

Wonders of the Living World

Curiosity, awe, and the meaning of life



Study series for church-based small groups

Leader's Notes, Session 1: Beauty

Summary

This session sets the scene for a conversation about science and faith by exploring the things that can be learned about God by looking at creation. How can we do this in a helpful way, without stumbling into any theological pitfalls? Alister McGrath is an Oxford-based theologian who likes to think of theology as a lens for looking at the world. In other words, does what we see around us make sense through the lens of a Christian world view – including scientific discoveries? We then meet Jeff Hardin, a biologist based in the US who uses microscopic worm embryos to understand how humans develop in the womb. Jeff is astounded by the beauty of the living world, and his work in the lab regularly leads him to praise God and thank him for the wonders he has made. Prompted by Jeff's reflections, the group will have the opportunity to discuss how this perspective might inform their own faith, conversations, or activities.

Start with a prayer

Introduction (10 mins)

Watch video 1.1 (1 min 43): Dr Ruth Bancewicz, The Faraday Institute, explains the thinking behind this series.

Summary

- Scientists experience awe and wonder in their work.
- Science can remind Christians about the character and purposes of God, and help us to worship.
- These sessions aren't about proving God, but celebrating science and what it tells us about God's world.
- Science raises questions of meaning and purpose.

Bible (10 mins)

Read Psalm 19:1–6

Discuss: Leaving science aside for a moment, have you ever had a time when you felt you were learning about God from something you saw in the living world? Can you share about it?

Thinking about God (20 mins)

Discuss: What potential pitfalls could we fall into when trying to learn about God from the things he has made, including scientific ways of learning?

[Hints: Try to cover as many of these points as possible:

1. God's revelation of himself in creation should be complementary to his revelation of himself in the Bible (as long as we are interpreting each of these properly!).
2. But, like looking at a broken picture, people can only see parts of the truth about God when looking at creation because, as Romans 8:18-22 describes, it is currently subject to decay.
3. We need to learn about Jesus if we want to see God's full character.
4. Christians worship God, not his creation.
5. Scientific data can be used to point towards God (he made this amazing mechanism), or away from him (we understand the mechanism, we don't need God). To decide which is right we need to look beyond science.
6. Some people believe in a 'god of the gaps', who made the things science can't explain. But when science advances, where is that god now? Christians believe in a God who made everything – both the things science can explain, and the things we don't yet understand.
7. Science is about evidence not proof, so you can't prove God's existence using science.
8. Scientific knowledge is provisional, so theology shouldn't rely heavily on very specific areas of science.]

Watch video 1.2 (1 min 49): What can we learn about God from science? With Alister McGrath, Professor of Science and Religion at the University of Oxford.

Summary

- Theology – the study of God – is like a lens that can be used to look at the world.
- For Alister, theology brings things into sharper focus than any other way of looking at life.
- Looking at science through the lens of theology, we can see that God made an incredible universe!



Discuss:

1. What do you think of the idea that Christian theology is a lens that clarifies our knowledge about and experience of the world?
2. Do you think using theology as a lens to look at science (rather than the other way round) could help avoid the problems already discussed? How?

Meet the scientist (25 mins)

Introduction (10 mins)

Explain: Jeff Hardin is Chair of Integrative Biology at the University of Wisconsin-Madison. He has an MDiv from the International School of Theology, is Vice-Chair of the Board of the BioLogos Foundation (helping people think about creation and evolution) and an advisor for the Navigators and InterVarsity Graduate Christian Fellowship.

Watch video 1.3 (2 min 22): Why are you a scientist, and a Christian?

Summary

- Jeff's faith journey began when he was at school.
- He went from studying physics, to zoology (with the aim of qualifying as a medical doctor), to theology (training as a church leader), then back to zoology!
- He developed a passion for studying embryos (sea urchins and worms), which complements his faith.

Watch video 1.4 (2 min 40): What questions about meaning and purpose does your work make you ask, and how does your faith help you to answer them?

Summary

- Studying embryos makes Jeff think about where he came from.
- We have such fragile beginnings, but the processes inside an embryo are so amazing, and so reproducible.
- Jesus became an embryo – how incredible!

Briefly reflect: What have you got to know about Jeff? OR Which part of Jeff's story stood out for you, and why?

Questions of meaning and purpose (15 mins) – Choose one or more of the following options

a) Introductory

Watch video 1.5 (1 min 26): How do you think science and faith fit together?

and video 1.6 (2 min 12): You have been known to use the Bible in one of your lectures – how does that work?

Summary

- Biology is like art appreciation – studying the wonders God has made.
- Psalm 139 describes how God knows how we develop, and Jeff gets to study that process!

Discuss:

1. In what ways are Jeff's reactions a good example of McGrath's way of learning about God from creation?

[Hints: He is allowing what he sees to remind him of things he already knows about God, and amplify his experience of God as creator.]

2. How could Jeff's views and experience feed into a conversation with someone who says, 'You have to choose between science and faith'?

[Hints: He is a scientist who has embraced both, his faith is enhancing his experience of doing science and motivating him to do more – not disrupting it as some might expect, his faith is enabling him to experience the beauty of the living world even more – and that sense of wonder is infectious and helpful to his students even if they disagree with his beliefs; science is not proof for God but it makes sense when you look at it through a theological lens.]

b) In-depth

Watch video 1.7 (1 min 53): What thoughts are prompted by the beauty you see in the lab?

and video 1.8 (2 min): What do you think we can find out about God from his creation?

Summary

- Beauty points Jeff to God, the author of that beauty.
- Beauty helps Jeff pause in awe and wonder and give thanks to God.
- God must love variety, intricacy, and the wonderful complexities of the world.
- Psalm 19 says the heavens declare God's glory, and so do the things we see through a microscope.
- These tiny embryos give him a sense of wonder and God's majesty, gratitude and worship.

Discuss:

1. What's your view on whether beauty points to God?

[Hints: Some say beauty is truth, but others think beauty is in the eye of the beholder. One perspective is that beauty can be interpreted in multiple ways, so while it might give you a sense that there is something meaningful behind the experience of beauty, that meaning can only fully understood by learning about God in other ways.]

2. How could someone who doesn't share Jeff's faith relate to his way of seeing biology through a theological lens?

[Hints: Could it be seen as a thought experiment? Does it make sense of what we know of the world? Does it answer any of the questions about meaning and purpose that science cannot answer?]

c) Scientific

Watch video 1.9 (4 min 20): Can we use the language of purpose in biology? What do people mean by it?

Summary

- Jeff described two kinds of purpose.
- Theological purpose: God has an overall Purpose for the living world.
- Biological purpose: Biologists use purposeful language to describe processes in living things, such as growing, getting food, or fighting an infection.
- These two types of purpose are related: Jeff believes God put the biological processes in place so the world can operate as part of his overall purposes.

Discuss: How might Jeff's idea, that God made a rich and complex world that doesn't need him to tweak it, affect your view of God's actions or your conversations about science?

[Hint: Does it make creation more wonderful, if it doesn't need God to constantly correct things because he has put reliable biological processes in place? Jeff believes that God sustains the world in regular ways, which makes science and technology possible. He also believes that he interacts with it, acting in miraculous ways when he wants to – which was demonstrated supremely in the person of Jesus Christ.]

Wrap-up (5 mins)

Discuss in pairs: What have you learned from this session? Will it affect the way you see the natural world, relate to God, or explain your beliefs? (Use the handout if that would be a helpful summary.)

OR Discuss as a group: How might these types of ideas be used in a church service?

[Hints: A scientist could be asked to share their own perspective on what it is like to study creation, beautiful scientific images could be displayed in a gallery corner or on a projector, or scientific examples could be used in a sermon on one of the creation passages (Psalms, Genesis or Job, etc.)]

Finish with a prayer

Taking it Further

More of Jeff's own faith story: https://www.youtube.com/watch?v=XSauvJ7syW8&feature=emb_title

Jeff's work is covered in Chapter 5, 'Dance of the Cells', and his faith in chapter 10, in [Wonders of the Living World](#) (Lion, 2021)

Lecture by Jeff Hardin on ['How We Are Made: Embryos, Biology and Belief'](#), which expands on many of the ideas presented in this session.

Read about Jeff's work and faith, and others like him, in Ruth Bancewicz, [God in the Lab: How science enhances faith](#) (Monarch, 2015)

Article in *Christianity Today* magazine about Jeff Hardin, ['What's Under the Microscope Can Lead to Worship'](#)

Short article by Jeff Hardin, ['Walking the Walk: Thoreau and the art of seeing nature'](#)

[Blog posts](#) by or about Jeff Hardin.

[Articles by Jeff Hardin](#) on the [BioLogos website](#)

Session 1: Beauty – Handout

'One of the things that excites me about Christianity is it's a lens that brings my experience, my observations of the world into far sharper focus than anything else I've discovered up to this point.'

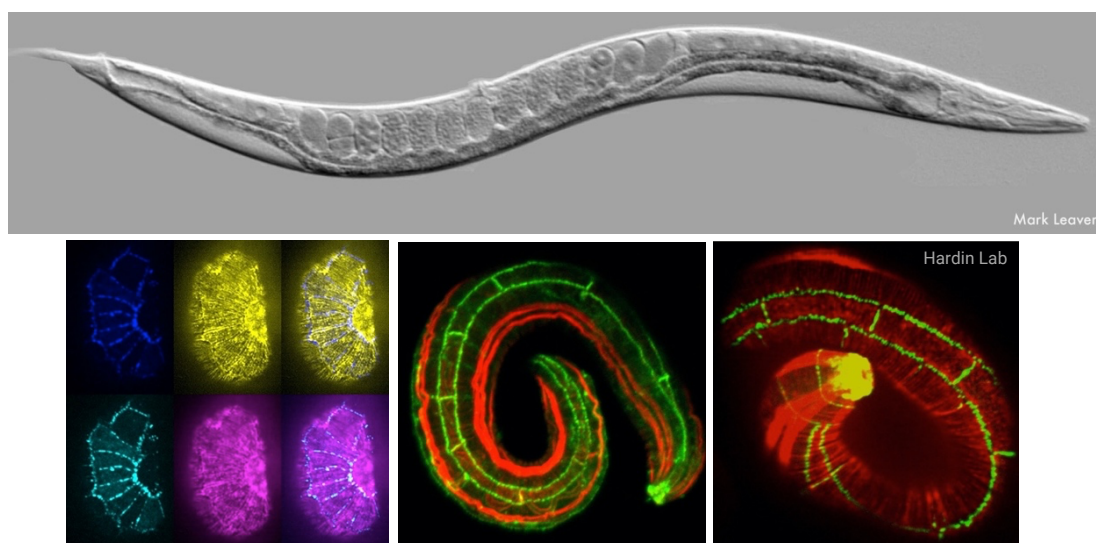
Alister McGrath

'My lifelong research interest is understanding how embryos develop, and for me that has always been pursued from a profoundly Christian perspective.'

'When I perceive things that are beautiful, to me that's a pointer to God himself, the author of things that are beautiful – things that are true.'

Jeff Hardin

Jeff studies *C. elegans* – a type of worm, which is 1mm long and lives in soil. These animals share many of the same functions as our own bodies, so they are used in many scientific studies.



Learning about God from creation – some pointers

1. God's revelation of himself in creation is complementary to his revelation of himself in the Bible (as long as we are interpreting each of these properly!).
2. But like gazing at a broken picture, people can only see parts of the truth about God when looking at creation because it is 'groaning' (Romans 8).
3. We need to learn about Jesus if we want to see God's full character.
4. Christians worship God, not his creation.
5. Scientific data can be used to point towards God (he made this amazing mechanism), or away from him (we understand the mechanism, we don't need God). To decide which is right, we need to look beyond science.
6. Some people believe in a 'god of the gaps', who made the things science can't explain. But when science advances, where is that god now? Christians believe in a God who made everything – both the things science can explain, and the things we don't yet understand.
7. Science is about evidence not proof, so you can't prove God's existence using science.
8. Scientific knowledge is provisional, so theology shouldn't rely heavily on very specific areas of science.

| | |
|------------|--|
| Biophysics | Using the techniques of physics to study aspects of living things. |
| Cell | The building block of living things. A cell has a thin outer membrane, with a watery mixture of molecules and microscopic structures inside that keep the cell alive and active. The only human cell that can be visible to the naked eye is the egg cell. |
| Ecosystem | A combined community of plants, animals and other organisms, together with the non-living factors they interact with, such as air, water and rock. |
| Zoology | The study of animals. |

Wonders of the Living World

Curiosity, awe, and the meaning of life



Leader's Notes, Session 2: Curiosity

Summary

Experiences of wonder can make us curious about the world. How do things work? Why do we find them beautiful? Why are they there in the first place? Some of these questions can be answered by science, and some cannot. In this session we meet Stephen Freeland, an astrobiologist who is interested in the origin of life and the genetic code. Looking at the properties of the universe, he thinks it may have been almost inevitable for life as we know it to emerge. The mechanisms of this process can be explored through science, but they also raise more philosophical or theological questions. Which world views are the data compatible with? Stephen believes that his scientific work is compatible with the existence of a loving God who has a purpose for the world.

Start with a prayer

Introduction – If this is your first session

Watch video 1.1 (1 min 43): Dr Ruth Bancewicz, The Faraday Institute, Cambridge.

Summary

- Scientists experience awe and wonder in their work.
- Science can remind Christians about the character and purposes of God, and help us to worship.
- These sessions aren't about proving God, but celebrating science and what it tells us about God's world.
- Science raises questions of meaning and purpose.

Bible (10 mins)

Read Psalm 8:1,3–4

Discuss: Have you ever learned something about the living world that helped you to appreciate it in a new way? What questions did it make you ask?

Thinking about God (20 mins)

Watch video 2.1 (2 min 43): Alister McGrath, Professor of Science and Religion at the University of Oxford, asks how can a feeling of awe and wonder prompt people to ask questions that science can't answer?

Summary

- His own experience of wonder helped him realise that there are two types of questions:
 - o Questions that science can answer.
 - o Deeper ('non-empirical') questions that experiments on material things cannot answer.
- Faith helps us to answer those more fundamental questions of life, such as, 'Why am I here?'

Discuss: What is science? On a large piece of paper, make a list of things you think define science. Here is a summary of the main points that should come up (drop them into the discussion if they don't!):

- A study of things that can be observed and measured.
- Involves making testable predictions.
- Often seeks to make generalisations about the properties of things, or describe them mathematically.
- Does not involve questions of meaning or value.
- Tries to reduce personal bias – e.g. by accountability to others and repetition of experiments.

Discuss: What are some questions that science or Christian faith cannot answer on their own? Make a table, and give the examples to spark off people's ideas

| Questions faith alone cannot answer | Questions science alone cannot answer |
|-------------------------------------|--|
| e.g. Why are we here | e.g. Why are we here |
| e.g. How the universe was created | E .g. What to do with a new technology |

Meet the scientist (25 mins)

Introduction (5 mins)

Explain: Professor Stephen Freeland is an Astrobiologist at the University of Maryland in Baltimore (UMBC). He has degrees from both Oxford and Cambridge universities, and has worked for NASA. His research is on the origins of the genetic code, asking why living things developed this system, and how well suited it is for life in the universe.

Watch video 2.2 (2 min 47): Why are you a scientist, and a Christian?

Summary

- He went to university, and discovered he wanted to be an academic.
- He is surprised to find himself in his job, and sees it as a sign of God's grace.
- His family were Christians, and he finds that Christianity also works for him.

Questions of meaning and purpose (20 mins) – Choose one of the following options

a) *Introductory (with a little science)*

Before watching the video, explain:

- All living things share the same genetic code.
- So at some point they had a common ancestor.
- That ancestor was the result of about half a billion years of evolution. There may have been other genetic codes out there, but this is the only one that survived.

Watch video 2.3 (3 min 10): What is your research, and how does that fit in with your faith?

Summary

- He studies the origin of the genetic code, which is shared by all living things.
- For him, faith is about meaning, and science is about mechanism.
- This work would be meaningless to him without faith.

1. What does it mean to you, to know that all living things share the same genetic code – can you see why Stephen is excited about this knowledge? *[Hints: It means we have something in common with every living thing on the planet. To rework Psalm 150:6, let everything that has DNA praise the Lord! It is an interesting clue for people researching the origins of life. Some of Stephen's research has been on the question, is this code the best one possible for living creatures? If this question catches the group's imagination you may also want to cover option c)]*

2. How do you think faith can give meaning to scientific work in general?

[Hints: It's good to explore the world God made, God said creation is 'very good' (Genesis 1:31) so it must be good to know more about it. We are also called to help others. Science helps us to develop helpful technology, and understanding the world helps us to take care of it as God asked us to in Genesis 1.]

3. Do you know any Christians who are involved in science, or are you in a scientific role yourself? How do they/you tend to express the experience of working in science?

b) *In-depth (with a little science)*

Before watching the video, explain:

- Living things use 20 building blocks (called amino acids) to build proteins.
- That set of building blocks was 'chosen' by natural selection.
- And it seems to be one of the very best possible selections for building life as we know it!

Watch video 2.4 (2 min 19): Stephen explains his work on how proteins are formed.

Explain: There are two ways to interpret the meaning of these results –

a) Now we are beginning to understand some of the physical mechanisms behind the origin of life, we no longer need to believe in a creator God.

b) These data are compatible with the existence of a loving, personal, creator God who has a plan for the world.

Science cannot tell us which of these two views is correct, because each involves knowledge and assumptions that come from outside of science.

Discuss:

1. If the science described by Stephen gives a correct picture of reality, which of these two views makes more sense to you? Why?

2. What extra evidence, might swing you more towards answer b?

[Hints: What about evidence for answered prayer; the life and teaching of Jesus as recorded in the Bible; a fresh look at the biblical creation passages; evidence for changes in individual people's lives when they start to follow God; a diverse Church working together; some rigorous theological or philosophical arguments for the existence of God; personal experience of God's interaction with us; or even some more scientific evidence?]

c) Scientific

Before watching the video, explain

- The genetic code matches the requirements for life in the universe incredibly well. If all you had were knowledge of the conditions on a rocky planet and the raw materials available, some of the properties of the genetic code could be predicted in advance.
- So if life arose again from scratch, it might have a very similar genetic code.
- It's not an accident life arose on earth. The universe seems to be 'life-friendly'.
- E.g. We are also made of the most abundant chemicals in the universe, life developed relatively early in earth's history, and also early in the universe's history.
- To Stephen, these data are compatible with the existence of a creator God.

Watch video 2.5 (4 min 11): Stephen explains the deeper scientific meaning of his work, and the questions it raises.

Discuss:

1. Which part of that video most struck you?

2. If you were you describing Stephen's story to someone else, which part would you focus on?

[Hints: What about the fact that he is a scientist and a Christian and sees no incompatibility there? Or his sense of curiosity and wonder at the science? Or the idea that the universe is friendly to life? Or the compatibility between science and the existence of a creator God? Or Stephen's own picture of God?]

3. It's quite possible that small organisms such as bacteria or single-celled algae live on other planets – even in our own solar system. What biblical themes could you draw on to help you think about this idea?

[Hints: The Psalms (e.g. 19; 148) say that all creation worships and brings glory to God, so this would simply make him even more glorious; God created and sustains every living thing – not just us. The Bible mentions that God is interested in places where people don't live, he cares and provides for all of creation e.g. Psalm 104, Job 38:25–27,39–40.]

Wrap-up (5 mins)

Discuss in pairs, and if time share with the group: What was encouraging from today's study? What questions you are left with? (Use the handout if that would be a helpful summary.)

Finish with a prayer

Taking it Further

Stephen's work is covered in chapter 3, 'One in a Million?' and his faith in chapter 10, in [Wonders of the Living World](#) (Lion, 2019)

[Talk by Stephen Freeland](#) on this subject

[Short leaflet on 'Fine-tuning' in the universe](#) (pdf, not exactly the subject of this session, but related)

Peter Ward and Donald Brownlee, *Rare Earth: Why complex life is uncommon in the universe* (Springer, 2000)

[Faraday papers](#) no. 4 & 10 (again, not exactly the subject of this session, but related)

A fairly academic science-faith [paper by Stephen Freeland](#) on the origin of the genetic code

Session 2: Curiosity – Handout

'Science and ... faith ... together are able to answer questions which on their own they simply couldn't.'

Alister McGrath

'Faith is about meaning ... Science can tell us a lot about hows and mechanisms and histories...'

'I think the science tells me that this universe is very, very intimately associated with life in a way that is consistent with [the] way that I read Genesis.'

Stephen Freeland

The genetic code is like Morse code

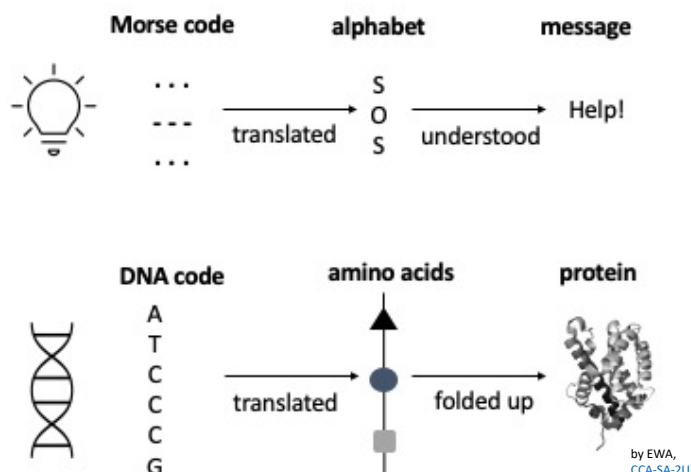
3-letter code words are spelled out using DNA subunits, A, T, C and G. Each code word specifies an amino acid.

Amino acids are small molecules, made mainly of oxygen, nitrogen, hydrogen and carbon (which are some of the most common atoms in the universe).

Amino acids form on the surface of rocks, in the clouds of dust and gas that form after a star has exploded.

It is thought that rocks carrying amino acids fell to Earth before its atmosphere formed, bringing the potential for life to our planet.

There are other amino acids in existence, but they are not used in the genetic code.



The building blocks experiment

| | | | |
|---|--|--|--|
| Fact Hundreds of naturally occurring amino acids. Living things only use 20 | Hypothesis Many other sets of amino acids could be just as good for making proteins as our 20. | Calculation How many random sets of 20 amino acids contain a better range of properties than ours? | Result Out of 100 million sets, looking at 3 properties (size, charge, behaviour in water), only six sets were better than ours. |
|---|--|--|--|

What if rest of the properties had been examined...? 'Yes, it seems as if this is the way that one would do life.'

Two ways to interpret the data

- Now we understand some physical mechanisms behind the origin of life, we don't need to believe in God.
- Compatible with the existence of a loving, personal, creator God who has a plan for the world.

Science can't tell us which is correct. Each involves knowledge and assumptions that from outside of science.

| | |
|-------------------|--|
| Amino acids | Small molecules that are joined together in long chains to make large protein molecules. Each amino acid has the same basic structure, with a side chain giving it unique properties. |
| Astrobiology | The study of the origin, evolution, distribution and future of life in the universe (definition courtesy of NASA). |
| Chemical elements | The atoms that can be joined together to make molecules. |
| Cosmos | The universe, when it is viewed as an ordered whole. |
| Evolution | A process where populations of organisms change over very long periods of time, by accumulating genetic mutations that alter the shapes and functions of their bodies. If a mutation helps organisms live together and thrive in their environment, it is passed on to the next generation and eventually spreads throughout the population. |
| Genetic code | The way in which DNA contains the information for the amino acids in a protein. A code word made up of three DNA subunits (A, G, C and T) stands for each of the 20 amino acids. |
| Protein | A type of large molecule made by joining small molecules called amino acids together into a long chain. That chain then folds up into a structure that can do work in the body, such as carrying oxygen (the haemoglobin protein) or sending a signal. |

Wonders of the Living World

Curiosity, awe, and the meaning of life



Leader's Notes, Session 3: Hope

Summary

This session explores the true value of creation to God. We meet Margaret Miller, a marine ecologist who studies coral reefs. She finds that her faith grows as she learns more about these amazing ecosystems. When coral populations are suffering what seem like irreversible losses, she finds hope in her belief that God has a plan and a purpose for all of creation. Theologians Alister McGrath and Hilary Marlow share a biblical perspective on the renewal of creation, which is both a source of hope and a call to urgent action. Discussion times will allow the group to think about how science can inform our worship, and how we can respond to today's ecological crises in a hopeful and practical way.

Start with a prayer

Introduction – If this is your first session

Watch video 1.1 (1 min 43): Dr Ruth Bancewicz, The Faraday Institute, Cambridge.

Summary

- Scientists experience awe and wonder in their work.
- Science can remind Christians about the character and purposes of God, and help us to worship.
- These sessions aren't about proving God, but celebrating science and what it tells us about God's world.
- Science raises questions of meaning and purpose.

Bible (15 mins)

Read Colossians 1:15–20; Romans 8:19–23

Watch video 3.1 (2 min 52): Alister McGrath, Professor of Science and Religion, University of Oxford, asks does the natural world have any value in and of itself (intrinsic value)?

Summary

- All of creation belongs to and is loved by God.
- If we love what God loves, creation has great value in and of itself.
- We are entrusted with the care of creation, which involves living within limits.
- We should also respect creation because it will be restored in the future.

Discuss: How could this idea of continuity between the present and future creation inspire us to care for it?

[Hints: If something is to be restored, is it better to wear it out as much as possible first, or to take care of it and use it wisely? What if we could herald that future restoration by doing some cleaning up ourselves? Which course of action shows the most respect and gratitude towards its owner?]

If someone asks where 2 Peter 3:3–13 fits in, burning by fire is used elsewhere as sign of purification (e.g. 1 Peter 1:7; 1 Corinthians 3:13). Just as the flood cleansed the earth without destroying it, fire could do the same. The word 'new' in Revelation 21:1 is translated by some scholars as surpassing and perfecting, not necessarily replacing with something brand new. In a similar way (same word as 2 Peter 3:13) 2 Corinthians 5:17 tells how someone is a new creation when they become a Christian.]

Meet the scientist (30 mins)

Introduction (5 mins)

Explain: Dr Margaret Miller is the Research Director of SECORE International, a conservation organisation for the protection and restoration of coral reefs.

Watch video 3.2 (3 min 11): Why are you a scientist, and a Christian?

Summary

- Her family were Christians, and as she got older that faith became her own.
- Her family also helped her learn to enjoy nature.
- She always wanted to be a field ecologist, and to work on coral reefs.

Questions of meaning and purpose (25 mins) – Choose one of the following options

a) *Introductory*

Watch video 3.3 (2 min 56): How do you think science and faith fit together?

Summary

- It's very enriching to talk about science and faith together – they help each other.
- Margaret has only recently started speaking about her faith at work, and her work at church.
- Margaret studies how organisms interact with each other and their environment.
- For her, these interactions demonstrate God's provision for all living things.

Watch video 3.4 (1 min 37): What do you think we can find out about God from his creation?

Summary

- For Margaret, the beauty of coral reefs is a reflection of God's character.
- She also sees whole ecosystems working together as an illustration of God's provision.

Discuss:

1. What might be some of the barriers that stop a scientist from mentioning their work in the context of their own church, or what might stop others from asking about it?

[Hints: Try not to spend too long wallowing in the negative aspects of church politics, and move quickly onto more constructive parts of the discussion! Some may forget the relevance of encouraging each other in our day-to-day work. There may be a fear that the science is too technical to explain or understand. If church members reject the principles behind their research, e.g. evolution or climate change, many scientists would avoid mentioning their work to avoid offending people/controversy/hurt feelings.]

2. What is the value of discussing scientific work in a church context?

[Hints: Encouraging others that science and faith are not mutually exclusive. Sharing the lessons about faith that the scientist has learned from their work. Enabling people to praise God because of the amazing things he has made and provided for us. Helping young people to see they can serve God by studying science. Encouraging other scientists in their faith. Encouraging people to look after creation!]

3. How might Margaret's sense of God's provision for living things tie in with the idea of caring for creation that we were discussing in the previous section?

[Hints: If we care for creation, living things continue to be provided for. We can benefit from creation, but overconsumption harms other people as well as the rest of creation, both now and in the future. Overconsumption also prevents us from heralding, by our actions, the renewal of creation in the future.]

b) *In-depth*

Watch video 3.5 (2 min 18): What is the value of creation and what does that have to do with us?

Summary

- Margaret believes that God's good creation has value in and of itself.
- Working with corals can be extremely discouraging.
- Her faith gives her hope that God has a plan for creation.
- She believes God allows us to partner with him to care for creation.

Watch video 3.6 (4 mins 06): The ethics of 'interfering' in ecosystems.

Summary

- Conservationists normally recommend that ecosystems are left alone to recover.
- But the current rate of loss of corals is so fast, they may be wiped out unless people intervene.
- Her hope for the process is that God also values those organisms and wants them to be preserved.

Discuss:

1. How could this sense of creation's intrinsic value affect our perspective on, and behaviour in, the living world?

[Hints: If we love God, we will love what he loves. Living that out means caring for creation, and enjoying its benefits within wise limits.]

2. How could this sense of intrinsic value give Christians a sense of hope?

[Hints: Margaret's gets hope from her belief that God values the living world and has plans for it.]

c) Scientific

Watch video 3.7 (1 min 43): What is coral?

Summary

- Coral polyps are animals with tiny plant cells (single-celled algae) living inside them.
- Hard corals use the energy they receive from these plant cells to extract minerals from the water, and make a limestone skeleton.

Watch video 3.8 (3 mins 16): How does climate change threaten coral reefs?

Words to watch out for: 'limestone', made of 'calcium carbonate', which the coral polyps use to make their homes

Summary

- One of the main threats to coral populations is climate change.
- The sea is sometimes too warm for coral now.
- Temperature stress can also cause diseases in coral.
- Increased CO₂ makes the sea more acidic, stopping coral polyps building their limestone homes.

Discuss:

1. Coral reefs provide a home for about one third of all known marine species. As changes in the temperature and chemistry of the water become increasingly common, they are becoming rarer. How might you encourage someone like Margaret in her professional response to this somewhat overwhelming challenge?

[Hints: Think back to the Bible section above. If creation is loved and valued by God for its own sake, and if there is a continuity between the present and new creation, she can have hope that God will not abandon her in her conservation efforts.]

2. What do you think the other differences might be for Margaret, as a Christian, working in ecology?

[Hints: Think back to the Bible section above. Her faith might be a source of inspiration for her work – it is worth studying coral simply because it is there, and it was made by God. Her work may also inspire her faith, as she studies the creation God loves, and sees some reflections of his character in the things he has made.]

Wrap-up (15 mins)

Watch video 3.9 (4 mins 41): Dr Hilary Marlow, Biblical Scholar and Fellow of Girton College, asks where can we find hope when we find the task of creation care too difficult?

Summary

- The Old Testament speaks about the renewal of creation after it has been damaged by human activity.
- Revelation also speaks of the renewal of the broken world – our ultimate hope.
- Our 'proximate hope' is that God can help creation to flourish, here and now, through our actions.

Read the passage Hilary mentioned: Isaiah 35:1–2

Discuss in groups of two or three, then share with the whole group: Should living out our 'proximate hope' be a central part of every church's regular activities? If so, how would you explain that to others and what would it look like in practice?

[Hints: The original role that was given to humankind by God in Genesis 1–2 was to tend and keep, or serve and preserve, creation. This could be seen as an aspect of servant leadership, extended to the rest of creation. Some may think this is not a central part of Christian faith, but a natural response to it. Sin degrades creation, so when sin is dealt with, creation will flourish. The degradation of creation affects the poor more than anyone else, so this is also a social justice issue.]

Finish with a prayer (And give people the handout to take home if that would be a helpful summary.)

Taking it Further

Margaret's work is covered in chapter 8, 'Living Cities' and her faith in chapter 10, in [Wonders of the Living World](#) (Lion, 2019)

Thinking about Creation Care (pdf) – [a short leaflet by Christians in Science](#)

'[Ecology: Living Communities](#)', a talk by Margaret on this topic

The Christian conservation group [A Rocha](#) has plenty of resources, and more are recommended [here](#).

Theologian and environmentalist [Ruth Valerio](#) does her best to model sustainable living

There are many books on this topic but [Planetwise](#) by A Rocha's Rev. Dave Bookless is a good place to start

Talks on [creation care](#).

Faraday Paper no. 5, [Why Care for the Environment?](#)

Session 3: Hope – Handout

'Because we love God, we love what God loves and therefore we have to respect the created order.'

Alister McGrath

'I certainly have always had the perception of nature having intrinsic value; of creatures within nature having value and existence in and of themselves.'

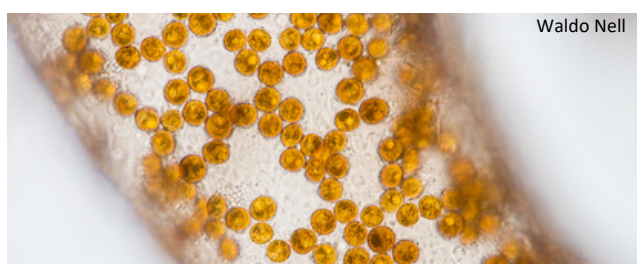
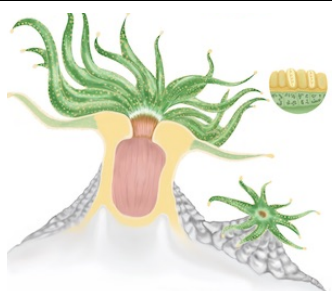
'We have responsibility as stewards of creation. We don't do a great job of that, but ... the concept we have of partnership with God in that stewardship, and maintenance, of nature, gives me hope...'

Margaret Miller

'It's not a completely hopeless picture. There are some parts [of the Bible] which talk about the restoral or the renewal of the created world ... our "ultimate hope" ...'

'There is another kind of hope ... proximate hope. It's about how we can, in the power of the Holy Spirit, bring or help to bring into being some of God's purposes for his world ... it's about asking "So what do we do now...?"'

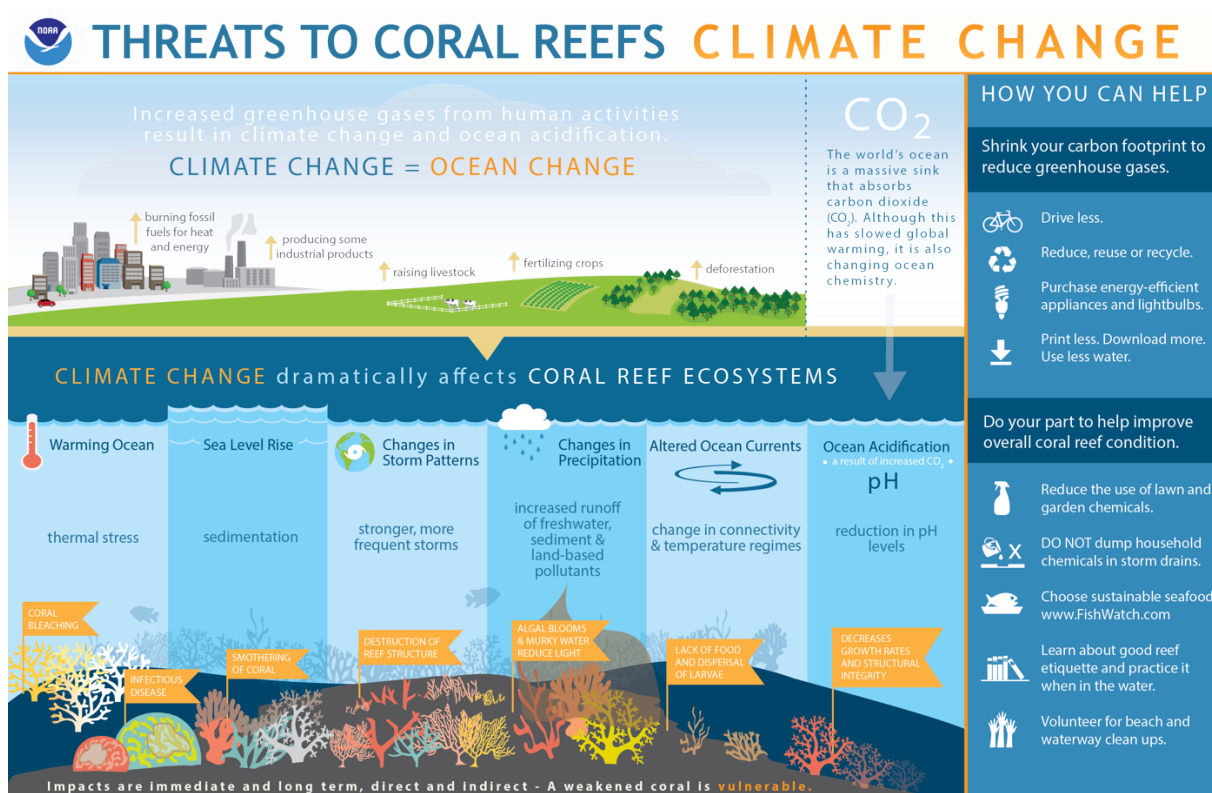
Hilary Marlow



Waldo Nell

In a hard coral, each polyp lives in its own limestone cup, connected to other polyps like a block of flats. They use their tentacles to catch food. They make limestone by extracting minerals (including calcium carbonate) from the seawater.

Single-celled plant (algae) cells live inside a coral's own cells, giving the polyps their unique colour. The plant cells use the energy from sunlight to make carbohydrates, some of which are used by the polyp. Without this extra energy, the coral will die.



Further information and other threats to coral reefs: <https://oceanservice.noaa.gov/facts/coralreef-climate.html>