ARCHAEOLOGY LESSON PLAN SERIES

FIRST PEOPLES OF THE ATLANTIC PROVINCES OF CANADA

MI'KMAQ, WOLASTOQIYIK, AND PESKOTOMUHKADI

HOW (AND WHY) WE DO ARCHAEOLOGY

An Introduction to the Indigenous Archaeological Record

A LESSON PLAN BY CORA WOOLSEY AND PATSY MCKINNEY

Lesson Plan 2: Time and History in Archaeology

How (and Why) We Do Archaeology: An Introduction to the Indigenous Archaeological Record
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Statement of recognition: This lesson plan has been developed using educational facilities and resources within the traditional lands of the Wolastoqiyik and many other First Nations of Canada. The material in these lesson plans deals with the culture and history of the Wolastoqiyik, the Mi'kmaq, and the Peskotomuhkadi, as well as the First Nations in the Northeast of North America and across all of the Americas. Much of the knowledge base shared in this lesson plan is the direct result of the sharing of knowledge by the First Peoples of the Americas. The authors gratefully acknowledge that the unceded territories of the Mi'kmaq, Wolastoqiyik, and Peskotomuhkadi and all First Peoples made this lesson plan possible and that the rich cultural history of these peoples created the sites that we study.

Note Concerning Ethical Treatment of the Archaeological Record

This lesson plan is not intended to replace archaeological education or give students or teachers the skills to conduct archaeology. The authors and NCCIE in no way endorse seeking out Indigenous artifacts, withholding archaeological information from regulatory bodies, looking for archaeological sites, or digging with the intention to find artifacts or sites. Conducting archaeology, including excavation, testing, surveying, and monitoring, is only to be undertaken by an archaeologist or under the direction of an archaeologist who meets the criteria to be permitted by the provincial regulatory body of the province in question. The authors and NCCIE strongly condemn any activity that endangers the archaeological record, treats artifacts in a disrespectful way (such as selling or destroying artifacts), or impedes the ability of regulatory bodies to protect cultural resources.

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Lesson 2

Time and History in Archaeology

In this lesson, you will learn about time and how we can build history from stratigraphy. You will also learn about different dating methods.

Archaeology is a historical discipline. This means that, in archaeology, we want to know about what happened in the past, how it happened, when it happened, and why. When we are studying a people, a place, or an artifact, we want to tell the story of what we are studying according to the evidence we have about it. This story is called a **history**.

In order to tell this story and to build the history of something in the past, we need to be able to tell when things happened. This means that we need a way to **date** things in the past. We already talked about stratigraphy, which shows which layers (and artifacts) came earlier, and which came later. You may also have heard of radiocarbon dating, which uses organic matter, like animal bones, to give an estimate of a date when the organic matter was left in the archaeological record. There are several ways to date **events**—which are the things we can say "happened," like a cooking fire or an animal kill—and they fall into two types:

1. Relative dating;
2. Absolute dating.

Both kinds of dating are important in ordering events, which we need to do to build a **culture history**—a history of how culture changed and developed over time. When we have ordered events based on evidence from these two methods, we call it a **chronology** ("chrono-" = time, "-logy" = knowledge).

Relative Dating

Relative dating methods tell you when an event happened compared with other events. You can't know exactly when an event happened in actual years or **millennia** (thousands of years), but you can sometimes get an idea of when something might have happened by studying the event in relation to other events. This is especially true if you know the approximate **calendar year** (a fixed date in time) of one or more events.

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Relative dating techniques used in archaeology are:

1. Stratigraphy

2. Seriation

STRATIGRAPHY

One of the most important dating methods for archaeologists is **stratigraphy**. As we already mentioned in the first lesson, stratigraphy is the study of layers, or **strata**. Stratigraphy usually refers to soil, but it can also refer to layers of organic material (like shells), layers of rock, layers of artifacts (like pottery), or even layers of garbage. Stratigraphy is formed any time loose materials are **deposited** over time. According to the **law of superposition**, materials that fall to earth first are the materials that form the lowest **stratum** (plural of strata), while the materials that fall to earth after this first layer has been formed make a layer that is higher up. The surface represents the present time, although you can't assume that just below the surface is very close to the present; it could be much earlier.

Interpreting stratigraphy is not always easy. Although some layers of soil can be deposited very evenly over time, other layers may be very thin because of small amounts of deposition, while others may be very large because of large amounts of deposition. This means that you have to be careful to understand what forces deposited the layers. Even when you know this, you may still not be able to exactly know how long a layer represents in time.

To understand stratigraphy, you need to know a little bit about soil and **sedimentation**. Sedimentation is the process of how sediments (any particle that falls to earth) are made and deposited. We can't get into it in depth here because it is a vast subject, but the main things you need to know about sedimentation is that:

1. *Weathering.* Sediments come from the weathering of rocks;

2. *Sedimentation processes.* Sediments are deposited through many different processes;

3. *Size.* Sediments can range from microscopic to…well, really big;

4. *Shape.* The further a sediment has travelled, the more rounded it is;

5. *Rates of deposition.* Sedimentation happens at different rates depending on the action causing deposition and the kind of sediment;

6. *Artifacts in layers.* The layers that artifacts occur in help build a culture history of the site.

We will talk about each of these things in a bit more depth.

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Weathering. Sediments are made of tiny pieces of rocks and minerals that have broken away from the original material. This breaking away is called weathering and is caused by water, wind, other sediments, and plant and animal activity. It is called "weathering" because weather events are by far the largest weathering agent. Water leaches minerals out of rocks, decomposing them and making them easier to break, while moving water (like a stream) knocks sediments and rocks against each other, causing chipping and breaking. Wind (especially high wind) throws sediments at other rocks and chips at them. Ice pellets pound rocks, chipping away at them, and snow builds up in layers and puts weight on rocks, causing fractures through pressure. **Freeze-thaw action** is especially destructive in this part of the world as water freezes, expanding, and widening small cracks, then thaws, allowing more water in, which freezes again, making cracks even wider. This is why we have so many potholes. Other forces are animals and plants that push their way through rocks and minerals.

Don't memorize this, but in case you're interested: the action of sediments rubbing together and making smaller particles is called **abrasion**, while forces cracking and breaking rocks are called **mechanical stress**. A third action that causes the breakdown of sediments is **chemical weathering**, which occurs when some elements are leached out of a rock, making it more fragile and susceptible to other types of weathering. So now that you know where sediments come from, let's talk

1. Sediments deposited by three different forces: wind (left), water (centre), and glacier (right).

about how they get deposited.

Sedimentation processes. Sedimentation is the process of sediments, or particles, falling to earth and building up in layers through time. This can happen in several ways. Water carries sediments along with it as it travels, picking up new sediments and depositing them again somewhere else. This process of water transportation is called **fluvial** transport and it happens in rivers and streams, oceans, lakes, and run-off from rain water and floods. Wind also moves sediments around, especially fine-particled sediments. Wind transport of sediments is called **aeolian** transport and is responsible for many sandy deserts. A third transportation process is **glacial**

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transport and is the process by which **glaciers** move sediments along. This is important in understanding the last Ice Age and when humans arrived on the landscape because humans probably didn't live on top of glaciers too much of the time, so when we find glacial sediments, there are unlikely to be any human traces.

All three of these processes result in different kinds of layers. It is important to know which kind of transport process made the layers you are looking at because this can tell you about the history of humans on the landscape. To understand what sediments tell us about history, we need to look at some clues to how sediments got there: size and shape.

Size. The size of the particles you find are the direct result of how forceful the transport was. In other words, when water moves very fast, it is able to move much larger particles than when it moves very slow. The same is true of wind. In the case of glaciers, the transport process is slow but the ice that is moving is very heavy and the sediments that are picked up by ice are forced to move along by the crushing weight of the glacier. So in all these cases, sediments are likely to look much larger than in the case of very slow-moving water (like in a lake) or light wind (like in a forest).

Particles fall into several categories based on their size. Below is a table showing the usual size ranges and what we call them, and also the sedimentation process that usually deposits them in layers.

Size	Name	Look and Feel	Depositional Processes
>0.004 mm	Clay	Greasy when wet, chalky when dry, can be formed into a coil and bent before it cracks	Very slow waters, such as on an ocean floor, in a lake, or in a wetland
0.004–0.0625 mm	Silt	Muddy when wet, dirty when dry, can be compacted into a ball but the coil test results in cracking	Slow-moving waters, such as in a meandering river (a river with lots of curves) or a stream-fed lake
0.0625–2 mm	Sand	Gritty when wet, sandy when dry, can be compacted into a ball but loses its shape quickly	Waters moving moderately fast, such as in a wide, straight river or a coastline with a lot of wave action
<2 mm	Gravel	Bumpy when wet and dry, cannot be compacted	Waters moving very fast, such as where floodwaters flowed or on a beach with a lot of storms and high winds

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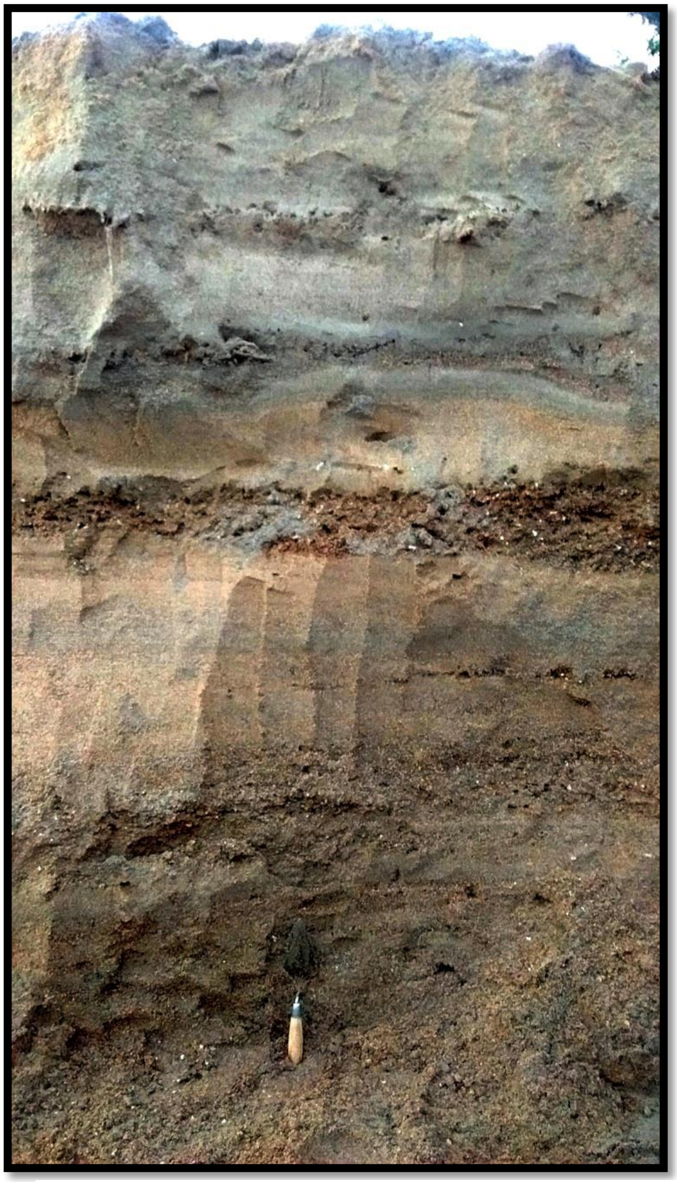

2. Stratigraphy showing many different particle sizes.

But there's more to it than just looking at size of sediments. These different sizes get mixed together because of long histories of bouncing around. Most sediments have been exposed to many different depositional forces—water, wind, and glacial—as well as different strengths of the same process, like different speeds of water in the same river. Often, they have been deposited and **eroded** (picked up again and deposited somewhere else) many times, often along with other sediments of different sizes and types. So we have to get good at spotting different mixtures of particle size. That can take a lot of practice, so don't expect to get good at it right away.

When sediments of different sizes are deposited together, they sort themselves: when wind and water deposit particles, larger ones get deposited first because they are heavier and they fall out of **suspension** first. In other words, particles get carried along by things like water and air but when those things stop moving so fast, the particles begin to settle. First, the largest particles fall out of suspension, then as the force slows more, the next smallest fall out, and when the force stops all together, the smallest particles slowly settle to the bottom. The problem, of course, is that forces slow down and speed up depending on lots of different factors (storms and weather, for instance) so particles are always settling out and being churned up again, making for mixtures of all these particles. When a layer is basically one particle size, we call it **well sorted**. When many different particle sizes occur together, we call it **poorly sorted**.

We find some common particle mixes over and over and they can tell us about the past environment. **Sandy silt** is the result of river sands mixing with finer silts from lakes. These are often deposited when rivers flood their banks and leave a layer of sediment behind. These are very **fertile** soils and allowed New Brunswick's agricultural industry to thrive along the banks of the Wolastoq River. Loam is a mixture of sand, silt, and clay and is often found where ancient floodplains have become forests and a large amount of weathering through aeolian and fluvial process have occurred over time. **Glacial till** is poorly sorted soil with clay, silt, sand, and gravel all mixed together, and this is the result of sediments churned up by ice and left where they fell after the ice sheet receded. **Silty clay** is often left behind by ancient lakes and wetlands and tends to be found in locations that are unattractive to humans because water

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gets trapped, making swampy conditions. There are lots more combinations, but these will do for the purposes of understanding stratigraphy.

Shape. Particle shape is also very important in understanding how sediments were deposited. Shapes range from angular to rounded. When particles first break off from a larger rock, they have very sharp edges, but as they bounce against other particles, they have more and more pieces broken off, both large and microscopic. So, over time, they get both smaller and rounder. Therefore, the smaller and rounder a particle is, the more it has travelled through the processes of deposition and erosion. The age of the particle can tell us a lot about where it was deposited.

Rounding doesn't matter to us too much in the smaller particles because shape is a bit hard to see in silt and fine sand, but coarse sand can be either rounded or angular, usually falling somewhere in between. This can help us know whether the sand came from a long way away, like in beach sand, or whether it has travelled a fairly short distance from the **source material** from which it originally broke off, such as in river sand. In the case of gravel and pebbles, this is even more the case.

3. Lots of different sediment sizes, colours, and roundness.

The most common place we look for angular sediments are in glacial till, the sediments left behind by the glacier that receded somewhere around 10,000 years ago. As we already talked about, glacial till usually means we have come to the end of the stratigraphy that will have artifacts or traces of humans. This is not always the case though, and so usually we want to go about 10 cm past the surface of glacial till just to make sure. We can tell when we have reached glacial till because it is made up of a mixture of angular and rounded sediments, and it is very poorly sorted, meaning it has all the sediment sizes. It is important to note that glacial till looks different depending on the region you are in, but usually it follows this rule: it has angular pebbles and gravel, lots of clay and silt, and is usually pretty hard-packed, meaning it is hard to dig.

Rates of deposition. Maybe the most important part of understanding stratigraphy for archaeological purposes is that sediments can be deposited at very different rates depending on the circumstances. In some rivers, sediments are deposited fairly rapidly, so the layers can build up quickly compared with an environment (like a forest floor) that builds up much slower. This means that one meter of sediment in one environment does not represent the same amount of time in another environment. Even more complicated, rates of deposition can change through time, so one stratum may represent 10,000 years while another of the same height represents only 500 years. This means that events we can date to a calendar year are very important to understanding the stratigraphy.

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How can we date one stratum? Sometimes we get lucky and we find a coin with a date. Then, we know that the layer cannot date to before this time. However much more often we have to do some research. The image to the right is strand of beach with 1.8 meters of stratigraphy, which might represent a large **time depth** (a long time span represented in layers of earth). However, the boulder that was found around half-way down was placed there in 2003 as part of the city's project to protect the beach from vehicles. This picture was taken in 2017, so from the boulder's placement to the top of the stratigraphy is 14 years. We cannot assume that the layers below the rock were deposited at a similar rate, but we can look for other signs that indicate this is the case. In fact, from finding a concrete block at about 1.8 meters (roughly where the water is), the archaeologist was able to determine that the entire time depth was not more than 60 years. This is an exceptionally rapid deposition rate!

4. A buried boulder dated to 2007.

Artifacts in layers. Artifacts occur in different layers because, while people are living on a surface, erosion and deposition are still happening, so artifacts get mixed in with sediments over time. The layers that artifacts and features are found in can tell us a lot about the histories that created the artifacts. Often, artifacts occur in some layers but not in others. These **artifact-bearing layers** are very important for building a culture history because we can see how artifacts changed through time. Then, the next time we find an artifact like one from a particular stratum, we know roughly how old it is in relation to other artifacts. This position of artifacts in relation to each other and to features and other layers is called the **context** and it is the most important part of understanding the history of a place we are digging in. One particularly important context is when we find artifacts associated with other artifacts or with features such as hearths. This becomes really important in radiocarbon dating, as we will discuss soon.

5. Flooding in Fredericton left behind debris and silt, the process that made the Wolastoq River banks so great for agriculture.

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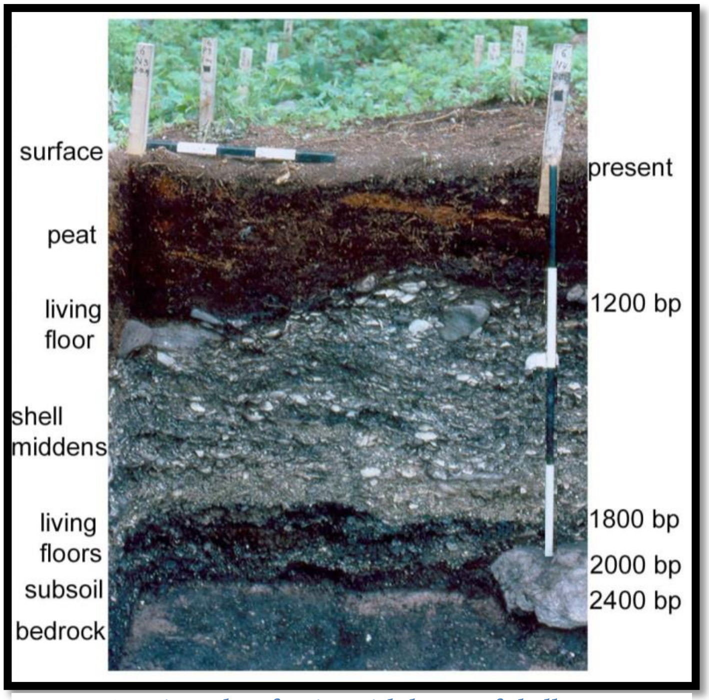

6. Stratigraphy of a site with layers of shell, peat, and silty sand.

For example, we might find three artifact-bearing strata within a site. The lowest layer (1) may contain one artifact type that is very plentiful. In the next highest layer (2), we may find another kind of artifact that is less plentiful. Finally, near the surface (3), we may find two or three different kinds of artifact, each of which is fairly plentiful. The lowest (1) may be composed of silt and sand, while the next (2) may be very thick and composed of a lot of coarse sand and gravel. The highest (3) may be composed of loam and be very thin. From this, we might say that the lowest layer was a flood plain where people lived for a long time, making artifacts to use around their homes. The next layer up seems to indicate a much more rapid rate of deposition, as though the river that people previously lived next to had moved and was now over top of the site, and was very fast-moving. Clearly, it would not make a good place to live! Last, we can see in the highest layer that the river seems to have moved again, and people seem to have come back, but maybe they only used the site for a short period each year because the river was now somewhere else and it was no longer the best place to live. The highest layer's different artifacts may show that the thin layer of loam in fact represents a very long time depth compared with the other two layers.

SERIATION

Seriation is a way of analyzing artifacts that orders them by their relative position in time. It is based on the principle that artifacts change through time. Unfortunately, we can't say how fast artifacts change through time, and sometimes we don't even know how they change! This means that we can't date events using artifacts but we can sometimes say which came earlier and which came later based on the stratigraphic layers they were found in.

7. Coke bottles through time.

Seriation works by looking at the individual **attributes** of artifacts. Attributes are any part of

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8. Projectile point sequence of the Maine–Maritimes Region

an artifact that we can describe. Basically, an attribute is the same as a characteristic, like you would use to describe something or someone, like hair colour, material, or smell. An attribute of an artifact can be its shape, size, colour, material, decoration, or any part of any of these. Attributes are important to seriation because we can see that, although an artifact type remains more-or-less the same through time (in terms of its function, overall look, material, and so on), one or some of its attributes probably changed through time.

A great example is Coke bottles. The bottles made by Coke now are different from the bottles made 20 years ago. They are still bottles, and they even look like Coke bottles, but something has changed. The change between some periods is subtle, no more than a slightly smaller waist. The change between other periods is more subtle, going from dark brown to clear glass. Without knowing the dates of each, we might think that some of these are actually from the same period. This is why stratigraphic context is very important in helping us figure out which attributes changed, when they changed, and in what ways they changed.

Each artifact class has attributes that are good for dating because they are **chronologically sensitive**. This means that, though the artifact type doesn't really change through time, some of its attributes do. Flaked-stone projectile points always have a point and are usually double-edged but their **hafting elements**—the base where they are attached to the shaft—change shape depending on time period. Decorations on pottery have been shown to change through time as well. These chronologically sensitive attributes help archaeologists date artifacts and the layers those artifacts come from.

The reason we know how artifacts have changed through time is by building knowledge about which artifacts come from which time periods. Many archaeologists in this region have noted the same order of projectile point hafting elements from lowest layers to highest layers, and they have also been able to date some of the layers to calendar years using absolute dating methods like radiocarbon dating. This has given us a well-established **sequence** that we can now use to date artifacts when we find them. In other words, we can compare a projectile point to the sequence from this area to figure out which type of hafting element looks the closest, and suggest that the projectile point came from that time period. Since radiocarbon dating is expensive and not always possible, this comparison to the sequence is very important for understanding the whole history of a site.

Absolute Dating

Absolute dating methods are ways to date events to calendar years instead of relative to another event. This means that we can say when an event happened, and if there is also a means of relative dating (like stratigraphy), we can better understand what happened before and after that date. The only trouble is, it can be hard to get an exact date, even with the methods that exist. First, let's talk about the kinds of absolute dating archaeologists use.

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Absolute dating techniques used in archaeology are:

1. Radiocarbon dating;
2. Tree ring dating;
3. Ice core dating.

RADIOCARBON DATING

Radiocarbon dating allows archaeologists to give a range of calendar dates to an event using organic material. Radiocarbon dating works by measuring the amount of the carbon **isotope** called ^{14}C (pronounced "carbon fourteen") in a sample. ^{14}C is an unstable isotope, or version, of carbon, which means that ^{14}C atoms lose their electrons over time, causing them to turn to an isotope of nitrogen called ^{14}N (pronounced "nitrogen fourteen"). Atoms that are unstable in this way are called **radioactive** and the process of turning into other elements is called **radioactive decay**. The amount of carbon in the atmosphere is more-or-less stable and always being replenished, and living things are always taking in more carbon through eating. However, once a living thing dies, it stops taking in carbon, and the carbon starts to decay.

^{14}C decays (that is, it turns to ^{14}N) at a known rate, called a **half-life**, which is 5,730 years. A half-life means that, during that time, half of all the unstable atoms will have decayed. After that half-life, another half-life must go by before half of the remaining atoms decay, and so on. So if exactly half of the expected ^{14}C is found in a sample, then we can say that the living thing where the sample came from died about 5,730 years ago, in theory. This can be used to tell how long ago a living thing died.

9. Carbonized food on the inside of a ceramic sherd can be used for radiocarbon dating.

Radiocarbon dating is complicated by the fact that carbon has not remained exactly the same through time. We know this because we have ice core samples, tree rings, and other ancient organic matter from very far back and are able to develop an amount for each calendar year going back at least 50,000 years. Another complication is that different regions had different amounts of carbon in their atmosphere. A lot of work has gone into making an accurate sequence of carbon levels for each year and in each place. Using this information, we can **calibrate** radiocarbon dates so that they are more accurate.

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Nevertheless, radiocarbon dates cannot give us a perfectly accurate date. The further back the sample comes from, the harder it is to be sure how close we are to the right date. Even very recent dates are hard to get precisely. So, radiocarbon dates are actually shown as a **statistical probability**, which means that we don't know the exact date but we think it is somewhere in this range. We do this by saying what 1 Sigma amounts to. 1 Sigma is a statistical term meaning within this range, the number (or date in this case) is 67% likely to be right. 2 Sigmas, which is just 1 Sigma multiplied by 2, is 95% likely to be right. Finally, 3 Sigmas (1 Sigma x 3) is 99.9% likely to be right. Radiocarbon dates in the last few decades usually have a 1 Sigma range of 30 years.

Radiocarbon dates are usually written with a calendar year, such as 3,165, and then a "±" symbol that means "plus or minus," and then a number of years representing 1 Sigma, and followed by "BP," which stands for "before present." ("Before present" actually refers to 1950, the year Willard Libby invented radiocarbon dating). So a radiocarbon date of 3,165±30 BP means that the date most likely falls between 3,195 and 3,135 years ago, but it almost certainly falls between 3,255 and 3,075 years ago (+ the time since 1950). Complicated, for sure!

There are even more complications to how dates are calculated, but we will not get into that here. More important for archaeologists is that radiocarbon dating can be a problem for lots of reasons. Here are the most common.

Contamination. Radiocarbon can be **contaminated**. Because it runs on carbon, if modern carbon gets mixed in, it can really mess up the results. The same goes for older carbon.

The sample must be organic. Another problem is that radiocarbon dating can only be done on organic things, but as we already talked about in the first lesson, organic materials don't survive very well in the archaeological record. We can't date lithics directly because stone is not organic, so the only way we can date lithics is if they are associated with organic material, like a hearth with charcoal.

Dating the wrong event. A third problem is that, if we are dating something that has been used for a long time but there is not too much stratigraphic separation, then we could get a date range that doesn't make a lot of sense. We can also sometimes accidentally date wood that is much older than the event we are trying to date because people often used wood that had died much earlier, especially in the Arctic where wood is scarce but preserves well. So we have to always evaluate the dates we get based on relative dating methods and other information.

Unlike in the popular imagination, then, radiocarbon dating is no sure thing. Nevertheless, radiocarbon dating revolutionized archaeology when it was invented. Before radiocarbon dating, archaeologists had to rely on relative dating methods and some culture sequences, it turns out, where off by thousands of years! Some

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archaeologists didn't even believe humans had been on North America more than a few thousand years. Radiocarbon dating proved conclusively that people had been living here for at least the last 15,000 years, which forced a lot of non-Indigenous scholars to evaluate how they had been thinking about Indigenous histories and cultures.

TREE RING DATING

Tree ring dating uses tree rings, which grow each year, to count backwards in time. Some trees are very long-lived , like the Bristlecone Pine, which has lived for over 5,000 year in some cases. We can go back even further by overlapping the rings of trees dated to known years with trees found in the archaeological record. The known tree ring sequence extends back about 12,000 years. This technique is more important in other parts of the world where wood is much better preserved.

10. Tree rings.

ICE CORE DATING

Another absolute dating method, which uses the same principles as tree ring dating, is **ice core sampling**. This is the study of ice cores near the Arctic or Antarctic poles where ice builds up each year but does not melt, preserving the layers that show a warmer season and a cooler season. Because the layers are thicker or thinner depending on how much precipitation there was that year, and depending on how much melting occurred that year, each layer is distinctive and ice core stratigraphy in one sample can be compared to another sample to match up the layers that came from the same year. If one year has record precipitation and resulted in a really thick layer that year, we can identify that year in calendar years. Ice core dating has been very useful in radiocarbon dating because it often traps organic material in the ice rings that can link radiocarbon dates to calendar years.

Analogical Reasoning

11. A replica of an ancient pot cooking maize in the traditional way.

Developing dated events and ordering events in time are a very large part of archaeology. However, chronologies are only one part of developing a culture history. We also need to say how things were done in the past and, hopefully, why they were done that way. But this means we need to understand what we are looking at when we see artifacts and what happened to them, which is not an easy task! This is especially true because often we are looking at

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technologies that are no longer used in our society.

To understand the past, we need to do some thinking about how people were using their artifacts and behaving on the landscape. Because we can't go back in time, we have to look at other clues that are not directly related but can be compared because they are similar in some ways. For instance, we know that people in the Maritimes used flaked-stone tools during most of their history. There are cultures today that still use flaked-stone technology, so we could study those cultures to help us understand what is involved in making stone tools, how they are often used, what kinds of traces (or use wear) they get during their lives, and how easy they are to break. This is called **analogical reasoning** because we are making an **analogy** (looking at the similarities) between two situations to see if things from one situation could be applied to the other.

12. An experimental flintknapper.

Analogical reasoning has helped archaeologists understand many things about the archaeological record. One way of learning about the past through analogical reasoning is **experimental archaeology**, which involves trying to reproduce artifacts using only the tools and techniques that would have been used by ancient people. Learning to make stone tools helped archaeologists realize that debitage, the flakes that come off a stone tool while it is being made, give a lot of information about the kind of activity that was done. Large flakes with the outside of the rock (called **cortex**) are made when the flintknapper was not yet making a tool but only preparing the **core** for knocking off a perfect large flake. Tiny flakes no bigger than a centimeter only happened in the very final stages of making a tool or when a tool was being resharpened. Knowing these things from making a stone tool helped archaeologists understand when they were seeing only a scatter of tiny flakes from sharpening or a scatter of larger flakes from preparing a core to get the perfect flake.

13. Replicas of ancient hand axes.

But perhaps most surprising of all was the first time archaeologists saw a traditional flintknapper from Australia making a tool called a hand axe, a tool that has been found as far back as 300,000 years ago. We have many examples of this tool from the archaeological record and archaeologists were excited to see how it was made and used. Imagine their surprise when the flintknapper discarded the hand axe and picked up several of the best flakes to show the archaeologists! He proceeded to use them to cut meat and leather with their much sharper edge and showed the archaeologists how well they fit the hand. This caused archaeologists to rethink their ideas about what makes a good stone tool.

Analogical reasoning also helped archaeologists understand traditional ways of life better. For instance, many of the tools that people used up until recently in the

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Arctic—where whales, seals, and other large sea mammals are still hunted—are similar to tools that people used when they were hunting large mammals during the last Ice Age. Archaeologists were trying to understand how people during the Ice Age could have been moving around so much, sometimes across the entire continent, which seems impossible to most people living in modern times. Some archaeologists turned to the peoples of the Arctic and saw that these people also moved vast distances with ease. Because Arctic people have to cover so much ground to follow their prey, which are their main source of food, archaeologists reasoned that following big game during the Ice Age could have resulted in a similar way of life, where plant foods were scarce and unreliable.

We have to be careful about analogical reasoning though, because we can draw conclusions that are not supported by the evidence sometimes. For instance, just because one society makes and uses an artifact type very similar to another society, we could not say that the two societies share similar ideas about the world. We could not draw conclusions about their spiritual views or their gender roles. Sometimes, archaeologists have done exactly this and have come up with bad conclusions that turn out to be wrong. Because of this, archaeologists are very careful about saying anything too definite about the past unless they have direct evidence for something.

Putting It All Together

While absolute dating can give us calendar years (or at least a good idea of calendar years), it is not always possible to date all the events we are seeing in the archaeological record with the dates we have. Similarly, stratigraphy doesn't always tell us about different periods because it is not always very obvious where one layer ends and another one begins. Also, when stratigraphy has been disturbed, both relative and absolute methods can become useless. Because of this, we need to use all available sources of evidence. Even then, we may not have enough evidence to figure out exactly what is going on. Analogy can help us with some things, but we have to be very careful to draw only those conclusions that can be supported by the evidence.

In order to be a good archaeologist, you must be good at understanding stratigraphy, comparing artifacts to other artifacts, understanding what your radiocarbon dates mean, and knowing what you can figure out from the world around you and what you can't. This is quite a job! The best way to get good at it is to observe your world, read a lot of books, ask a lot of people about what they know, and do a lot of thinking. This is the life of an archaeologist.

So now you have some knowledge of the artifacts you are likely to find and an understanding of how to see them as part of a history. You have several tools to interpret the time periods of artifacts and you have begun to think like an archaeologist—using analogical reasoning. Next, you need to learn about what we know already about this region.

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In the next lesson plan, you will learn about the history of the Maritime Provinces. This history will help give you an understanding of what you are seeing in the archaeological record.

PHOTO CREDITS

1. *Sediments deposited by three different forces. Left: sand ripples in the Giza Plateau in Egypt, courtesy of Ahmed AlSaggaf. Centre: Sand on the northeast coast of New Brunswick, Cora Woolsey. Right: Glacial sediments in Jasper National Park, courtesy of Roísín Seifert.*
2. *Stratigraphy showing many different particle sizes, Cora Woolsey.*
3. *Lots of different sediment sizes, coulours, and roundnesses, courtesy of Mikael Basque.*
4. *A boulder dated to 2007, Cora Woolsey.*
5. *Flooding in Fredericton, Heather Molyneaux.*
6. *Stratigraphy of a site, courtesy of David Black.*
7. *Coke bottles, compiled by Cora Woolsey.*
8. *Projectile point sequence, compiled by Cora Woolsey.*
9. *Carbonized food on the inside of a pot, Cora Woolsey.*
10. *Tree rings, Cora Woolsey.*
11. *A replica of an ancient pot, courtesy of Richard Zane Smith.*
12. *An experimental flintknapper, courtesy of Mikael Basque.*
13. *Replica of ancient hand axes, James Dilley and courtesy of AncientCraftUK.*

List of Terms

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