



IS EARTH IN A NEW TIME PERIOD: THE PLASTICENE?

Nelson Rangel-Buitrago^{1*}, William Neal² and Kathleen Nicoll³

¹Programa de Física, Facultad de Ciencias Básicas, Universidad del Atlántico, Barranquilla, Colombia

²Department of Geology, Grand Valley State University, Allendale, MI, United States

³Department of Geography, The University of Utah, Salt Lake City, UT, United States

YOUNG REVIEWERS:



LEAF
AGE: 9



MOMO
AGE: 11

Earth has a special calendar called the geologic time scale that helps us understand its long history. We are currently in the Holocene Epoch, but some scientists believe we have entered a new time called the Anthropocene or the “Age of Humans” because of our impact on the planet. One of the biggest changes humans have made is inventing and using plastic, which has now become a major pollutant. Because plastic is now found everywhere, some scientists, like us, think we have entered a new stage in Earth’s history called the Plasticene. Plastic can now be found in many places on Earth, even in rocks! Scientists are trying to understand the various types of plastic rocks and how they form, which might help us to better manage plastic pollution. Plastic waste is leaving a mark on our planet’s history, but there are ways we can help.

GEOLOGIC TIME SCALE

A timeline that organizes Earth's history into smaller parts called eons, eras, periods, epochs, and ages, helping us understand Earth's long history.

ANTHROPOCENE

A proposed period in Earth's history characterized by the significant impact of human activities on the planet, signifying the "Age of Humans."

PLASTIC

A versatile material that is lightweight, strong, flexible, and cheap, but has become one of the major pollutants on Earth due to its resistance to degradation.

Figure 1

Plastics are everywhere! **(a)** Colorful plastics on a beach. **(b)** Tiny pieces of broken-down plastic objects, called microplastics, hiding in the sand. **(c)** Plastics stuck in a river.

THE EARTH'S HISTORY AND THE AGE OF PLASTICS

Did you know that the Earth has a calendar that helps us understand its long history? This calendar is called the **geologic time scale**. It is like a big timeline divided into smaller parts called eons, eras, periods, epochs, and ages. Right now, we are in the Holocene Epoch, which started about 11,700 years ago when the last ice age ended.

During the Holocene, humans began to do more activities, and these actions changed our planet in many ways. Some scientists say we have entered a new time, called the **Anthropocene** [1], which is a word used to describe a period in Earth's history when humans had a big impact on the planet. It is like saying we are in the "Age of Humans" because our actions are changing the environment, including the climate, the plants and animals that live here. People started talking about the Anthropocene because they want everyone to understand how important it is for us to take care of our planet and make it a better place for future generations.

One of the biggest changes humans have made is inventing and using **plastic**. Plastic is a material that can be shaped into many kinds of objects. It is lightweight, strong, flexible, and cheap to make. Unfortunately, plastic has become one of the biggest pollutants in the world [2]. It is everywhere, from the mountains to the oceans (Figure 1). The problem is that plastic is hard to get rid of. Most of the plastic that has ever been made still exists somewhere on the planet. Only a small amount of plastic is recycled or properly disposed of, and the rest ends up in the environment.



Figure 1

PLASTICENE OR PLASTIC AGE

A proposed stage in Earth’s history marked by the widespread presence of plastic in the environment, including in the ground, rocks, and living organisms.

LIFE CYCLE OF PLASTICS

The entire journey of plastics, from their creation using fossil fuels to their movement through the environment and eventual degradation.

Figure 2

The life cycle of plastic. Plastic starts as oil from the ground, turning into things like bottles at factories. Sadly, most plastic is used once and thrown away. Some gets recycled, but much ends up in nature. The sun breaks it into tiny pieces over many years. In shadowy places, plastic hardly breaks down, even getting into rocks. Plastic is all around, and it can harm our planet.

Because plastic is now found everywhere, some scientists, like us, believe that we have entered a new phase within the Anthropocene epoch, termed the **“Plasticene” or “Plastic Age”** [3]. This is a time when plastic is found in the ground, inside living things and even in rocks.

THE STORY OF PLASTIC

Do you know the story of how plastic is created and how it leaves a mark on our planet? **Figure 2** shows the **life cycle of plastics**, illustrating how they move through the environment and change as they go [3].

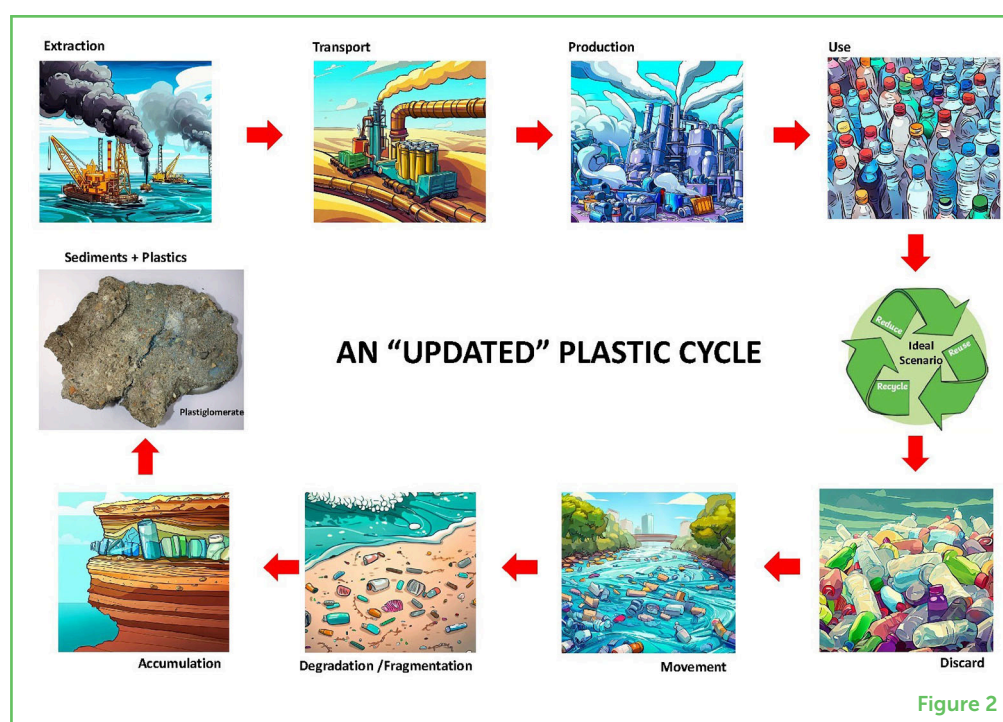


Figure 2

The story begins when we take fossil fuels like oil or gas out of the ground. Fossil fuels are the raw materials for most plastics. After we get the fossil fuels, we use big trucks, ships, and trains to transport them to the factories where oil is separated into several parts. Some of those parts are used to create plastic pellets, which are then used to make all sorts of plastic items we use every day.

We use plastic for many things. In fact, more than half of all the plastic ever made has been made in the last 20 years [4]! But did you know that half of the plastic we make is only used once and then thrown away? That is a lot of waste. After we use plastic, only a small part of it gets recycled and turned into new things. The rest of it ends up in landfills, in the environment, or even in the ocean. This is bad because plastic takes a very long time to break down, and it can hurt all living beings.

When plastic does break down, the process usually starts with sunlight. The sun's rays can make plastic weaker and more brittle. Over time, the plastic breaks into smaller and smaller pieces. Some of these pieces might stay where they are, while others might get buried or moved to new places. Tiny living things called microorganisms can sometimes help break down plastic even more, but this process takes a very long time. Overall, it can take at least 50 years for plastic to completely break down! In some places, plastic can get trapped and will not break down quickly because there is not enough sunlight or air. This means that, in some cases, plastic can stay in the environment virtually forever. Plastic is now found in many places on Earth, even in rocks!

ROCKS MADE WITH PLASTICS?

Plastics are used to make many things, like toys, bags, water bottles, and containers. But did you know that plastic can also be found forming rocks, due to plastic pollution? How does plastic end up in rocks in the first place?

There are three basic types of rocks: igneous, sedimentary, and metamorphic. But with plastic pollution, things get a little more complicated. Plastic-containing rocks are a new type of rock that is made up of both minerals and plastic (Figure 3). Imagine you have some old rocks and some plastic litter, like bottle caps or wrappers. Over time, the sun's rays and other things in nature break down this plastic into tiny pieces. These tiny plastic pieces mix with the small bits of rocks, sand, and dirt. When it rains or the wind blows, these mixed-up bits get moved around. After a while, they all get squished together and form these new types of rocks. It is like nature's way of making a rock sandwich with plastic inside.

Such rocks are called **Plastiglomerates**. Other types of plastic rocks are formed when plastics are combined with marine organisms like mollusks that pile up and then stick together after dying. Imagine you have a rock that has some plastic bits inside it. When water flows over this rock, it picks up tiny pieces from the rock and the plastic. This water then moves to other places. As the water dries up, these tiny pieces come together and form a new kind of rock. Think of it like making a new toy from old toy parts! And guess what? People have found these rocks in places like Spain, Brazil, Colombia, Taiwan, and Sri Lanka. Finally, plastics can sometimes get mixed with igneous rocks when they are buried by volcanic ash.

OTHER PLASTIC DEBRIS

Besides the special plastic rocks, we talked about, there are other ways we find plastic in nature. Sometimes, you might see burnt bits of plastic that come in all sorts of shapes and sizes. Have you ever seen plastic

PLASTIGLOMERATES

A new type of sedimentary rock composed of both minerals and plastic, formed from the combination of plastic debris and natural geological processes.

Figure 3

New formations found in the Plasticene. **(a)** A mix of litter found in the soil, including glass, plastics, and rubber (the hammer is used for scale). **(b)** A Plastiglomerate rock with plastics of all shapes and sizes mixed in. **(c)** A weird-looking lump of plastic made from burning/melting plastic objects.

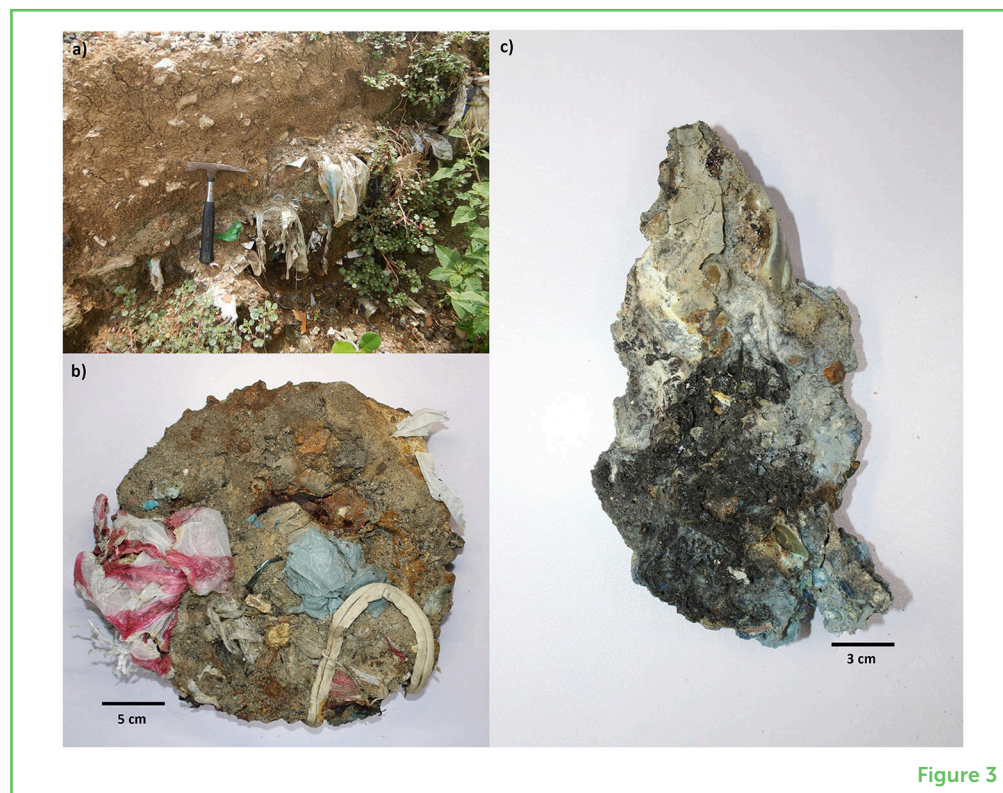


Figure 3

TECHNOFOSSILS

Objects made by humans, such as toys or tools, found embedded inside rocks, serving as a record of human activity.

URBAN FOSSILS

Plastic and other human-made materials embedded in urban infrastructures like roads or sidewalks, helping scientists understand historical plastic usage and human activities.

pieces stuck to rocks, especially at the beach? It is like when you get a sticker stuck on something and cannot peel it off. Now, about the “tar”—tar is a thick, black, sticky stuff that sometimes comes from deep under the ground or from factories. When tar and plastic come together, they stick to rocks, just like glue. Also, tiny bits of plastic can get mixed in with dirt and sand. Plastic fragments can also be found in soils.

Now, imagine finding old toys or tools stuck inside rocks. These are called “**Technofossils**,” and they are like time capsules showing things people made a long time ago or even just recently. It could be an old can, a bottle, or even a toy. There is also something called “**Urban fossils**.” It is like when you see plastic bits stuck in the roads or sidewalks in the city. Scientists look at these to learn about how people used plastic and to connect stories from different places. It is like being a detective, but for rocks and plastics!

SUMMARY: PLASTIC WASTE IS LEAVING A MARK ON OUR PLANET’S HISTORY

When special types of rocks and fossils are found around the world, they can mark a new part of our planet’s history [5]. Since the early 20th century, humans have been creating tons of plastic waste, most of which ends up in the environment. Scientists think that the worldwide presence of plastic waste marks a new period in Earth’s history called the Plasticene or Age of Plastics. Rocks and fossils that have plastic in

them are important clues to the start of this new age. Scientists can also date these plastic artifacts and describe what it is made of.

The Plasticene is a time we are living in right now, where there is a lot of plastic everywhere. You might wonder, "Why is that bad?" Well, too much plastic can hurt animals, plants, and even us. Animals can mistake it for food and get sick. Plus, plastics do not go away for a very, very long time. In the past, no one knew about plastics, so they did not worry. But now we know, and we can do something about it.

We need to use less plastic and recycle more. Instead of using plastic things like forks and straws, let us use stuff we can use again, like metal or bamboo. We can ask stores to use less plastic, join clean-up days at the park or beach, and tell our friends why too much plastic is not good. When we shop, let us buy big packs instead of small ones to use less plastic and choose things in cardboard or paper boxes. Every little bit helps! If we all do our part, we can make our planet a cleaner and happier place for everyone. You want to help?

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SUBMITTED: 22 April 2023; **ACCEPTED:** 07 November 2023;

PUBLISHED ONLINE: 24 November 2023.

EDITOR: [Melissa Hamner Mageroy](#), Norwegian Institute of Bioeconomy Research (NIBIO), Norway

SCIENCE MENTORS: [Xiaoming Wan](#) and [Karen Holmberg](#)

CITATION: Rangel-Buitrago N, Neal W and Nicoll K (2023) Is Earth in a New Time Period: The Plasticene? *Front. Young Minds* 11:1210561. doi: 10.3389/frym.2023.1210561

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YOUNG REVIEWERS



LEAF, AGE: 9

I am in third grade, and my favorite subject is art and science. I love observing changes in the world. I like to work as a Young Reviewer as I can observe many more changes using scientist's equipment. In my spare time, I like hiking, swimming, and riding bikes with my friends.



MOMO, AGE: 11

Momo loves to travel the world and see new places. Even so, she is a self-proclaimed couch potato when she is at home. The two extremes can coexist in one person! Her favorite couchmate is her fuzzy and affectionate dog, Lita.

AUTHORS



NELSON RANGEL-BUITRAGO

Nelson is a geology professor (like an Earth explorer). He teaches about rocks, coasts and the ocean at the Universidad del Atlántico in Barranquilla, a city in the Caribbean Coast of Colombia. He also writes lots of cool stories about the beach and the coast. Plus, he is an editor for special journal that talks all about coastal issues. You can find him at Programa de Física, Facultad de Ciencias Básicas, Universidad del Atlántico, Km 7 Via Puerto Colombia, Barranquilla, Atlántico, Colombia. *nelsonrangel@mail.uniatlantico.edu.co



WILLIAM NEAL

Bill (he/him) is emeritus professor of geology (like a rock detective!). He used to teach about rocks at university. Bill loves studying beaches, the dangers they can have, and even the trash we find there. You can find him at Department of Geology, Grand Valley State University, The Seymour K. & Esther R. Padnos Hall of Science 213A, Allendale, Michigan, USA.



KATHLEEN NICOLL

Kathleen (she/her), also called "Dr. K," is a geography professor at the University of Utah. She is like a treasure hunter for Earth's secrets! She learns about the different layers in the ground, how our Earth's climate is changing, the shapes of the land, and old things left behind by people from a long time ago. She especially loves to

explore dry, sandy places like the big Sahara Desert and the deserts in the southwest of the USA. Dr. K thinks sharing science is super fun, so she uses the internet, like her Facebook page called "Geomorphology Rules," to tell everyone about the cool science stuff that makes our world look the way it does. You can find her at Department of Geography, The University of Utah, 260 Central Campus Dr #4625, Salt Lake City, Utah 84112.