

YouTube Story Board:

Remember the Future

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The Big Moon Dig

SBRemFuturemddy.docx

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Captions added

Description:

“Arrival” is a movie about remembering the future. Can we now remember our future too?

Our technology lets us model our future. Then from these models we can be in action toward a future that is good for us all. Our actions now will affect all our futures in positive ways.

Purpose: So, get into action, stay in action.

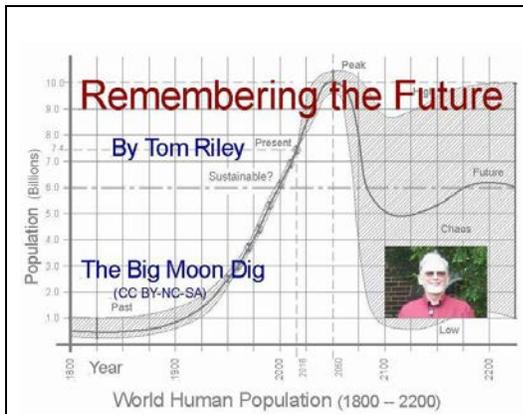
Intended Audience: Young Adult.

YouTube: <https://www.youtube.com/watch?v=EVhiN5gNGZg>

Story Board:

Graphic

Dialog (Critical column for editing)

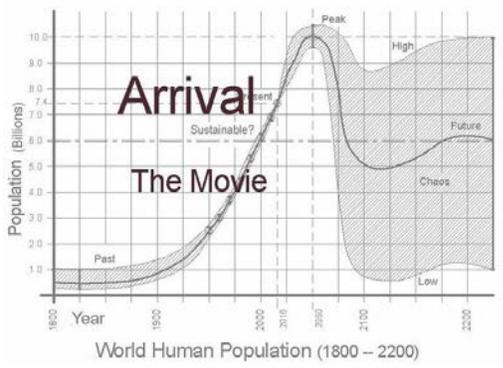


Title, author, BMD, Friendly face photo

Time: 10 s

No voice
Rocket sound fading in

Rocket sound fading out
Narration starting



Title for Movie section
Time: 2 s



Arrival poster by Paramount pictures.
AA Time: 33 s

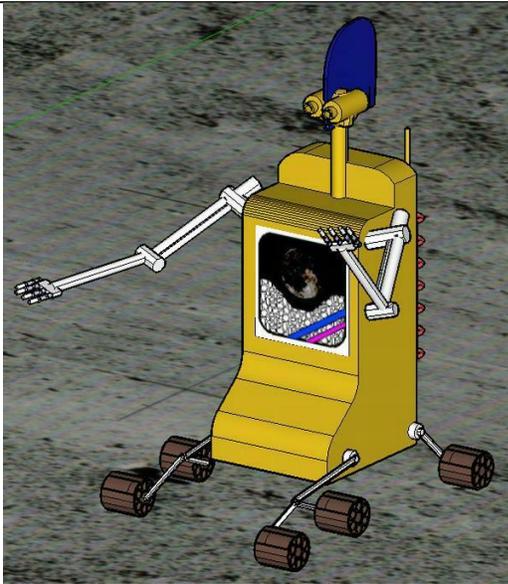
The movie *Arrival* opened in theaters recently. It's about the sudden appearance on Earth of alien spaceships and our efforts to communicate with those onboard.

I hope to avoid a spoiler but do need to give away a single plot point from the middle of the movie:

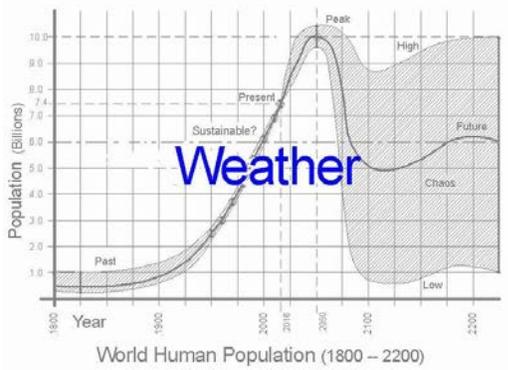
The alien language does not distinguish the past from the present, or the present from the future. It has no tenses at all. Their language then defines their thinking. They are aware of the present, but they remember both the past and the future, without favoring one over the other.

Unfortunately the end of the story pushes this idea beyond what is actually possible under our current understanding of physics. In fact, I see the ending as an example of magic realism. Still it is a great movie and I feel there are real lessons for us here.

Could we, starting from a base of reliable science and mathematics, learn to actually remember the future?



Caption: Digger03
 Digger03 from The Big Moon Dig,
 AB Time: 24 s



Title for Weather section
 Time: 2 s

Break
 Narration starting in



Caption: Chesapeake Sunset
 Chesapeake Bay – by Carol R.
 B Time: 22s

I think the answer is a qualified yes, particularly in this the 21st century. What fun!

Let's look at three cases where modern technology at least gives us actionable information about our future: weather, climate, and population.

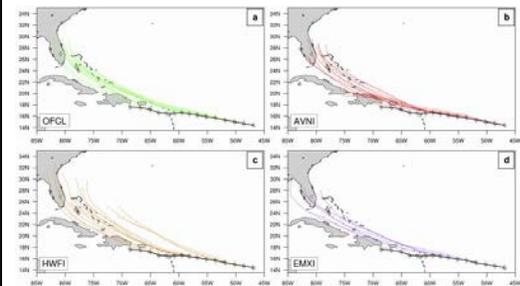
The first example is weather. Long ago, the best you could do to predict the weather was to look out the door.



Weather satellite by NASA
C Time: 26 s

Today we can put our massive satellite data on computers and model the weather fairly well. For a day or two out we can use the predictions just as they come, often in the form of maps proudly displayed on our computers and TV's.

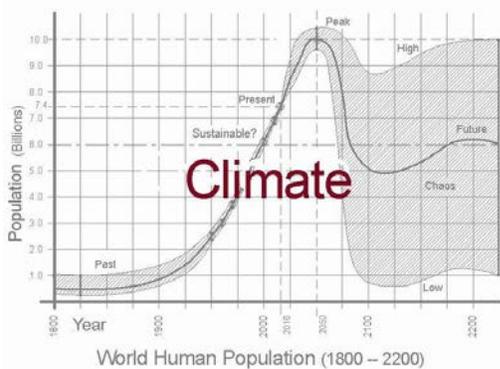
Out a week, we can take the predictions as an indication of what we can do in our lives and what precautions we should take, like carrying an umbrella, but we know that these predictions will be updated later.



Caption: Storm Tracks
Weather map by the Weather Channel
D Time: 36 s

For major storms, such as hurricanes, a half-dozen different models are often run to give both an idea of the most likely path and an idea of possible variations. These multiple tracks often have a funnel shape because accuracy is lost as we go father out in time and the various models diverge. This spreading gives us an idea of how far out we can trust the prediction.

If you do as I do and check the weather forecast on my computer each morning, then for the rest of the day we both can claim to remember the future, at least for the weather through the end of the week.

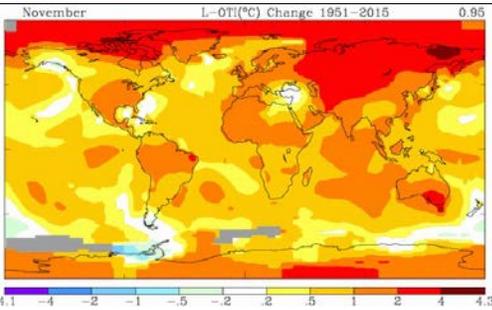


Title for Climate section
Time: 2 s

Break
Narration starts

But aliens have not landed.

Can we use the remember-the-future trick to help address 21st Century problems like climate change?



Caption:
Global Warming 1951 – 2015
by NASA.
E Time: 35 s

Yes again, but only within limits.

We can now model climate change well enough to support action.

The physics of which gasses can cause a greenhouse effect was worked out more than a century ago. We now have extensive data, built up over decades, on how much of each gas was in Earth's atmosphere over time. And, we have a number of computer models working to crunch this large data set.



Antarctic Ice Shelf

Rapid Sea Ice Brake up by Climate / NASA
F Time: 47 s

The computer model are now good enough to support practical action, just like the weather predictions. But, to get that good they have to be run hundreds of times with very small changes to the input parameters.

From the models we can see which problems, like sea level rise, that we should take action on first and where to best apply our efforts. We are justified in taking immediate action where the danger is great and our efforts will be most effective. For example, we can now see that our dumping of carbon dioxide into the atmosphere is a clear danger that needs action now.

The current models have however missed several details of the problem, like the arctic warming faster than the mid-latitudes. So they are incomplete and require continued research and updating.



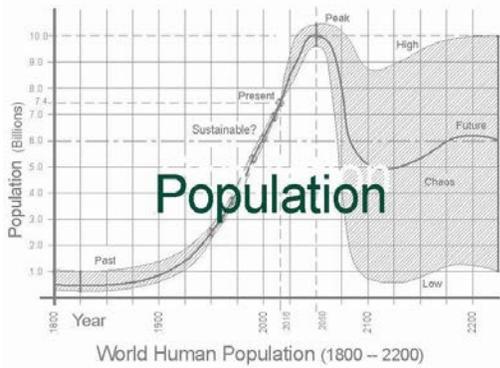
Caption: Calving Glacier
by Flickr.com
G Time: 35 s

To this we can add images from the many fine nature documentaries presented on TV, so we can build a powerful vision of our future.

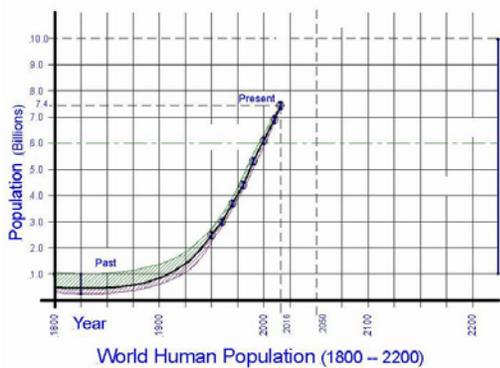
The giant slabs of ice calving off arctic glaciers are particularly striking to me. Our models show us that these images, and the global warming that has accelerated their generation, will continue to appear for a long time. We can therefore trust this memory of the future.

We can then remember our future of melting ice and rising seas. From such a strong memory, we can take serious action.

Pause
Start narration



Title for Population section
Time: 2 s



Population graphic A by Riley
H Time: 69 s

Our remembrance of both the past and the future is limited.

One other set of models, the Human Population of Earth, is now far less known but again has tremendous consequences for our futures.

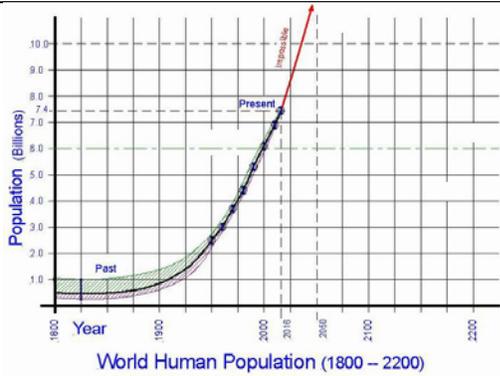
World population was one of the first things calculated back in the 1960s with the earliest computers. This modeling approach was popular with the general public for a while, but lost favor when its results, calculated out 100 years, were so unstable that they were upsetting and did not justify mass action.

We have now taken a new look and restarted these models from the present, 50 years on, and with much better data. The human population of the Earth was less than 1 billion at the start of the Industrial Revolution around eighteen hundred. Today, it has grown exponentially to 7.4 billion in 2016.

Note that we know the world population accurately only back to about nineteen fifty when actual worldwide data were collected. For before that, we must use estimates, which are markedly less accurate than the real surveys but still useful. The hatched areas on this graph show the approximate error in the measurement by date.

We do not remember our past with absolute accuracy, just as our remembrance of the future is also limited.

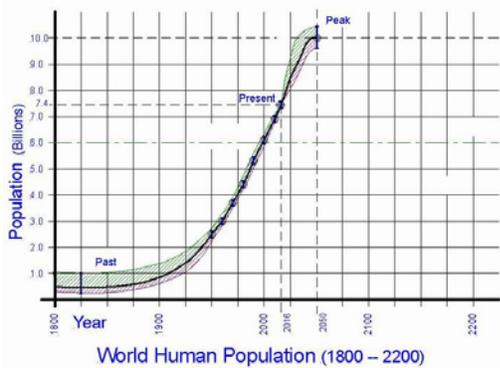
We could simply extend this curve. One thing becomes clear from its upward thrust, continued exponential growth will soon become physically impossible.



Population graphic B
Grow forever by Riley
I Time: 31 s

Already we are adversely affecting the Earth’s ability to support us, the climate is changing, and sea levels are rising. If this type of damage continues to grow and to grow at an increasing rate, as it has for decades now, we will soon not be able to support all our people.

Physics and biology then rule out a grow-forever scenario, whatever we may think, or do, or wish.



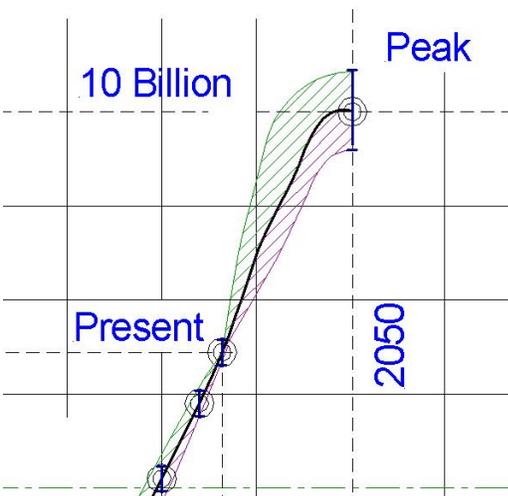
Population graphic C by Riley
JA Time: 48 s

If population cannot grow forever, then it certainly must peak. We all can agree on at least that much. The question then is, when will this peak occur?

The computer models clearly show a peak of about 10 billion people around 2050. That is only 33 years from now.

Apollo to the Moon is farther back in the past than this peak is in the future, and Pearl Harbor twice as far. Our remembrance of such events is detailed and really sticks with us. When we can see such major events in the future, like this peak, we need to take note, even when the future is not as clear as the past.

Again, like weather, the short-term estimates are more exact than the longer term ones, but mid-range estimates have value, too, if they are important enough to us.

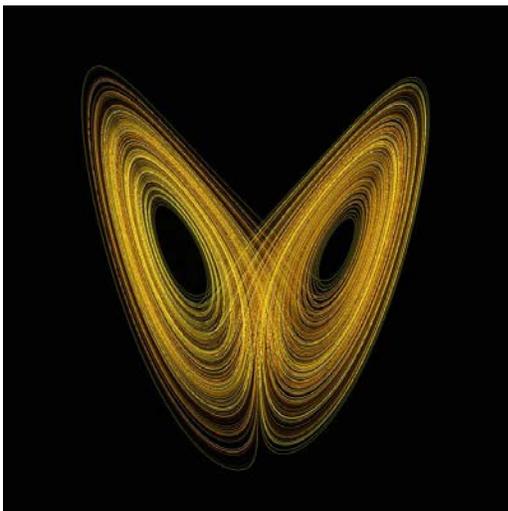


What we did not appreciate in the nineteen sixties was that this peak will occur naturally. When crowded and short on resources, the fertility of most mammals including humans, falls off drastically. This effect is now evident in all industrialized countries.

Malthus famously did the first calculations of population back in the early eighteenth hundreds. This is the key point he simply missed and a major reason our new models are so much better.

Today, falling fertility underlies the ease at which same-sex marriage suddenly became legal. And fortunately, it is also the reason that draconian restrictions, like those applied in China, will not be necessary.

Population graphic C detail by Riley
JB Time: 42 s



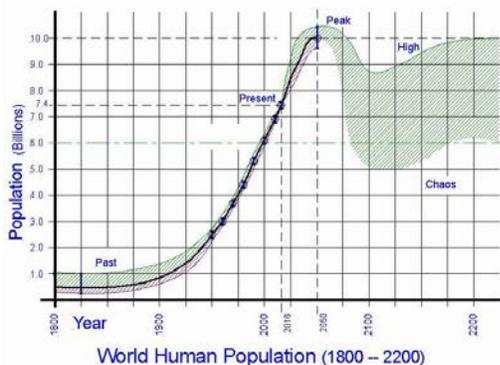
Caption: Lorenz System
 Chaos image
 K Time: 40 s

If we push our population models out past the peak, the forecast becomes chaotic. This is common for complex feedback systems including population and climate, particularly when hard driven.

But that's OK. Chaos now even has its own field of mathematics, Chaos Theory.

Computer models cannot predict accurately in a region of high chaos. However, this limitation does not mean that there are no good lessons to be found here. We should not discard near-term predictions just because the models are to wild far out.

Also, it is important to know exactly how chaotic a function is when one is planning action based on it.



Population graphic D
 Too high by Riley
 L Time: 55 s

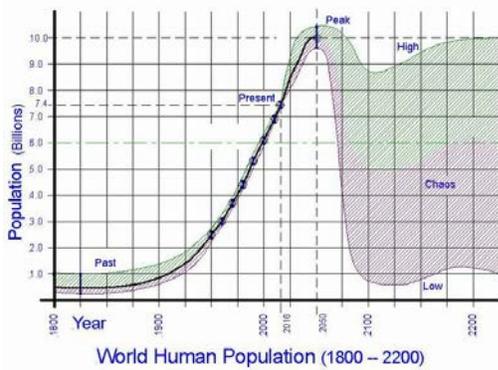
The exact path that Earth's population will take after the peak is subject to chaos. We know from formal Chaos Theory that calculated results in this area are highly sensitive to the initial conditions we set for the computer run.

This effect has real-life consequences. It means that the small efforts we are able to make today are unlikely to have major effects in the short term, but can still have dramatic effects in the long term. The critical lesson here is that our present efforts can determine the long-term sustainable level of the human population on Earth.

A very high sustainable population level occurring within the top shaded area of this graph is therefore still a possibility, but it would require huge breakthroughs like solving the excess carbon dioxide problem while generating clean, cheap energy. A practical fusion reactor might do the job, but such a breakthrough happening quickly enough is unlikely.

We can now add the possibility of a low sustainable population level to the graph. Again this is well within the predictions of our models depending on the initial conditions.

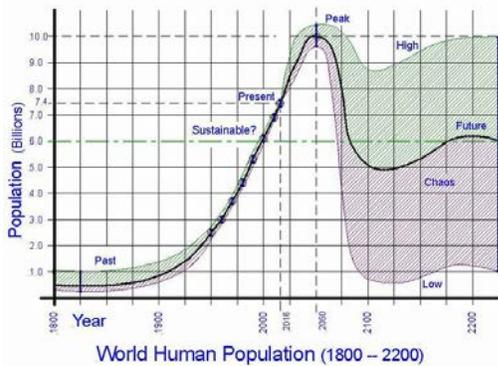
A disastrously low-level could really happen, particularly if we fail to handle problems like climate change. It is quite possible for us to do long-term damage to Earth's



Population graphic E
To low by Riley
M Time: 41

biological systems as we go over the population peak. This damage could then cause a catastrophic fall to low sustainable level.

Fortunately this outcome, although clearly possible, is not set-in-stone. If we take positive action today, it will be even less so.



Population graphic F
Just right by Riley
NA Time: 72 s

Many paths do exist that will bring us over the population peak and then allow us to settle to an attractive sustainable level for the human population of the Earth. The exact level will depend on how much damage we do to Earth's systems and what ingenious solutions we can find and implement very quickly.

We can count on these models to improve as our technologies rapidly grow. Virtual Reality will soon make our possible futures not just graphs but experiences generating personal growth.

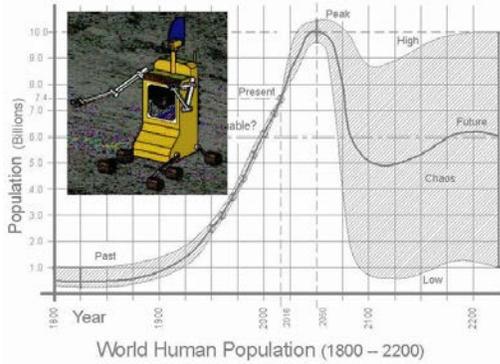
In some real sense, Artificial Intelligence is growing so dramatically, while their type of thinking is so different from ours, that they may soon become the true aliens in our story.

Sometimes, not being able to accurately predict the future can be a good thing. The more predictable the future, the less effective our current small efforts can be. A vague future is definitely better than a bad one solidly predicted.

Again, modeling the future and then remembering the lessons learned from these efforts, will let us remember a future that calls to us and these memories will then provide us with direction for our current actions.

Moving from exponential growth, through a peak, to a sustainable Earth will take significant changes in our societies. Not all will be good, but not all will be bad either.

Currently, we have little guidance. We have endless media series on how to handle a zombie apocalypse, but



Digger03 from The Big Moon Dig,
NB Time: 50 s

few on realistically handling the problems we actually face, like climate change.

We at “The Big Moon Dig” are in action to develop stories and short videos that can provide us with visions of the future through these interesting times. We hope to generate buy-in for action with our pieces. Please contact us (see below) for examples or Google “The Big Moon Dig.”

As for me? I’m just Digger03, an artificial intelligence from the Big Moon Dig stories, talking to you from the Moon.

In Conclusion:
(see below)

Text on plane background
O Time: 34 s

To conclude:

In this the 21st Century, our technology lets us make practical models of our future.

Yes, there are limits, but if we model the future and study our models we can then remember the future. – at least well enough for effective action.

Our positive actions now will affect the future in positive ways. – if not sooner, then later.

So, you should always remember your challenging future, then get into action and stay in action.

Enjoy!

Attributes 1:

- Attribution-NonCommercial-ShareAlike (CC BY-NC-SA)
- Voice: Paul NaturalReader13
- Self-portrait by Tom Riley
- Rocket sounds by NASA
- *Arrival* poster by Paramount Pictures
- Digger03 by Tom Riley
- Chesapeake sunset by Carol F
- Weather Satellite by Climate/NASA

Credit for the Graphics, etc.
Time: 6 s

Rocket Sound fading in

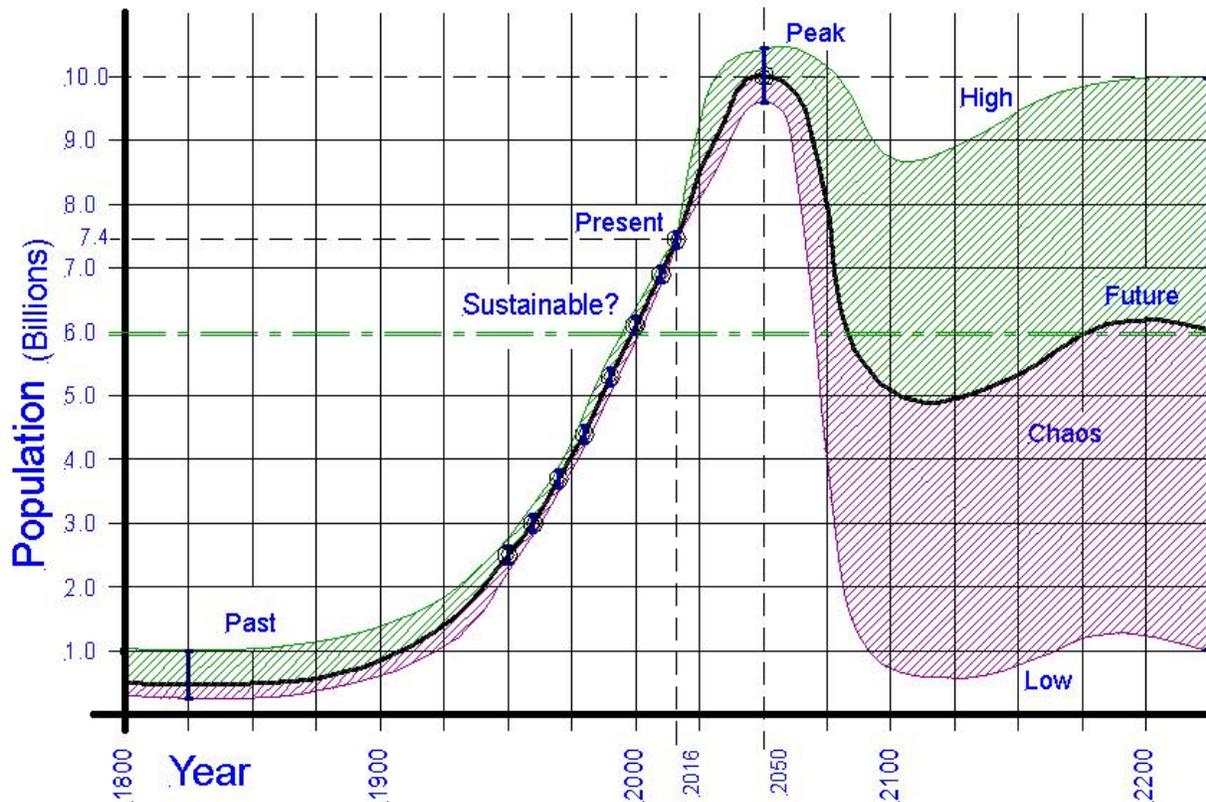
Attributes 2:

- Storm Tracks by Wikipedia Commons

Rocket Sound

<ul style="list-style-type: none"> • World thermal change map by NASA • Filchner-Ronne Ice Shelf by Wikipedia • Calving Glacier by Flickr.com • World Population by Tom Riley • Lorenz System by Wikipedia Commons <p>Credit for the Graphics, etc. Time: 6 s</p>	
<p>References:</p> <ul style="list-style-type: none"> • The Big Moon Dig, http://bigmoondig.com/BigMoonDig.html • Tom Riley, BMD@BigMoonDig.com • Daniella Meadows, Jorgen Randers, Dennis Meadows, <i>Limits to Growth, The 30-Year Update</i> (Chelsea Green, 2004) <p>#Arrival, #BigMoonDig</p> <p>References: Time: 6 s</p> <p>Total: ~12:15 mm:ss</p>	<p>Rocket sound fading out</p>

Main Graphic full size:



World Human Population (1800 -- 2200)

YouTube text description: (First sentence is critical for editing)

Arrival is a movie about remembering the future. Can we now remember our future too?

Yes, but with limits. Our technology lets us model our future, for example weather, climate, and population. Then from these models we can be in action toward a future that is good for us all. Our actions now will affect all our futures in positive ways.

This video was built in [Coursera](#) *Powerful Tools for Teaching and Learning: Digital Storytelling* by the University of Houston System.

Enjoy,

- The Big Moon Dig, <http://bigmoondig.com/BigMoonDig.html>
- Tom Riley, BMD@BigMoonDig.com

#Arrival #BigMoonDig

In Conclusion:

- Our technology lets us model our future.
- Memories of our futures are thereby available to us.
- These memories are only an estimate,
- But they are of practical value.
- Our actions now will affect the future in positive ways.
- So, get into action; stay in action.