The notion that “big things” are more important permeates the human experience. We aim to climb the tallest mountain, discuss the largest empires, and on rare occasions, even bake the largest cookie. This notion is one of the great appeals of Astronomy, where everything is big. One can easily be swept up by the incomprehensible scale of the universe and think that, on cosmic scales, small things are insignificant. Sometimes, however, “thinking big” can be the wrong approach.

A major endeavor in Astronomy is to understand how the universe went from a neutral state, where the atoms between galaxies had all of their electrons, to an ionized state, where electrons are separated from atoms. This is what we refer to as the problem of “reionization”. We know an incredible amount of energy is required to ionize all of the gas between galaxies, and we know that this energy must come from the high energy light emitted from the galaxies themselves. What we do not know, however, is how this energy escapes the galaxies.

The problem stems from the simple fact that it is incredibly hard for light to escape a galaxy with energy capable of ionizing hydrogen, the gas between galaxies. When we look at galaxies nearby, we find very little high energy light ends up escaping, on average just a few percent. This is because there is typically a lot of neutral hydrogen within the galaxy that acts like clouds on an overcast day, absorbing the light before it can break through. If an event were to occur that removed those clouds, then this high energy light would be free to escape the galaxy. Such a scenario, where all clouds in the galaxy are removed, is called a “blow-away”, and new observations of Pox 186 show it is likely the first galaxy ever observed to be in such a state.

A blow-away requires an immense amount of energy in a short amount of time. When large stars reach the end of their life, they self-destruct and explode in what we call supernovae. These supernovae are the primary driving force behind a blow-away. The explosions carry enough energy to create “holes” within the galaxy where clouds within are pushed out. If enough supernovae were to go off in a short amount of time, those holes would merge together, pushing the clouds completely out of the galaxy, creating a blow-away. This is what we think happened in Pox 186.

What’s special about this galaxy is it’s extremely small size and relatively large population of stars. Pox 186 is 1/100,000th the size of the Milky Way. It is more similar to 30 Doradus, a single star-forming region, than the galaxy 30 Doradus resides in, the Large Magellanic Cloud. Pox 186 is only a few hundred lightyears across and hosts at its center a super massive star cluster which dominates the galaxy. In essence, it is one star cluster that is simultaneously its own galaxy. This combination of small size and central, dominant star cluster is what enabled the blow-away to occur. Much like a lightweight boxer, it packs a lot of punch for its size.

This also highlights the potential flaw in “thinking big”. At first glance, massive star-forming galaxies seem the obvious places to look for a blow-away, and the likely culprits behind reionization. Being the biggest galaxies with the highest raw production rates of stars, they have the potential to output enormous amounts of energy. If reionization is like water erosion, they are the Niagara Falls of galaxies. Yet, how many “Niagara Falls” are there in the world? Not many. Not only are there not many, the erosion that occurs due to them are mainly contained *within the river itself*. So, if dry land is the focus, large waterfalls have relatively little effect. In this same way, massive star-forming galaxies are relatively rare and the energy they produce is largely confined within the galaxy before it can escape. Large galaxies have more clouds blocking the light, and removing those clouds is more difficult because of their large mass, which creates more gravitational pull that draws them back in. On the other hand, small galaxies would be more akin to waves in the ocean. Waves are seemingly endless in number, and typically smaller in size. At any given moment most waves exist out away from the coast and do not affect the land. The ones that do make it ashore, the blow-away galaxies in this analogy, deposit *all* of their energy into eroding dry land.

If Pox 186 is like a wave, then we’re looking at it as it’s cresting. What will happen to it once it hits the shore? Will it crash against the sand, dooming itself to a future devoid of major episodes of star-formation? Or will it rebound, travel across the sea, regain its strength, and come ashore once more? Regardless, it serves as a gentle reminder. The reason big change is rarely noticed at its start is because it typically begins as something small. Even the tallest mountain grows one inch at a time.