

August 30, 2009
Berkeley, California, USA

Dear Mr. Darwin,



I hope you do not mind me interrupting you, and that you will excuse my impudence for intruding on your peace of mind. You do not even know me; for I was born in America 57 years after you died. I, as a geologist and paleontologist and like so many other scientists, am an admirer of yours ever since I first learned of you in a magazine (named *Life*) in 1959 and bought some of your books a bit later.

Now I write to you in the year of your 200th birthday because I'd like you to know how the world has been doing since you were last here. When I contemplate my own death, the one thing I will miss most is not being able to see how the world will change after I am gone. Our lives are too short to see most changes, but humans have been changing the world so much, so fast between your time and mine, that the changes are now obvious. I presume that you too might be curious about how those changes have affected some of the places you saw on the *Beagle* from 1831 to 1836.

I am sending this letter to you by way of *Palaeontologica Electronica* over the Internet, a new way to communicate around the world. In many ways, it is like the telegraph system that was being built during your lifetime, except that we can send letters, reports, pictures, raw data, and even our voices and images to one another from our own homes. I can imagine you in your study at Down House with an instrument on your desk with which you could send letters and pictures to your colleagues all over the world. You could communicate with Mr. Wallace in the Moluccas, for example, in just a few minutes. You'd like it.

Nowadays we can get to the same places you went much faster than you did—we now can fly through the air in machines (airplanes) that take us from city to city anywhere in the world in less than 24 hours. Once you are there, you could take an automobile (motorized coaches; we call them "cars") that will race you down roads at 60–70 miles/hour or perhaps a train, like those you saw in England, but much faster and more comfortable. I have done this myself to most of the places you went, and those trips form the basis of this letter.

Just a word about your 17 books: they were well received during your lifetime, but some of them, as you know, were regarded as blasphemous and, in fact, have been ever

since. *The Origin* still causes a great deal of consternation among those who accept the Bible as the literal word of God. They believe that if you do not accept the Bible as the literal word of God, especially the first eleven chapters of Genesis, then you cannot be a good Christian and you are doomed. "Darwinism" is not a good word among them! You too were faced with this problem, even within your own family, so nothing has changed over 200 years. Nevertheless, many of your books remain good sellers to this very day.

I have had the good fortune to have walked where you did in most of the places you visited on the *Beagle*. I have tried to understand what you saw, what you thought about then, and particularly what you would think about those places as they are now. If you returned to most of the places you visited, even in foreboding Tierra del Fuego, you would be surprised and very concerned about the future. You would probably be appalled to see how the places you went on the *Beagle* have been changed. You would recognize that these changes have already impacted the entire world.

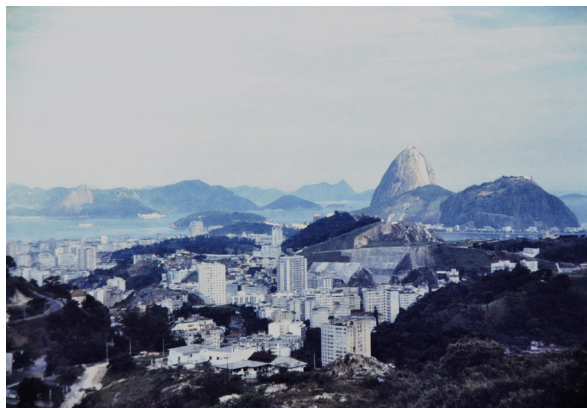
As you know, Mr. Darwin, from reading Thomas Malthus's *Essay on the Principles of Population*, population is everything. Malthus explained how populations grew geometrically and utilized their resources until they were exhausted and the populations declined (extinct). Yet ours is growing just about everywhere in the world.

When you set sail in 1831 on the *Beagle*, about 900 million people were on Earth. From that size, the human population has grown enormously, most of it in just the last few decades. After you died, the human population passed one billion, and in another 60 years, it reached over 2 billion. Now, 70 years on and 200 years after you were born, almost 6.8 billion humans inhabit Earth. This will increase to 9 billion in another two decades or so, and it is projected to pass 12 billion in the lifetimes of people now living. In just the last year, humans increased by 112 million worldwide. This kind of growth was controlled to some extent in your time by a high level of infant mortality and disease, like the smallpox that killed Boat Memory, the 4th Fuegian Robert FitzRoy brought back to England but whom you never met. Sadly, early deaths also occurred in your family, and in mine, in about the same years. Medical science solved many of those problems so they no longer limit population growth.

This growth has had great impacts already, just like Malthus wrote. In fact, you would not recognize many of the places you visited on the *Beagle*—Rio de Janeiro, Montevideo, Buenos Aires, Port Jackson (Sydney), even little Hobart Town in Tasmania, the villages of Chiloé in Chile, Ushuaia, a town on the Beagle Channel that did not even exist when you went through there, and Papeete (Tahiti). All of these were smaller, much more so, than they are now. Each has expanded in its own way as more and more people were born into, or migrated to, them.

I've visited these places in the past few years and took some pictures to show you. They are interleaved within this letter.

Rio de Janeiro, a tropical seashore town when you were there, is a huge city now, with 10.6 million people filling in the valleys and spaces between the spectacular bald, rounded peaks it is famous for. Buenos Aires, a cosmopolitan city resembling in many ways some of the larger cities of Europe, also is inhabited by millions (12.4), as is Sydney (3.7 million), a small port-side town when you were there.



Rio de Janeiro about 25 years ago. The city has more than 10.6 million people. Huge buildings now crowd between the peaks and down to the seashore. It was just a small town when the *Beagle* and you spent some months there. It has expanded everywhere except up the sides of the steep peaks.



A view from the center of Sydney to the harbor. Houses and buildings also crowd the water and extend far in all directions. You said this “might be a city” when you visited. I bet you don’t recognize it now.

You thought then that Sydney “might be called a city” but that was nothing compared to it now. Today most of the shoreline around the city is encumbered by buildings and houses, some quite grand, like the Opera House built on a point projecting into the harbor. The people long ago set aside some nice land for a park along a bit of coast in the city, but it fails to give a sense of what it used to be like 175 years ago. In all these places are very tall buildings, unlike any you ever saw, housing both the many places of commerce and residences of many people. Unfortunately, in some parts of most cities, but particularly difficult at Rio, are slums of thousands and thousands of people living in abject poverty. For them, the victims of this population growth, modernization has not provided a better life. London has grown too, from the three million living there when you went for scientific meetings and when it was the largest city on earth, to more than 7.6 million now. It is no longer the largest city; indeed it is not even on the list of the top 10 or 20 largest cities—it ranks 25th. The top 20 cities all have populations between 10 and 30 million. Can you imagine your London with 30 million people? It’s bad enough now with 7 million. You were wise even in 1842 to have left London for the peaceful life in Downe.

Even the smaller villages and towns you visited have grown remarkably. Hobart Town, a place you found so delightful that you said you would emigrate there rather than to Sydney, has changed. It’s not a town anymore—it has 300,000 people living in it. Houses are encroaching onto Mt. Wellington, where you climbed and did geology, and the harbor is chaotic with small yachts owed by the residents. Cars are everywhere; just as they are in the rest of the world. On Chiloé, that island in southern Chile that you found so “fine”, you will remember old Castro, the island’s capital, with sheep grazing in deserted streets. No more, the sheep are long gone from the streets, replaced by the ubiquitous cars and crowded with 30,000 people. The main business is still fishing,



The central business district of Sydney. You never saw these kinds of tall buildings when you were alive anywhere, let alone Sydney.



Sydney’s spectacular Opera House. Perhaps you once walked on this point? You wouldn’t recognize it either.



Hobart, Tasmania. You will remember Mt. Wellington which you climbed, but there were no houses near it then. The harbor did not shelter so many small boats in your time. Photo courtesy of Dr. Roman Leslie of Hobart.



Palafitos de Gamboa, part of Castro, Chiloé, that didn't exist when you visited in 1834. If you look closely to the left of the trees in the center of the picture, you can see rows of little houses, newly built for the increasing numbers of people. The island's population will continue to grow.

although a lot of those fish (introduced Norwegian salmon) are now raised in pens in the sea, just like cattle in a tight paddock. Tourism is now a prominent business activity. All of this increased the population of that little city by many thousands and it is still growing, as you can see in my photograph of the rows of identical houses newly constructed this past year or so in a suburb of Castro, a sure sign that population size is growing rapidly. You may also remember coming up the Murray Narrows into the Beagle Channel and seeing the beautiful, ice-covered mountains of what is now called the "Cordillera Darwin" surmounted by "Cerro Darwin", a huge prominent peak. Both honor you. Nothing was there along the Channel except for the "wikiups" of the Fuegians. Now the town of Ushuaia, the southernmost city in the world or so it proclaims, is built there. It has only about 45,000 people, all of European descent, the Fuegians having long ago died off by measles, influenza, smallpox and other diseases. Ushuaians make their living from agriculture too, a little commerce through the dock, and, to some extent, tourism.

In the South Pacific, Papeete, an occasional stop for whalers, missionaries and explorers in your time, has grown up the valleys of Tahiti and all the way to Point Venus, from where you climbed nearly to the top of the island. Cars are everywhere as usual, racing to get from one place to another on the island, and the port at Papeete is busy with some commercial and huge tourist



Little Ushuaia did not exist when you roamed the Beagle Channel. Now 45,000 people live and work there.

ships much larger than the *Beagle*. “Resort” hotels line the roads to Point Venus and a huge airport (a place where airplanes land) lies at Faaa on the other side of the city that accommodates several flights a day carrying hundreds of passengers in each airplane. Tahiti, indeed all of French Polynesia, is dependent on tourists from France, other places in Europe, America, and Japan for much of its income. Their own industries have mostly disappeared—copra, vanilla and chickens. All these places have changed—radically.

We knew about this growing population problem long ago. You could have predicted it from reading Malthus. One professor Paul Ehrlich published a now-famous book in 1968 called “*The Population Bomb*”. He described the increasing world population and its threats to us and our well being, and how it had already started. None of it was new—you understood it long ago—but the huge increases in population and its predicted growth made the book’s title and message particularly relevant in the 1960s. Since about 1975, the world has largely ignored and forgotten his predictions, and we hear very little about population problems anymore in our press. The “bomb”, however, is now part way through its explosion and we can see its destruction moving across the face of the globe.

Nothing will stop it now. We’ve had two “World Wars” since you died, involving Britain, the United States, Germany, France, Italy, Russia, Poland, and Japan, that killed over 50 million people in those and other ravaged countries. Another 50 million have probably been killed by various dictators in the last century. We’ve had world-wide epidemics of influenza and a new disease called AIDS that killed many more millions. These mass mortalities have had no effect on slowing the “population bomb”. We have too many humans reproducing too fast.

Very few countries have acknowledged the problems that population growth would cause and even fewer have tried to do much about it. We can control births now, but many people oppose any interference in natural procreation. China, however, with a billion and a half people, was essentially forced to adopt a law restricting each couple to only one child (at least in the cities). That slowed growth a little but China and India, no longer a colony of your country, continue to add people at a tremendous rate. Even the relatively well-informed population of the United States has increased from 245 to 306 million people in just last 20 years. Growth, growth, growth—it’s considered a good thing by many—God’s will, more bodies to buy more things, and the complete utilization of the land and its resources. In America, many believe that our ingenuity will save us. Others, mostly scientists and environmentalists, see it as particularly bad—destruction of the land, more intensive use of energy, declines and extinctions of all kinds of plants and animals, and social problems created by so many people living so close together. You understand the impact of people on the land and on each other, because you described them well at Galapagos where the tortoises were endangered and Tasmania where Europeans were threatening to, and finally did, kill off all the natives.

Our problems are getting worse, as you probably anticipated. All those people will need or want “Resources”—Malthus explained that well. For many people in the world, that equates especially to food and water, but also to an infinite variety of goods, many made chiefly to sell. All those people, who have little, want what those in our countries and in Europe already have.

And, that all takes energy, which is our second biggest problem. When you were alive in the mid-1800s, the “industrial revolution”, as we call it now, was already underway. It was powered chiefly by coal—you must remember the mess coal made in London. Since then, the world developed petroleum oil as its energy base although coal is still a major source particularly in the generation of electricity, a much easier form of energy for us to use. We just plug our electrical machines and lights into a socket in the walls of our houses, and amazingly they turn on or make light at any hour of the day or night. Most people don’t even think about it and certainly do not know where it comes from. But a large part of it comes from coal-fired, electrical generating plants, and more of those plants are being built every year. Hundreds are planned in China and India, and even in the United States, although people who know are objecting fiercely to this. Great Britain, you will recall, has an abundance of coal too. I don’t know what it plans for the future, but if it wants to keep up with the rest of the world, it will probably burn coal for its electrical energy.

Even so, ever since the early 1900s, a race to find more and more petroleum oil has been underway because it is a much more flexible fuel. Once the United States was the number one producer and consumer of oil, but it has already found most of the oil contained within the subsurface rocks of its own borders and its production fell way off. It remains the largest consumer of oil, however, with less than 5% of the world’s population (this is another problem, as you can imagine). Great Britain uses a lot of oil too, but



Glacier San Rafael on the Andean coast of Patagonia. It has retreated up the valley ~100 m in the last 10 years. In 1834, it must have extended all the way to the water between the mainland and the Chonos Archipelago. You might have seen it from the *Beagle*, Mr. Darwin, but you could not see it now. It is melting fast and probably will be entirely gone in another 20-30 years.

has none within its island home. The search for oil has been focused for a long time on supplies in the seas, and Great Britain, thanks to Scotland's geographic position, gets oil from below the North Sea. Oil, like everything else is not distributed evenly across the globe, so great tensions have arisen between those countries that need oil and those, chiefly in the Middle East, that have a lot of it. So far, those tensions have not elevated to outright wars, except in a few cases, because the United States, Great Britain, and European countries spend an incomprehensible fortune each year to buy oil from those other countries. With all that money, those oil-bearing countries have built some of the most fantastic things, like huge islands in the sea shaped like the palm trees lining the shores of Tahiti. But their oil will run out too someday, and as that happens, new struggles will take place. The world needs new sources of energy. We are already using more oil than we can find, so the end is in sight. The practical end will likely come about the time the world holds 10 to 12 billion people, compounding the problem. What will they do? What will we do, for the end comes gradually and we are already past the beginning of the end?

You might think, because of your experiences in tropical seas that energy from the sun might help solve the problem. Indeed it will but the solution is far off and it will require rethinking and retooling our societies. Wind mills will help too. None of it will happen fast enough to help most people however.

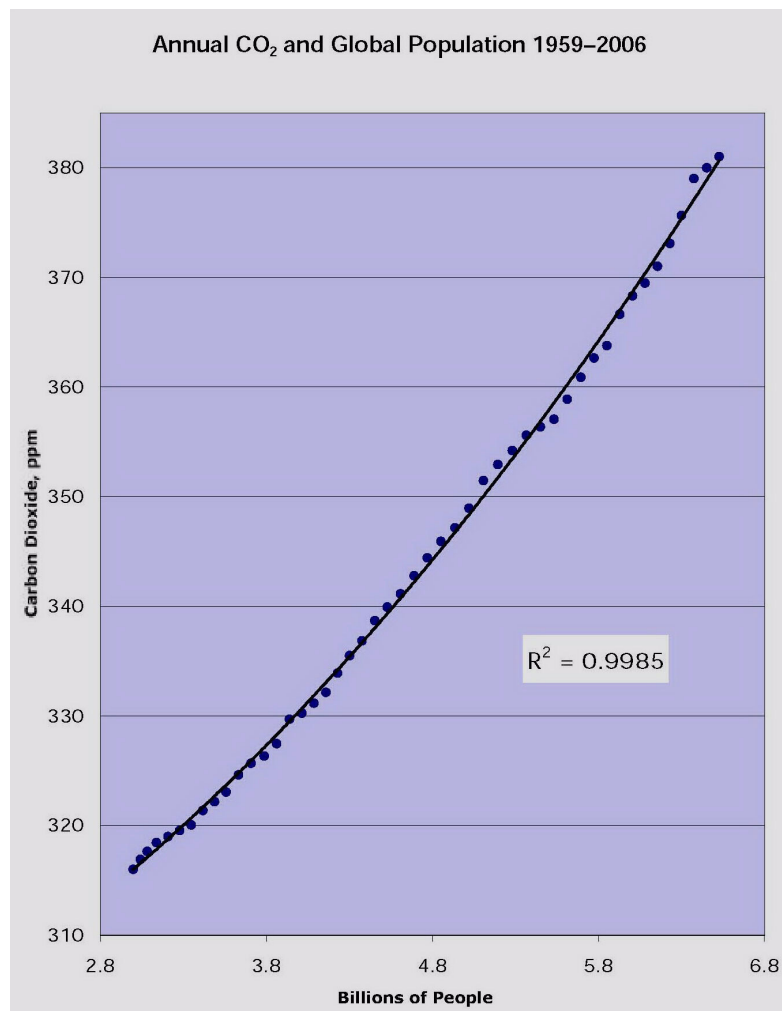
As a result of all this energy use and population, we face another major problem, Mr. Darwin, but one you may not have anticipated. You would see its effects if you revisited the places you went on board the *Beagle*—South America, Falklands, Galapagos, Tahiti, Australia, and even, perhaps especially, Cocos-Keeling Atoll. You would see that glaciers in Patagonia, along the Beagle Channel or on the coast opposite Chiloé, have retreated miles since you were there in 1834. They were obvious then, and some projected far into the sea. Now they are backed up far into the valleys they cut. I have a picture of Glacier San Rafael near the Chonos Archipelago I took a few months ago. Perhaps you saw this very glacier at a distance, or at least another similar one nearby, flowing down from the ice field on top of the Andes. I think you could see those from the *Beagle*. It has retreated remarkably in just the past few years, and it is representative of glaciers and ice caps in most of the world. You also would see that the species you saw previously in one place have moved, sometimes quite far, to another place, because the climate has gotten warmer. The same coral reefs you saw in 1831 off Brazil and later those at Tahiti and

Cocos-Keeling are turning white and dying. You might recognize that your interpretation, quite reasonable and obviously influenced by your good friend Charles Lyell's great volumes on geology, that the landforms at Sydney were formed by the submergence of the land is wrong. Now you would note that the sea rose, causing the intricate flooding of shorelines to form Port Jackson, and you might also be able to tell that the sea is still rising even more rapidly now. The signs are obvious, not just to scientists like you, but to just about anyone interested in taking a good look.

We've known for decades what is happening. It came as a bit of a shock. Scientists in the mid-1960s began to measure the carbon dioxide (CO₂) in the atmosphere, and found that it was increasing. So was methane (CH₄). These and some other gases tend to trap (to put it simply) solar heat in the atmosphere, thus causing the globe to warm—"Global Warming". Atmospheric scientists and geologists sounded the alarm about these "greenhouse gases", and biologists also soon recognized that this warming would change the biological world. But other people, politicians, businessmen, and those who develop the land, objected to these conclusions, not based on

science so much, as based on their own economics. Any plan to change these emissions would cost individual businesses a great deal of money. However, much of the world did recognize that global warming meant redistribution of animals and plants, especially crops, changes in precipitation, increased tropical storms and hurricanes, retreating glaciers and melting ice caps, rising sea levels, as well as dying reefs. The CO₂ dissolves in sea water and makes it more acid. This, they say, will cause all the animals with shells, corals and calcareous algae to be unable to secrete or maintain their skeletons. If that comes true, Cocos-Keeling will look much different than it did when you saw it in 1835. The burning of all that oil and coal is increasing the gases and those are changing the world in easily perceptible ways that you would see immediately if you returned to almost any place you went on the *Beagle*.

This too is dependent on population size. All those people burning all that oil and coal generate those increasing gases, along with methane from all the livestock needed to feed the people and the warming of the shallow seas, marshlands, and tundra. Two paleontologists, Norman Newell and Leslie Marcus, published a paper in a journal called *Palaios* in 1987 that showed a remarkable correlation between the numbers of people and CO₂ levels in the atmosphere. My friend Dr. Ken Towe has extended their data to 2006 and the correlation is still there (He said I could show you his diagram; it's just above in this long letter). More people mean more greenhouse gas.



This chart, by Norman Newell and Leslie Marcus and modified by Dr. Ken Towe, shows a remarkable correlation between world population and carbon dioxide in the atmosphere.

Global warming is perhaps the most serious problem facing the world right now. It is effecting us all—from little things like changing growing seasons (even seed packages we buy have been revised to show the warmer trends) to big ones like more hurricanes and tornados, dying reefs and species, biodiversity declines, sea level rise, and many others. Some humans on those low atolls you saw in the Pacific Ocean have been forced to move already because of rising sea level caused by melting ice.

Those people who are blind to all of this say it's natural or it's not happening. I ask you, Mr. Darwin: if you were sick and you asked 100 doctors what's wrong with you, and 99 said you would soon die if you took no action, and one said "Oh, don't worry, you're okay"—who would you believe? I think you'd take action to circumvent those 99 doctors' prediction. And that's what it's like with global climate warming—99% of climate scientists say warming is happening. That should be a clue to stop, think and take action, wouldn't you agree? Right now the atmosphere has 380 parts per million CO₂, up from about 260 before industrialization, and this may rise to over 450 in the next decade. Would you, sir, conclude that we're in deep trouble? I think so.

The world is on the brink of something disastrous to most people on Earth. Rising sea levels will threaten London and other low-lying places you've been, and it will do the same to the United States and to my state of California. The Gulf Stream, which keeps England pleasant rather than terribly cold, could change its position, changing England. So not only will the remote parts of the world be affected but it will be very personal and hit us as well. I am not sure what we can do, but engineers, scientists and social scientists are all trying to figure it out.

I wish you were still here. You were one of the greatest thinkers who formed the modern world, perhaps the greatest according to the famous biographical novelist Irving Stone who wrote a novel called "*The Origin*" about you. We need another scientist like you; someone who can think big, think clearly, create new ideas, gather the data, and then solve the problems, someone with broad training and experience, gained from another breakthrough like your voyage on the *Beagle* that he or she can put into practice and help humanity.

I hope you receive my letter and I would welcome a reply, although that seems unlikely. I also hope that in another 200 years, someone else will write you and, hopefully, me a letter that tells us what the world is like then. I can hardly wait to see how we humans have fared. It might be very grim. Or, perhaps it will be a new day for humanity.

Very Sincerely Yours,

Jere H. Lipps

P.S. Mr. Darwin: I include here a few references published since your death about you or the places mentioned in my letter that you might find interesting, if you can access them.

REFERENCES

- Armstrong, Patrick. 2004. *Darwin's other Islands*. London, United Kingdom: Continuum.
- Barlow, Nora (Editor). 1958. *The Autobiography of Charles Darwin, 1809-1882, with original omissions Restored*. London, United Kingdom. Collins.
- Barlow, Nora (Editor). 1967. *Darwin and Henslow, the Growth of an Idea*. London. John Murray.
- Browne, Janet. 1996. *Charles Darwin: Voyaging*. Princeton, New Jersey: Princeton University Press.
- Browne, Janet. 2002. *Charles Darwin: The Power of Place*. New York: Alfred A. Knopf.
- Davies, Margaret (Editor). 2009. *Charles Darwin in Hobart Town*. Hobart, Tasmania. Royal Society of Tasmania.
- Ehrlich, Paul R. 1968. *The Population Bomb*. New York. Ballantine Books.
- Ghiselin, Michael. 1969. *The Triumph of the Darwinian Method*. Berkeley. University of California Press.
- Ghiselin, Michael. 2009. Darwin, a Reader's Guide. *Occasional Paper 155*. San Francisco. California Academy of Sciences.
- Herbert, Sandra. 2005. *Charles Darwin, Geologist*. Ithaca, New York: Cornell University Press.
- KQED. 2009. *QUEST--Climate Watch: California at the Tipping Point*. <http://www.kqed.org/quest/television/climate-watch-california-at-the-tipping-point-part-one>.
- Lagos, Ovidio. 2006. *Chiloé: Un Mundo Separado*. Buenos Aires. Editorial El Ateneo.
- Nichols, Peter. 2003. *Evolution's Captain: The Dark Fate of the Man Who Sailed Charles Darwin around the World*. New York: HarperCollins Publishers.
- Riesenberg, Felix. 1939. *Cape Horn*. New York: Dodd, Mead & Company.
- Stone, Irving. 1980. *The Origin. A Biographical Novel of Charles Darwin*. Garden City, New York. Doubleday & Company, Inc.
- Wallace, A. R. 1889. *Darwinism: An Exposition of the Theory of Natural Selection with Some of its Applications*. London: Macmillan.