenings to her interview I hear a rich, unguarded account of her personal philosophy on life. I am not sure what the impact of our slightly rocky start has had on her account, but I do not feel she was holding back as I did in some interviews. She is comfortable with her irritation with me and it becomes integrated into our conversation at one point, but in a constructive manner, when she talks about small things having potentially large effects. What might be the impact of me being late she asks? Good question.

Susan

The 'peaceful battle' was a phrase that remained with me following my interview with Susan. I had felt a struggle within her. She seemed to be looking for a solution to a profound question, where do we come from? And who has the answers? This questioning was for herself, but also for her son; like Jane she felt responsible for providing answers for her child. I notice that my common response to interviewee uncertainty or answer seeking is that I try to provide answers, be the teacher or parent. I am not able to fully tolerate their uncertainty.

Dhruv

When I spoke to Dhruv and listened back to his interview I was puzzled. He seemed a person of contradictions. He was a scientist, a trainee physics teacher, whom I would have predicted would be both familiar and unperturbed by the visual depictions of evolution and great apes I showed him. He had also been brought up as a Jain, so I would have thought he would have been comfortable with the connection between humans and nature and the endless cycling of life. However, he seemed more puzzled and disturbed by the depiction of apes than most people I interviewed. This highlighted for me the danger in the assumptions we may make. In listening deeply and going through multiple cycles of analysis, as I described in Chapter 3, I can see the complexity in Dhruv's position. This has been a significant learning point for me as a researcher. It has highlighted the need for a deep and unprejudiced examination of rich data such as these.

Zara

When I first encountered Zara I made the mistake of thinking that because she had a very strong faith and a creationist perspective she could not help me understand the existential concerns that I had come to believe are possibly at the heart of some ambivalence towards evolution. I did not want to examine the role of faith in evolution acceptance, much had already been written on that. However, I have also come to realise that she was still trying to answer the big questions that had become so confusing and conflicted for her. Her position was one of an ongoing attempting to understand existence, although now expressed in her concern for her own pupils. At first I was just aware of the burden of responsibility which was so palpable in her account, but now the questioning and search for answers that she expresses are apparent.

I think it is significant that our interview ended with her describing her student's potentially existential concerns, what happens after death? Is God even real? Are we alone in the universe? Questioning and seeking answers.

Appendix 9.1

Leading education and social research
Institute of Education
University of London

Ethics Application Form: Student Research

All research activity conducted under the auspices of the Institute by staff, students or visitors, where the research involves human participants or the use of data collected from human participants are required to gain ethical approval before starting. *This includes preliminary and pilot studies.* Please answer all relevant questions responses in terms that can be understood by a lay person and note your form may be returned if incomplete.

For further support and guidance please see accompanying guidelines and the Ethics Review Procedures for Student Research http://www.ioe.ac.uk/studentethics/ or contact your supervisor or researchethics@ioe.ac.uk.

Before completing this form you will need to discuss your proposal fully with your Supervisor/s.
Please attach all supporting documents and letters.

For all Psychology students, this form should be completed with reference to the British Psychological Society (BPS) Code of Human Research Ethics and Code of Ethics and Conduct.

Section 1 Project details			
a.	Project title		Why is evolution difficult to learn? the role of affect
b.	Student name and ID number (e.g. ABC12345678)		Emma Newall NEW05017856
c.	Supervisor/Personal Tutor		Prof. Michael Reiss
d.	Department		CPA
e.	Course category (Tick one)	PhD/MPhil ☐	EdD ☒
		MRes ☐	DEdPsy ☐
		MTeach ☐	MA/MSc ☐
		ITE ☐	
		Diploma (state which) ☐	
		Other (state which) ☐	

f.	Course/module title	Thesis
g.	**If applicable,** state who the funder is and if funding has been confirmed.	The Charles Darwin Trust
h.	Intended research start date	January 2015
i.	Intended research end date	July 2016
j.	Country fieldwork will be conducted in *If research to be conducted abroad please check www.fco.gov.uk and submit a completed travel risk assessment form (see guidelines). If the FCO advice is against travel this will be **required** before ethical approval can be granted: http://ioe-net.inst.ioe.ac.uk/about/profservices/international/Pages/default.aspx*	

k.	Has this project been considered by another (external) Research Ethics Committee?	
	Yes ☐	External Committee Name:
	No ☒ ⇨ *go to Section 2*	Date of Approval:

If yes:

- Submit a copy of the approval letter with this application.
- Proceed to Section 10 Attachments**.**

Note: Ensure that you check the guidelines carefully as research with some participants will require ethical approval from a different ethics committee such as the National Research Ethics Service (NRES) or Social Care Research Ethics Committee (SCREC). In addition, if your research is based in another institution then you may be required to apply to their research ethics committee.

Section 2 Project summary

Research methods (tick all that apply)

Please attach questionnaires, visual methods and schedules for interviews (even in draft form).

☒ Interviews ☐ Focus groups ☐ Questionnaires ☐ Action research ☐ Observation ☐ Literature review	☐ Controlled trial/other intervention study ☐ Use of personal records ☐ Systematic review ⇨ ***if only method used go to Section 5.*** ☐ Secondary data analysis ⇨ ***if secondary analysis used go to Section 6.*** ☐ Advisory/consultation/collaborative groups ☐ Other, give details:

Please provide an overview of your research. This should include some or all of the following: purpose of the research, aims, main research questions, research design, participants, sampling, your method of data collection (e.g., observations, interviews, questionnaires, etc.) and kind of questions that will be asked, reporting and dissemination (typically 300-500 words).

Biologists agree that evolution by natural selection, Darwin's grand theory, unifies biology and provides the best explanation of the history of the diversity of life on Earth. A large body of work has continued to provide evidence to support the theory of evolution by natural selection and is accepted by scientists as the foundation of biological science. However, experience in the classroom, my own and that documented in the research literature, reveals a subject that is perceived by teacher and students as difficult and controversial. In my experience as a scientist and as an educator, I have become aware that the scientifically accepted theory of evolution can provoke emotional responses from people in a way other topics in biology do not. It is these experiences that have led me to question why evolution, unlike other areas of the biology curriculum, provokes such responses. I am interested in exploring the influence of affect on people's conceptions of evolution. More specifically, how do emotional responses influence people's conceptions of biological ideas about species change and the origins of humanity?

The emotional barriers to understanding and accepting evolution have been touched on by research but only to a limited extent as barriers are generally presumed to be religious. The importance of affect in learning has also been significantly researched, and the roles of motivation, identity, self efficacy and confidence have been documented. However, their relevance to science education is less well investigated and when examined often limited to student attitudes to science rather than an in-depth assessment of emotional responses to scientific explanations.

There is therefore a demonstrable gap in our knowledge and understanding of the fundamental human responses and behaviours that are at the point where emotion, the unconscious, fear and resistance meet ideas about the origins of life on Earth and its subsequent history. It is this gap that I wish to address with this research. I am interested in using evolutionary ideas to probe for anxiety, distrust, resistance and denial and wish to consider the impact of emotional responses in the context of conceptual change in understanding evolution. To do this I will use aspects of psychoanalytical theories of teaching and learning, the nature and impact of affect, as well as personal narratives to explore people's personal conceptions of and attitudes to the natural world, its origins and our place within it.

Provisional Research Questions

Through this research I intend to explore the origins of people's personal conceptions of evolution and resistance to scientific explanations of evolution. I will seek to establish if and how affect may influence misconceptions about evolution.

Research Questions:

- Why is evolution difficult to teach?
- Does affect have a role in resistance to evolutionary thinking beyond that of religious beliefs?

Research participants

1) Undergraduates undertaking a BEd degree at London Metropolitan University.
2) IOE physics and chemistry PGCE students.

Methods

I have chosen to look at two of Darwin's ideas specifically and probe people's emotional responses to them indirectly by using approaches that refer to these ideas. I have chosen these ideas as, in my experience, they are most likely to produce resistance. These ideas are:

- Species change
- Evolution by natural selection explains human origins.

I will use a semi-structured interview but with aspects of narrative interviewing. I have a certain number of specific questions defined by my topic and research questions, but I wish to allow participants to tell me their story and will therefore use the minimum number of questions. My approach is based on Free Association Narrative Interviewing (**FANI**) (Holloway and Jefferson, 2013), which uses personal narratives to explore emotional responses and experiences. My aim is to allow participants to explore their own experiences through the interview, but I will also draw on their reactions to key topics to generate further questions that look more closely at those responses. During the interview and in its analysis I intend to probe instances of defensiveness, inconsistencies and contradictions.

PART 1 of the interview will include general questions about the participants' experiences in education.

PART 2 will consider the interviewees' responses to evolution, in particular the idea of species change. The discussion will focus on a drawing depicting the evolution of biological organisms over geological time.

PART 3 will consider change in relation to human evolution more specifically using a video artwork held by the Wellcome Trust collection that depicts an animal changing through several forms until it becomes human.

PART 4 looks at attitudes to primates, specifically their human attributes. I will use images created by wildlife conservationist James Mollison of apes he has worked closely with.

PART 5 asks the interviewees about their religious and spiritual beliefs.

Section 3 Participants

Please answer the following questions giving full details where necessary. Text boxes will expand for your responses.

a.	Will your research involve human participants?	Yes ☒	No ☐ ⇨ *go to Section 4*

b. Who are the participants (i.e. what sorts of people will be involved)? Tick all that apply.

☐ Early years/pre-school	☐ Unknown – specify below
☐ Ages 5-11	☒ Adults *please specify below*
☐ Ages 12-16	☐ Other – specify below
☐ Young people aged 17-18	

NB: Ensure that you check the **guidelines** (Section 1) carefully as research with some participants will require ethical approval from a different ethics committee such as the National Research Ethics Service (NRES).

c. If participants are under the responsibility of others (such as parents, teachers or medical staff) how do you intend to obtain permission to approach the participants to take part in the study?

(Please attach approach letters or details of permission procedures – see Section 9 Attachments.)

d. How will participants be recruited (identified and approached)?

Participants will be approached by their tutors initially (whom I know professionally) and then will receive some background information from me directly before they areasked if they are willing to take part. I will ensure that they are encouraged to ask questions and/or voice concerns before agreeing to be interviewed.

e. Describe the process you will use to inform participants about what you are doing.

1) Face-to-face presentation as a group explaining the purpose and scope of the research, the method (interview), time involved and timescale of the project.

	2) At the time of interview: I intend to reiterate the aims of my study and briefly explain the types of question I will be asking, with a focus on personal experience. I will explain that they will not be referred to by name in any written materials and that their participation is treated as confidential.
f.	How will you obtain the consent of participants? Will this be written? How will it be made clear to participants that they may withdraw consent to participate at any time? *See the guidelines for information on opt-in and opt-out procedures. Please note that the method of consent should be appropriate to the research and fully explained.* I will be emphasise in the interview preamble and on the written consent form that they and I will sign: 1) That their participation is voluntary and does not affect the outcome of the course they are undertaking and is in fact not linked in any way. 2) That they can withdraw at any time. 3) That the interview will be audio-recorded with their permission, 4) That their participation will be treated as confidential and they will not be referred to by name in any outputs of the research.
g.	**Studies involving questionnaires:** Will participants be given the option of omitting questions they do not wish to answer? Yes ☐ No ☐
	If **NO** please explain why below and ensure that you cover any ethical issues arising from this in section 8.
h.	**Studies involving observation:** Confirm whether participants will be asked for their informed consent to be observed. Yes ☐ No ☐
	If **NO** read the guidelines (Ethical Issues section) and explain why below and ensure that you cover any ethical issues arising from this in section 8.
i.	Might participants experience anxiety, discomfort or embarrassment as a result of your study? Yes ☒ No ☐
	If **yes** what steps will you take to explain and minimise this? 1) I will endeavour to make clear before they are interviewed that I will be asking them about their personal experiences and the views they hold and ensure they are happy to answer such questions before proceeding.

	2) I will be sensitive to signs of distress and pause or even cease the interview either on their request or if I feel this is necessary. 3) I will allow interviewees time to reflect on the experience after the interview and address any worries or concerns. I will also reiterate their right to withdraw. If **not**, explain how you can be sure that no discomfort or embarrassment will arise?
j.	Will your project involve deliberately misleading participants (deception) in any way? Yes ☐ No ☒
	If **YES** please provide further details below and ensure that you cover any ethical issues arising from this in section 8.
k.	Will you debrief participants at the end of their participation (i.e. give them a brief explanation of the study)? Yes ☒ No ☐
	If **NO** please explain why below and ensure that you cover any ethical issues arising from this in section 8.
l.	Will participants be given information about the findings of your study? (This could be a brief summary of your findings in general; it is not the same as an individual debriefing.) Yes ☒ No ☐
	If **no**, why not?

Section 4 Security-sensitive material
Only complete if applicable

Security sensitive research includes: commissioned by the military; commissioned under an EU security call; involves the acquisition of security clearances; concerns terrorist or extreme groups.

a.	Will your project consider or encounter security-sensitive material?	Yes ☐ *	No ☒
b.	Will you be visiting websites associated with extreme or terrorist organisations?	Yes ☐ *	No ☒
c.	Will you be storing or transmitting any materials that could be interpreted as promoting or endorsing terrorist acts?	Yes ☐ *	No ☒

* *Give further details in* ***Section 8 Ethical Issues***

Section 5 Systematic review of research Only complete if applicable			
a.	Will you be collecting any new data from participants?	Yes ☐ *	No ☒
b.	Will you be analysing any secondary data?	Yes ☐ *	No ☒

* *Give further details in* ***Section 8 Ethical Issues***

If your methods do not involve engagement with participants (e.g. systematic review, literature review) ***and*** *if you have answered* ***No*** *to both questions, please go to* ***Section 10 Attachments.***

Section 6 Secondary data analysis Complete for all secondary analysis				
a.	Name of dataset/s			
b.	Owner of dataset/s			
c.	Are the data in the public domain?	Yes ☐	No ☐	
		If no, *do you have the owner's permission/license?* Yes ☐ No* ☐		
d.	Are the data anonymised?	Yes ☐	No ☐	
		Do you plan to anonymise the data?	Yes ☐	No* ☐
		Do you plan to use individual level data?	Yes* ☐	No ☐
		Will you be linking data to individuals?	Yes* ☐	No ☐
e.	Are the data sensitive (DPA 1998 definition)?		Yes* ☐	No ☐
f.	Will you be conducting analysis within the remit it was originally collected for?		Yes ☐	No* ☐
g.	**If no,** was consent gained from participants for subsequent/future analysis?		Yes ☐	No* ☐
h.	**If no,** was data collected prior to ethics approval process?		Yes ☐	No* ☐

* *Give further details in* ***Section 8 Ethical Issues***

If secondary analysis is only method used ***and*** *no answers with asterisks are ticked, go to* ***Section 9 Attachments.***

Section 7 Data Storage and Security

Please ensure that you include all hard and electronic data when completing this section.

a.	Confirm that all personal data will be stored and processed in compliance with the Data Protection Act 1998 (DPA 1998). *(See the Guidelines and the Institute's Data Protection & Records Management Policy for more detail.)*		Yes ☒
b.	Will personal data be processed or be sent outside the European Economic Area?	Yes ☐ *	No ☒
*** If yes,** please confirm that there are adequate levels of protections in compliance with the DPA 1998 and state what these arrangements are below.			
c.	Who will have access to the data and personal information, including advisory/consultation groups and during transcription? Myself and my supervisor		
During the research			
d.	Where will the data be stored? My personal computer and USB		
e.	Will mobile devices such as USB storage and laptops be used? Yes ☒ * No ☐ *** If yes,** state what mobile devices: Mobile Phone *** If yes,** will they be encrypted?: Password protected		
After the research			
f.	Where will the data be stored? My personal computer and USB		
g.	How long will the data and records by kept for and in what format? The audio recordings will be destroyed when I complete my Doctorate.		
h.	Will data be archived for use by other researchers? Yes ☐ * No ☒ *** If yes,** please provide details.		

Section 8 Ethical issues

Are there particular features of the proposed work which may raise ethical concerns or add to the complexity of ethical decision making? If so, please outline how you will deal with these.

It is important that you demonstrate your awareness of potential risks or harm that may arise as a result of your research. You should then demonstrate that you have considered ways to minimise the likelihood and impact of each potential harm that you have identified. Please be as specific as possible in describing the ethical issues you will have to address. Please consider / address ALL issues that may apply.

Ethical concerns may include, but not be limited to, the following areas:

– Methods	– International research

– Sampling – Recruitment – Gatekeepers – Informed consent – Potentially vulnerable participants – Safeguarding/child protection – Sensitive topics	– Risks to participants and/or researchers – Confidentiality/Anonymity – Disclosures/limits to confidentiality – Data storage and security both during and after the research (including transfer, sharing, encryption, protection) – Reporting – Dissemination and use of findings

I have addressed the concerns in other parts of this document but to summarise:

1) Confidentiality: participants will not be named in any written materials. The participating institutions will be identified in the submitted thesis.
2) The interviewees' participation is voluntary and does not affect the outcome of the course they are undertaking and is in fact not linked in any way.
3) Examining emotional responses is not straightforward and has ethical considerations. Interview questioning to elicit emotions can produce uncomfortable, even possibly distressing, responses in the interviewee. For this reason I will encourage interviewees to reflect on their experience of the interview at the end, but also be vigilant to signs of distress and ensure the person knows they can pause or withdraw from the interview whenever they wish to.
4) I do not to intend to show or ask anything that is likely to cause be offensive.
5) Research participants will be able to see the transcripts of their interviews on request and will be able to ask for amendments of the transcripts.

Section 9 Further information

Outline any other information you feel relevant to this submission, using a separate sheet or attachments if necessary.

Section 10 Attachments Please attach the following items to this form, or explain if not attached			
a.	Information sheets and other materials to be used to inform potential participants about the research, including approach letters	Yes ☐	No ☒
b.	Consent form	Yes ☒	No ☐
	If applicable:		
c.	The proposal for the project	Yes ☐	No ☒
d.	Approval letter from external Research Ethics Committee	Yes ☐	No ☒
e.	Full risk assessment	Yes ☐	No ☒

Section 11 Declaration

	Yes	**No**
I have read, understood and will abide by the following set of guidelines.	☒	☐

BPS ☐	BERA ☒	BSA ☐	Other (please state) ☐

I have discussed the ethical issues relating to my research with my supervisor.	☒	☐
I have attended the appropriate ethics training provided by my course.	☒	☐

I confirm that to the best of my knowledge:

The above information is correct and that this is a full description of the ethics issues that may arise in the course of this project.

Name	Emma Newall
Date	11 December 2014

Please submit your completed ethics forms to your supervisor.

Notes and references

Professional code of ethics

You should read and understand relevant ethics guidelines, for example:
British Psychological Society (2009) *Code of Ethics and Conduct*, and (2014) *Code of Human Research Ethics*
or
British Educational Research Association (2011) *Ethical Guidelines*
or
British Sociological Association (2002) *Statement of Ethical Practice*
Please see the respective websites for these or later versions; direct links to the latest versions are available on the Institute of Education http://www.ioe.ac.uk/ethics/.

Disclosure and Barring Service checks

If you are planning to carry out research in regulated Education environments such as Schools, or if your research will bring you into contact with children and young people (under the age of 18), you will need to have a Disclosure and Barring Service (DBS) CHECK, before you start. The DBS was previously known as the Criminal Records Bureau (CRB)). If you do not already hold a current DBS check, and have not registered with the DBS update service, you will need to obtain one through at IOE. Further information can be found at http://www.ioe.ac.uk/studentInformation/documents/DBS_Guidance_1415.pdf

Ensure that you apply for the DBS check in plenty of time as will take around 4 weeks, though can take longer depending on the circumstances.

Further references

The www.ethicsguidebook.ac.uk website is very useful for assisting you to think through the ethical issues arising from your project.

Robson, Colin (2011). *Real world research: a resource for social scientists and practitioner researchers* (3rd edition). Oxford: Blackwell.
This text has a helpful section on ethical considerations.

Alderson, P. and Morrow, V. (2011) *The Ethics of Research with Children and Young People: A Practical Handbook.* London: Sage.
This text has useful suggestions if you are conducting research with children and young people.

Wiles, R. (2013) What are Qualitative Research Ethics? Bloomsbury.
A useful and short text covering areas including informed consent, approaches to research ethics including examples of ethical dilemmas.

Departmental use

If a project raises particularly challenging ethics issues, or a more detailed review would be appropriate, you **must** refer the application to the Research Ethics and Governance Coordinator (via researchethics@ioe.ac.uk) so that it can be submitted to the Research Ethics Committee for consideration. A Research Ethics Committee Chair, ethics department representative and the Research Ethics and Governance Coordinator can advise you, either to support your review process, or help decide whether an application should be referred to the REC.
Also see 'when to pass a student ethics review up to the Research Ethics Committee':
http://www.ioe.ac.uk/about/policiesProcedures/42253.html

Student name	Emma Newall
Student department	CPA
Course	EdD
Project title	Why is evolution difficult to learn? The role of affect.
Reviewer 1	
Supervisor/first reviewer name	Michael J Reiss
Do you foresee any ethical difficulties with this research?	These have been fully discussed with Emma Newall and revisions to her original ethics application have been incorporated into this version.
Supervisor/first reviewer signature	
Date	14 December 2014
Reviewer 2	[redacted]
Second reviewer name	S.D.Tunnicliffe
Do you foresee any ethical difficulties with this research?	No
Supervisor/second reviewer signature	[redacted]
Date	15.12.14
Decision on behalf of reviews	
Decision	Approved x☐
	Approved subject to the following additional measures ☐

	Not approved for the reasons given below	☐
	Referred to REC for review	☐
Points to be noted by other reviewers and in report to REC		
Comments from reviewers for the applicant		
Recording – supervisors/reviewers should submit all approved ethics forms to the relevant course administrator		
Recorded in the student information system		☐

If the proposal is not authorised the applicant should seek a meeting with their supervisor or ethics reviewer.

Appendix 9.2

Participant Consent Form

Thank you once again for agreeing to help with this research. This interview is being conducted as part of my own research as a Doctoral Student enrolled on the UCL Institute of Education's EdD (professional doctorate) programme. Evolution is a fundamental topic in school biology, but there is a great deal of research and anecdotal evidence that suggest it is a particularly difficult topic to learn. I am interested in people's emotional responses to evolution and hope to investigate how our emotions may affect our perception and understanding of evolution.

I have a series of questions to ask you; some are general and others more specifically address evolution. The full interview has been designed to last no longer than 45 minutes, but I will also make sure there is time at the end to for you to raise any additional thoughts or questions of your own.

Your participation in this research is entirely voluntary and you may end your participation at any time. **If for any reason you want to stop the interview or withdraw from the research, please just let me know**.

Your participation in the research will also have no implications for the course you are currently enrolled on.

I will be making an audio recording of your interview, but your participation will be treated as confidential and you will not be named in any of the written research outputs, including the final thesis.

Please complete the interviewee part of the form in the space below if you are happy to proceed with the interview and understand the information outlined above.

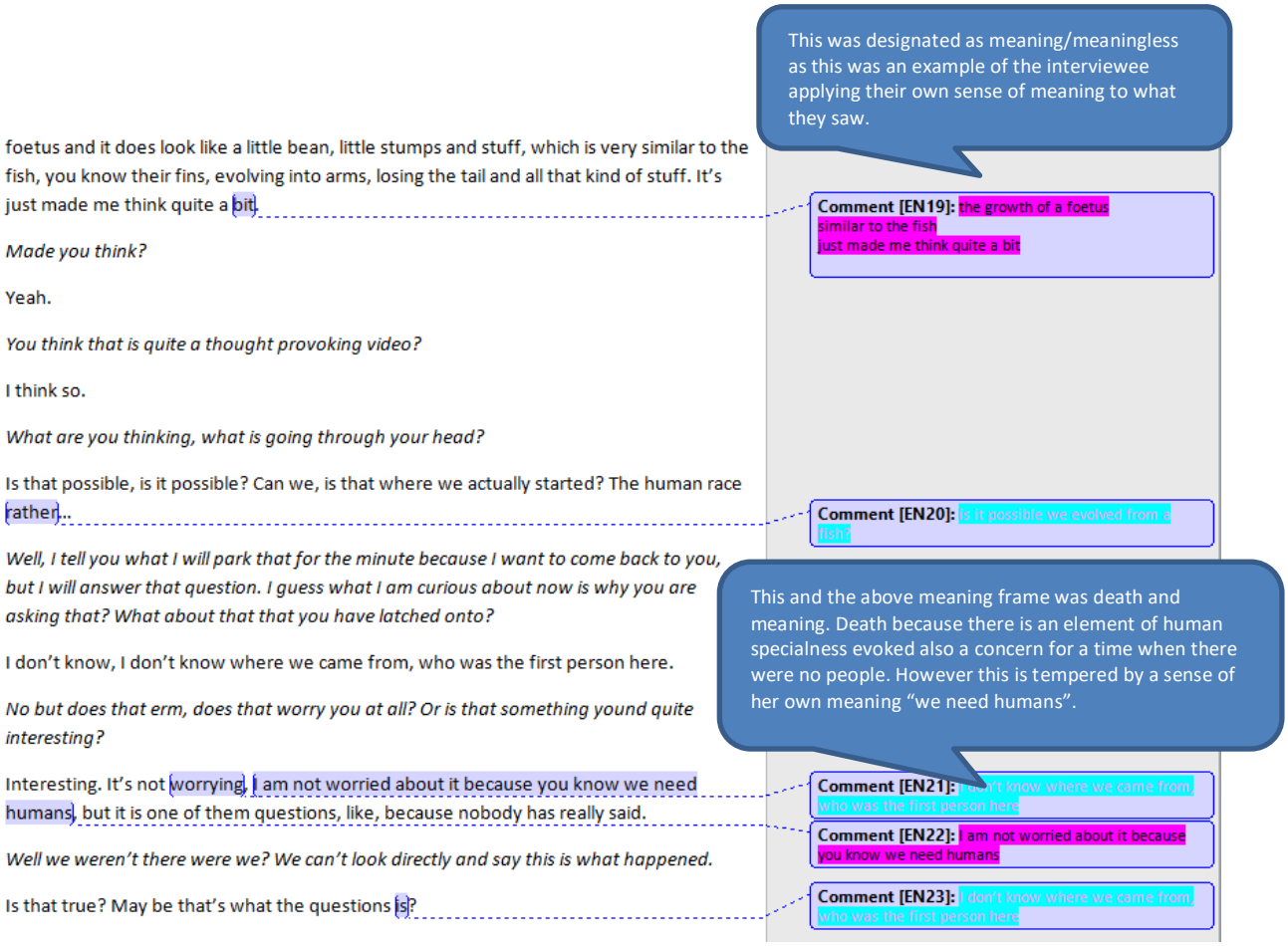
Interviewee Name: Signed: Date:

Interviewer name: Signed: Date:

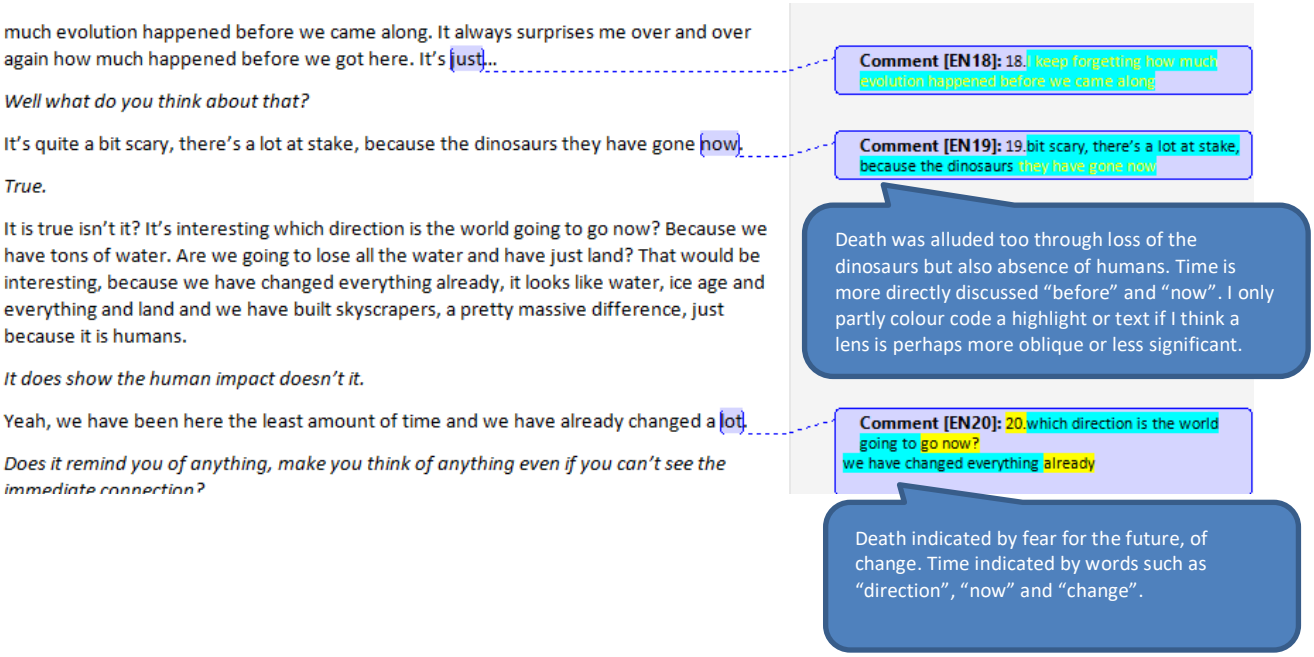
Appendix 10

Samples of interview transcripts with TCA coding

1.



2.



3.

EMMA: Even though as a physicist you have to deal with time on an even larger scale?

MAN: But that's just calculations. This is kind of different because this is thinking about our existence. It just feels different. In a lot of Physics there is some dependency on time for something, so it's usually a lot of calculations, so your emotions never get involved in the calculations.

EMMA: No I don't suppose they do.

MAN: This seeing that the relative, so initially I thought it was something else, and then I realised, there was a realisation that okay, humans have only been there for that time and I could think about it in a positive way and say, I feel like if there is only this much time then what is going to happen in the future. It makes me think about the future, how we are going to evolve and how human life will change, but it feels a bit scary at the same time. My mind is blank. I don't know what is going to happen. I don't know if that is because there is almost like a cliff there.

EMMA: Yes you are right. It's very cut off there.

MAN: Because I do like sci-fi films, and I like the idea of sci-fi, and it's looking at our

I have applied the code *insignificance*. Death is associated with thinking about existence, about the significance of our relatively short time on Earth (this analysis is taken in the context of the whole interview). Evolutionary time was the topic under discussion. I also hint at responsibility as he was making personal sense of what he was seeing.

Comment [EN17]: 17.Insignificance

Comment [EN18]: 18.My mind is blank. I don't know what is going to happen.

Death was alluded to through fear for the future and the image of the "cliff"; time through reference to the "future". However, as above he also seems to be making sense of it through his reference to "sci-fi" so I have also applied responsibility.

4.

Melanie: Of what, like connections and inter-connections?

Emma: Yes, like anything. Anything that comes into your head?

Melanie: No I guess that that I have always felt that we were connected so it is not a new feeling to me. I very much believe that everything, every choice, every decision that you make and that others make, from the very beginning of history to the simple decision of going to get a cup of coffee, effects and changes and evolves everything that you do, from you walking in here late, to me coming here at a certain time and sitting in this seat, it has a domino effect. It is absolutely connected to some stranger that I brushed past. My brushing past them affects them in some way and just everything is connected.

EMMA NEWALL
18.from the very simplest form we are still connected

This short response suggests a number of existential issues. There is her own sense of meaning being applied at the same time she is constructing meaning in response to the visual prompts (responsibility). Isolation is alluded to through its opposite, a sense of connectedness. Time is woven throughout her response.

5.

MAN: The deadline was midnight and I started it at 11:30pm so I just wrote from my feelings, my emotions, I didn't think about it too much but maybe that was good. So I remember in primary school in the fifth form when I was 10 years old having to have a reading diary because for some reason I didn't like reading, I didn't read much. So I remember being the only kid in the class that had to have one of those.

EMMA: Was that a bad thing?

MAN: I can't remember. I kind of knew it was because I wasn't reading enough and I don't know if I reflected on it at that time.

EMMA: But you remembered it.

MAN: Yes I remembered it which is interesting. But then with maths, maths was different, I was top of the class in maths so I didn't feel like I was failing in school. I was quite naughty and I know I was naughty because I was being told off a lot.

EMMA: Were you bored?

This part of the interview centred on personal identity claims (I used identity in this way rather than human versus ape identity). The earlier responses centre on his success at science and maths, but isolation is expressed through being singled out for reading support.

Comment [EN3]: 3.I remember having to have a reading diary because I didn't like reading I remember being the only kid in the class that had to have one of those

Comment [EN4]: 4.maths was different, I was top of the class in maths

Appendix 11

Thematic analysis of nine non-core interviews (these quotations represent a significant sample of the existential responses but are not exhaustive)

Table A11.1: evolution timeline

Interviewee	Existential concept	Existential concern	Quotation	Notes
Naomi	Time	Responsibility	But if this description says? Who was there to see this?	Exemption from natural laws. Bearing witness, magical thinking.
	Time	Responsibility Death	It's a bit scary as well. Why? When I look at it now it makes me feel what is going to happen in the future now? We don't know so probably still building up, this is how far we have walked, what is going to happen there? If time keeps going. What is going to happen with that coming and what will the world be like? Will there be humans? Are we still evolving? Is evolution still happening, I think still changing?	Change – fear of the future, unseen threats, danger, endings, death of the human.
	Time	Responsibility	Everything has to be given time and it makes me feel you have to be patient so everything that happens maybe in your life somehow, somewhere there is going to be something out there. You know, with change you don't know what is coming. Could be good. Could be bad. But it just makes me feel wait, and see what is coming. When I get change either then or now, anything that changes in my life, I try to say I am not accepting it but when it is there then I get to, I'm kind of like this is not happening, why, but when it is there I have to approach it and take it away and accept it and find a way of working around that change around me. Try to overcome any challenges.	Ambivalence and then reconciliation to change. Oscillation between fear (row above) and rationalisation.

Martina	Time	Death/ Meaninglessness	Humans overall are really important but actually in the grand scheme of things in terms of this they are not particularly. There are lots of things that have come before.	Lack of purpose - Insignificance is a fairly common interpretation of humanity's position on the timeline in this group.
Sian	Time	Meaninglessness	I think it's quite a simplified view, very simplified idea of evolution, but evolution is hard to explain anyway. I feel that we really don't know what happened and I think it's a nice way to draw our attention to that. We think we have it all figured out but actually there are so many things we don't know. *So how do you feel about that then, the not knowing, the not having it figured out?* I think it's quite exciting really. *OK. Exciting.* Yes because we think we know everything with technology and stuff but it's still huge what we don't know so I think it's quite exciting. *OK, so positive.* Yes. Not scary. Unknown.	tolerance of change or uncertainty – it is important to note that I am arguing that Sian is indicating a tolerance of change a potentially existentially challenging idea, but I am only arguing for evidence of this in this specific context. I cannot make any assumption regarding her general response to change or uncertainty.

Table A11.2: video animation

Interviewee	Existential concept	Existential concern	Quotation	Notes
Naomi	Identity and Time	Responsibility	I don't really feel negative about it because do you know why? I wasn't there when people started forming from fish and monkeys. I wasn't there. So I am just happy that I am who I am now. I didn't see the history but I am happy to know and learn something about it, that this is how we came into existence. It doesn't make me, I don't feel bad about it at all.	Connection to natural world; Identification with animals. Who was there? Who bears witness?
	Identity and Time	Responsibility	Yes, I think we are all animals and somehow we all got these features there. I think a person from baby to where we are is like, you know from fish to monkeys, how a person from a baby grows up into a responsible adult. Especially with water, they do, they flap around, and this is how babies are playing when they are born. It is like they are using their four legs, their arms and their legs, they lie on their backs, they dribble like fish, and then they start walking they don't know nothing much, they are looking around, this is now like when the monkey starting to form … on four legs, they don't know much, and then they start to stand and start walking on two legs and there it is, the human formed. Now this is when they get an understanding, learning to walk and talk takes phases, so they dribble, and then they start talking, and with the fish the baby playing on its back and the fish can be on its back and on its belly as well and that's a baby, and then they start crawling, that's when the monkey starts coming in using four legs, and then when they start walking that's a human. They are also human when they are babies. But it's like now they are an adult, they have a different understanding, from fish to monkey to human, using senses they are mustering.	Identification with animals. Seeing evolution as development. Making her own meaning from experience. Identification with animals but with a hierarchical perspective indicating a possible degree of ambivalence.
Richard	Identity	Death	I think I found it a bit disturbing when I first looked at it the first time through. I am trying to think why I found it so, and I think it's because the creatures appear to be naked all the way through. By that I mean with the fish, I think the fish had scales, but then we go through a phase where we	The monstrous.

			don't see reptilian scales or any fur or any hair or anything like that, that we would expect to see in the intermediate forms that are being pictured, and I find that a little bit disturbing and I don't know why. The only thing it reminded me of, and again it goes back to the lack of hair, some of the supposed alien sightings where they have taken creatures and taken their hair off and they look pretty strange to our eyes…	Possibly uncanny valley effect or archetypal Other.
Martina	Identity	Death	Well the kind of transitions that we don't recognise, that we don't know about, we can't associate with anything because they don't exist now. You see the human, you know that's a human, you see the fish, you know that's a fish but the kind of in between stage. I don't know what that is.	Fear of ambiguity. Uncanny valley effect / the monstrous. Possibly uncanny valley effect, transitional forms are disturbing, reminiscent of monsters.
Sindy	Identity and time	Death/ Responsibility	It kind of makes it look like the other organisms that came before are less complex or less important than humans are because humans are the end one, or that all evolution is leading towards making a human. It kind of makes it seem like the whole of nature and everything in the world was aiming towards making a human and I think that's a bit of weird … I don't like it.	Connection with the natural world; identification with animals; tolerance of ambiguity, complexity, change. Tolerance of ambiguity etc. is an interpretation and only refers to this context.
Lewis	Identity	Death	*I wonder why you found it creepy. Any idea?* The face. It was a creepy face. No music as well. I don't know. The colour as well was quite dim. Um. The colour definitely contributed to it.	Fear of ambiguity.

			What is a creepy face? Dunno. A face that is … maybe the fact that the face was changing and morphing in between, like on any TV show a face morphs into someone else, that morphing transition is quite a strange thing to look at, and then the colours and everything around it, um … This fish growing it's legs and then it shows quite well how the fins turn into legs and would be able to walk on all fours and then in between it was sort of lizardesque at times, it looked a little bit, and then the transition between that and the ape-like form was very gargoyley. I think that's what I meant when I said it looked creepy. It very much reminded me of the transition of a gargoyle, and the first image of it was very gargoylish.	Uncanny valley effect / the monstrous. The artist may be aiming to promote disquiet. However not all interviewees find the changing forms "creepy". There is a common theme of transitional creatures seeming monstrous. Change as disturbing.
Amy	Identity	Death	it's just saying that we are nothing better than a lizard or a we … progress no further. Or there is the other sense of, OK so if we have come from that now where can we go, according to you, where can we go from here? 'Cos if we can that from lizards so where else are we going to go, see? ...I don't understand why we have stopped at human.	Denial of creatureliness, fear of change, ambiguity.

Table A11.3: ape portraits

Interviewee	Existential concept	Existential concern	Quotation	Notes
Naomi	Identity and time	Isolation	It is just interesting that we are just kind of the same process that we go through is the same process that other creatures go through as well, animals, doesn't matter which one. They go through the same process like us and they also have also got different features of their outlook like us humans as well.	Identification with animals. Connection with natural world.
	Identity	Isolation	I think I have no problem with them as they are relate to them and when I was told that we came from apes it doesn't bother me at all because they used to tell us the things they are doing they are the same as us and they used to take us on trips to go to see them in the zoo. So you can see, give it a banana and you are gonna see what it does. Then it will peel and eat it. It was surprising how an animal could do human things like eating a banana. They fetch food and take to their kids as well. It was really interesting.	Identification with animals. Connection with natural world.
Ria	Identity	1. Death 2. Death	1. Their eyes are scary. Because they are really looking straight. We normally see monkey eyes like far away. Scary. 2. I would never forget the moment when we, when they started showing us human as a monkey and how it changes. I thought it was a dream because I was very little and to know this, the brain won't accept it as a child. To see a monkey and then to show you how it then is standing up on two feet, and then a human without clothes and then with clothes.	Alienation from animals.
Martina	Identity	Death/ Meaninglessness	It looks quite unusual. I've never seen one like that. It looks like maybe it has a disease, something wrong with his skin? The others seem alright. Some of them look quite angry, like that one and that one. *How does that make you feel?*	Alienation from animals. Fear of the unknown/ambiguity. Like many of the interviewees Martina reads human emotions

			A bit uncomfortable I suppose. I don't really know what they are thinking, if they think, what kind of things they want to do. I suppose the fear of the unknown, not knowing how their minds and brains operate. Some I quite like, some are cute, that one looks like it's smiling.	on the faces of the apes (anthropomorphism).
Sian	Identity	Death	Yes, I have done field work so we had to identify them. I think it's nice, I think it's quite powerful because they have so many features similar to our own like the forward-facing eyes, the nostril shapes, so I think that it is a nice representation to show that humans are apes to show that we are in the same kind of family and things like that. I really like these, not just because they are monkeys but because they are quite powerful. You kind of make that link that you've got to look after your own. These are our own.	Connection with natural world; identification with animals. Sian is a `oologist so it is unsurprising that she has a positive attitude to apes.
Sindy	Identity	Death	The way that he has shown them all like portraits kind of makes it seem like it's less … It almost seems like it's personifying or putting a human persona on to an extent because normally when they photograph animals, they photograph them in their habitats. You don't as often see a very big close up of the face. And I think also just to capture the fact that there are so many different expressions on their faces. It's not like all animals are little clones of each other, just as humans are different, there are variations in animals as well. He looks very confused to be here, his eyebrow is raised, they have actual expressions and things.	Identification with animals. Sindy interprets the photographer's approach; she thinks that he is deliberately portraying them as human. Another interpretation could be that they appear human not because of the treatment by the photographer, but just because they are very similar to us. Sindy gives another layer of interpretation perhaps because she is used to thinking of apes as very different. However, her overall attitude is positive and she does not appear disturbed by their similarity.

Sam	Identity	Death/ Isolation	1. Well you can certainly see and understand, whether you believe in it or not, where someone would get the idea for evolution from because it is not a great deal away. Getting a child to make a human face out of Play-Dough and it's just a few squidges and pushes away from being finished and being human. It's so close. The noses they are slightly more bridged, so no flaring nostrils for instance, you know they are very close to human faces aren't they? You can clearly see that some of them are quite happy while some of them are not quite so chuffed to have their photos taken maybe? The way they fill up the whole picture with their faces and the way they do seem to have a lot of emotions, I would think that the artist was trying to put across or show the emotion of them, the intelligence behind them. With the exception of this one who I thought was a bit older and weather worn, all big bright eyes, the eyes are very prominent more than anything else so I would imagine trying to put across the emotion or the feeling or the intelligence that they have. 2. Since coming back to university, I have realised that you can really connect almost everything to anything.	Identification with animals. Connection. Sam at several points in his interview alluded to connections, connectedness, similarly to Melanie.