Dear Young People,

I am writing for the sake of all young people, and I hope to communicate with those of you of high school and college age. You must be concerned about your future, and hopefully also about the future of your nation and your planet.

You have the potential to affect all of those futures. That is a bold assertion – it may seem like a homily for a graduation ceremony. I wish to persuade you that it is not only a plausible goal, but that it is essential that you alter the course upon which older generations have set us.

No doubt you know that global climate is changing. Moreover, political polarization and disaffection within and among nations is rising. Life prospects for youth, in many nations, are not improving.

These matters are interrelated. While these threats are not being addressed effectively, nevertheless a basis for optimism emerges – if the global situation is assessed objectively and if the issues are well understood. “Well understood” is the key phrase here.

Is there any reason you should believe that I can help you understand these matters?

The best reason I can offer is that I am trained in scientific objectivity, and so done by a master, Prof. James Van Allen at the University of Iowa. I will always try to make clear the rationale for my conclusions, warn you when subjective and political factors may be involved, and leave ultimate conclusions to you.

I describe where I came from, so you can assess what prejudices that might introduce.

I am of the generation that followed what has been termed the ‘greatest generation.’ I was born before the United States entered World War II, but I was not yet five years old on what we called V-J Day, Victory in Japan. We had a giant bonfire that evening, in front of the Court House in Denison, Iowa, as we burned worn-out rubber tires that had been collected to support the war effort. We children ran about with sparklers, miniature fireworks on a stick. Adults were happy but war-weary; many homes had Armed Forces service banners in their windows, with blue stars for family members serving in the war and golds star if family members died in the war.

I grew up in the era of Presidents Truman, Eisenhower and Kennedy. Our government invested in infrastructure and in its youth. College was not expensive, and it was not difficult for me to emerge from college without any debt. It was a time of opportunity and high expectations, with a positive view of the future. Each generation expected to be better off than the one before.

Trained in space sciences, I was fortunate to get a position in NASA, where I led development of an experiment to go to the planet Venus. However, even before our spacecraft arrived at Venus, I realized that there was a more interesting planet, our home planet, Earth, whose atmosphere was changing before our eyes. What would be the consequences of that, I wondered?

I proposed and received funding for a project to investigate how the changing atmosphere would alter our climate. Eventually this led to opportunities to testify about climate change to the
United States Congress in the 1980s. The predictions that we made then about climate change have proven to be accurate.

Considerable hullabaloo followed my congressional testimonies in 1988 and 1989. This was in part because of annoyance of some scientists who felt that I was speaking out too soon, and in part because I objected to edits of my testimony by government censors. Emerging from that imbroglio, I realized that I preferred to stick to scientific research. I would leave climate communications to others who were more capable at it and enjoyed it.

That seemed to work well for 15 years. However, by 2004 I was concerned that a gap had grown between what I perceived as the dangerous level of atmospheric greenhouse gases and the levels that were being talked about as plausible targets by governments and most scientists. Lax targets provided an excuse for governments to let global fossil fuel emissions continue to rise, while making promises for reduced emissions down the road, by the middle of the 21st century.

Thus, when I was invited to give a public talk in 2004, I decided to use the opportunity to make a strong statement about the threat of climate change and to encourage people to vote for candidates who would address the matter. Not being a good public speaker, I prepared diligently for the talk, which was planned for delivery in Washington, DC. However, the sponsor got cold feet, so Prof. Van Allen kindly arranged for a Distinguished Lecture at the University of Iowa. My talk had no discernible impact. I was trying to make the climate story clearer, not fully realizing that the issues about climate change were more political than scientific.

The period 2004-2008 was a turning point in my career, as I was drawn out of pure climate science by young people – first by my grandchildren and then by college students at Virginia Tech and other universities. In considering the planet that we are leaving for young people, I was forced to think more broadly, not just about climate, but about energy systems and economics.

Connecting climate, energy and economics is not rocket science. Economists inform us that an economy is most efficient and strong if prices are honest. Thus when climate science informs us that carbon emissions impose a growing cost on society, an effective way to address this is via a simple, transparent, rising carbon fee. I gave a comprehensive public talk as the Bjerknes lecture at the annual meeting of the American Geophysical Union in San Francisco, in late 2008. Additionally I described the policy implications in a letter to President-elect Obama.

Again, I had no significant influence. President Obama’s climate policy was late, ineffectual and partisan, focused on regulations and subsidies. Obama owed his election, in large part, to young people, and he was well-intentioned. Unfortunately, good intentions are not enough.

My education continued to broaden in the past 10 years, as I worked both within the government and outside the government. From 2008-2013 I continued to work 40 hours per week for NASA, focusing on climate research, and 40 hours per week as a private citizen, preparing the science case for lawsuits against the government and supporting citizens’ groups. The most important of these groups is Citizens Climate Lobby (CCL), which is using the democratic process to try to affect policy, writing op-eds and letters-to-the-editor, and continually visiting the offices of Senators and Representatives. CCL now has more than 90,000 members and is growing.

In 2013 I resigned from the government to form the Climate Science, Awareness and Solutions program in the Columbia University Earth Institute. Some of the best relevant scientists in the
world agreed to work with us to produce peer-reviewed papers describing the situation faced by young people, future generations, and nature, and propose the actions that are needed to stabilize climate and provide a bright future. These papers provide the scientific basis for legal action against governments and the fossil fuel industry for violating the rights of young people.

Today we stand at a dangerous point in history. The public is fed up with government. Washington and other capitals are awash in influence peddling. ‘Drain the swamp’ is a universal cry.

The public, in its frustration, is driven to extreme political positions. Media provide echo chambers for right and left extremes, increasing hatred of the other side. Fighting the other side becomes paramount, extending from election to election, with no time in between for governance. Compromise and good governance have become almost impossible.

Both sides have legitimate issues. If you belong to one camp or the other, please take a minute now to consider just one issue of the other side, as I will do here.

People on the right say that we now have an Administrative State in the United States. There is more than a grain of truth in that claim. I call it a Bureaucratic State. Even NASA, one of our most effective agencies, has become a bureaucracy, wasting taxpayer money. I will describe how the Washington swamp caused this to happen. We also have a Secret Government, which, among other things, encourages and carries out overthrow of other governments. These overseas adventures cost lives and treasure while generating hatred for America. Our Secret Government is protected by a rule that prohibits any citizen from even saying that they ever provided technical advice to the Secret Government. This rule is functioning more to protect the Secret Government, rather than to protect the public. I am able to write the chapter ‘If I Did It’ because I worked for decades for the government, thus gaining some understanding of its major parts. I realize that in today’s world it is essential to have accurate intelligence to protect ourselves and our way of life, but we must demand better civilian control over the Secret Government. People on the right have a good basis for their concern about government overreach.

People on the left say that our government favors the wealthy and powerful. There is more than a grain of truth in that claim. Billionaire Warren Buffett notes that his secretary pays a higher tax rate than he does. The tax code is riddled with loopholes designed for special interests, while the wage earner cannot escape high income tax rates. Should corporations have the rights of people, corporations with pockets so deep that they can buy elections? Clearly, the rich and the powerful do have greater access to the White House and to Congress, much greater.

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The problems are bipartisan. The problems are not solved by replacing one party with the other. I will provide numerous examples showing that both parties are at fault.

Democracy can still work. Making democracy work has always been hard. Yet democracy has the advantage that it is possible to have a peaceful revolution, a revolution without guns.

Founders of the American government, who signed the Declaration of Independence and framed the Constitution, anticipated that occasionally a revolution would be needed. That time has arrived.

The revolution should restore government of the people, by the people, for the people. The revolution should come from the center. It requires a new political party in the United States, which should be based on bedrock principles of the American Constitution.

As a name, I would suggest the American Party. Its slogan: ‘Make America America Again’.

Here I should give a few words about my rationale and my prejudices.

First, as a scientist, I recognize that many of our issues are global. Climate change, for example, cannot be addressed by the United States alone. Cyber security, terrorism, pandemics – I could go on – there are many matters that require global cooperation to avoid or minimize problems.

Second, my perspective is affected by having grown up in the aftermath of World War II. The United States exerted leadership in establishing the United Nations, the Universal Declaration of Human Rights, and numerous organizations such as the World Bank. It was not a zero sum game. Standards of living rose almost worldwide.

Some people will argue that the situation is different now, that my perspective is outdated. I believe, more than ever, that issues are global and American leadership is crucial.

Yes, there are problems with international organizations. Parts of the United Nations are ineffectual or even corrupt. These should be fixed, and the United States has the clout to help see that they are fixed. There is no plausible alternative that will work, in my opinion.

Time is running out. You do not have time to repeat my mistakes. I hope you can learn from my experience. I will not hold back relevant information. You can judge what is helpful.

Don’t waste your time in the shouting match between the political extremes. Nor can you learn much that is useful by listening within a single echo chamber.

I am sorry that we older people are leaving problems for you. I do not mean that we will desert you – we will keep doing what we can. For example, I am trying to provide science for lawsuits against governments and the fossil fuel industry, which will help put pressure on the system.

I am heartened that many of you are standing up for your rights. Of course it is not enough to demand solutions. You will need to understand what will work and demand that, and perhaps work on those solutions yourselves.

One of the things that I learned in science is that understanding a problem is 90 percent of the solution. Your planet and your future depend upon your understanding and your actions.

Jim Hansen
Sophie’s Planet

“I’m Sorry to Leave You Such a F***ing Mess.”

Young People Can Save Their Planet and Their Future, but it Requires Ditching Today’s Elitist Political Parties.

Preface

Fresh, expectant young eyes greeted me, as I was about to speak to 350 high school students. My mind flashed back to the rapt attention of youth listening to talks by Carl Sagan or Robert Jastrow, as they spoke about planetary exploration or the origin and fate of stars and galaxies.

The high school students’ eagerness disconcerted me. I could not compete with the stage presence of a Sagan or Jastrow. I had a large audience of young people only because they were captives. It was Youth Government Day hosted by Benedictine University in Lisle, Illinois.

My topic, human-made climate change, is not uplifting. The physics of climate change is simple. And it’s easy to see how that physics creates a pickle for young people. But how to fix it?

The crucial physics that students need to know is the slow response of climate. The ocean and the ice sheets on Antarctica and Greenland do not respond quickly to factors that drive climate change. It takes decades for the ocean to warm in response to increased atmospheric carbon dioxide from burning of oil, gas and coal, and even longer for ice sheets to melt and raise global sea level. These delayed responses imply that young people can suffer consequences due to actions of earlier generations.

The physics is the easy part of the climate problem. It is the human response – policies and politics – that make the climate story a tragedy. Actions needed to stabilize climate make economic and strategic sense independent of concerns about climate. Yet the actions are not proposed by either political party in the United States or by major parties in other countries. Liberals and conservatives instead propose climate and energy policies that fit their political ideologies, not policies that are most effective and best for young people.

Students asked questions and we discussed potential remedies, such as lobbying the government, lawsuits against the government, and a new political party. Democracy can still work, I argued, but it will not be easy, because powerful special interests oppose effective remedies. I had been saying similar things for a decade, with little impact. It seems that the climate matter may be left for today’s youth to deal with, however they can.

“I’m sorry to leave you such a f***ing mess,” I muttered under my breath as the session ended. The microphone on my shirt was still on; it seems that my final comment was heard by everyone. It received the strongest reaction, the loudest applause of the day.

Benedictine University, founded by Benedictine monks, is named for St. Benedict, the father of western monasticism. So the university hosts surprised me, at dinner that evening, when they suggested that I use the sentence muttered under my breath as the title of this book.
I decided to keep the title, *Sophie’s Planet*, which stands for the planet that all young people are inheriting, but I added the subtitle. The Benedictine experience also persuaded me to write the book to upper level high school students or recent high school graduates. I want to reach them before their political perspectives are set. I love the optimism and open minds of young people.

I was committed to the book for years, but I struggled to write it. I first tried a series of letters to my oldest grandchild, Sophie, when she was in junior high. I put a few of the letters on my Columbia University web site, but then book writing was interrupted, for years, by a new task: to provide the scientific basis for a lawsuit against the United States.

The lawsuit charged that the federal government was violating Constitutional rights of young people and future generations by subsidizing and enabling the burning of fossil fuels at rates that would lead to irreparable harm. We asked that the government have a plan to reduce emissions at a rate that science indicated was required to approximately stabilize climate.

The final act of Obama in response to this lawsuit altered the nature of this book.

**A wasted opportunity.** President Obama, during the waning months of his administration, had an opportunity to settle our lawsuit in a way that would have brought the issue of climate change and Constitutional rights of young people before the American public, and probably before the Supreme Court, much sooner than otherwise will be the case.

Secretary of State John Kerry, in November 2016 at COP-22, the 22nd conference of the parties for the United Nations Framework Convention on Climate Change, presented a United States fossil fuel emissions reduction plan. The plan, an 80 percent reduction of greenhouse gas emissions by 2050, was almost exactly the reduction rate that we were demanding in our lawsuit!

That U.S. plan could be ridiculed as a meaningless gesture by a lame duck administration. But why not “settle” the lawsuit with us? We would gladly have signed up to a settlement at the implied rate of emissions reduction, which was about 5 percent per year. Such a settlement could bind later administrations. If a subsequent government initiated actions that violated the settlement, those actions could be stopped by court order.

We tried to persuade the Administration to accept a settlement, but ultimately Obama rejected it. For the moment, I just note that this agonizing experience spurred a new determination to write this book – and it changed the nature of the book.

I realized how much more difficult it was to make contact with Obama Administration officials than it had been in the G.W. Bush or Clinton Administrations. I had made some missteps with the Obama administration, but the main problem seemed to be that I was just too slow to act.

Coincidentally, Anniek, now my wife for more than 47 years, mentioned a discussion she had long ago with my sisters – about my inherent slowness!

“**Has James always been slow?”** My sisters were taken aback by the question. They were already surprised that I had come home, to Denison, Iowa, with a beautiful young woman. It was the first time they had seen me with a girl friend. I even talked to her. I was 29 years old.

I only learned of this conversation recently. Anniek’s question was not one she would have asked on first acquaintance, so it likely was after we had been in Denison several days, or even on a later trip to Iowa.
My sisters’ first reaction was denial that I was slow. But then something like “Well, he was slower after his appendix burst.” That explanation – that a 3-year old’s burst appendix could cause slowness decades later – was implausible, but it forced me to think: my sisters had probably used that excuse on their little brother’s behalf a number of times.

This also set me thinking more about this slowness and missed opportunity business. Upon reflection I had to admit that such occurrences went back all the way to when I was a kid!

Then, during the transition from the Obama to Trump administrations, I read the letter I had written to Obama in December 2008 during the prior transition. Almost nothing had changed! The policy advice in the letter remained valid, but unacted upon. I had tried but failed to get an audience with Obama. There was even less chance with the new (Trump) Administration.

**Over to you.** After 50 years of research in a growing range of relevant disciplines, I probably understand the global climate and energy situation, and appreciate the broad picture, as well as anyone. However, what we need is political action. It’s clear that the transition to a clean energy world with stable climate must be led by younger people.

How can I help? I can write this book to and for young people. The best chance of getting you to understand what I learned is to take you through the process that I went through. This book will describe my efforts and stumbles in learning the scientific method, but especially I want to clarify the obstacles that block transition to clean energy and stable climate.

I hope that I can help some young people take advantage of their opportunities and make fewer mistakes than I did – and not be so slow! This goal and my writing approach lead to some embarrassing confessions, but don’t worry, I’m not going to confess all the mistakes in my life, just relevant ones in my youth that you should not repeat.

It may seem like I’m saying “O.K., kids, I didn’t get the job done, so it’s over to you! Good luck in your gloom and doom future!” No, that’s not it. First, I’m not bailing out. I will continue to investigate how climate and energy use are changing and make information available, but you must make use of it. Second, there is no reason to accept a gloom and doom future.

On the contrary, I will describe a realistic scenario for fossil fuel emission phasedown that keeps global warming less than even the most optimistic United Nations goal. If this approach is adopted by 2021, the cap on global warming is achieved without unnatural and potentially dangerous “geoengineering” of the planet. Best of all, it is a path not of deprivation but of abundant affordable energy as required for poverty elimination, natural peaking of human population, with preservation of open spaces and our fellow species.

You have the power to make that happen. Sophie’s Planet is your planet. I don’t mean to put pressure on you, but the future of humankind and our planet is in your hands!

**Politics.** You must understand policy alternatives and become a dominant influence on politics. A dominant influence? Is that plausible? Yes! Young people in 2008 drove the swing from the

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4 Geoengineering is human-made interference with Earth’s energy balance, intended to at least partially counterbalance human-made global warming.
presumed Democratic nominee Hillary Clinton to Barack Obama. In 2016 they were the force behind Bernie Sanders’ underdog yet nearly successful campaign.

However, it is not enough to elect political leaders who say they will address climate change. Special financial interests, especially the fossil fuel industry, have huge influence in Washington and other capitals around the world. These special interests can be overcome in a democratic system, but only via deliberate informed political activism.

Your planet, a magnificent, incomparable planet, is being abused, but it has remarkable powers for recovery, if only we halt the abuse soon enough. And the science is crystal clear: we must find a path, a realistic path, to reduce global fossil fuel emissions rapidly.

Politics-as-usual will not produce such a path. Political camps today, on the left and right, are concerned mainly with their status and defeating their opposition. A new political campaign begins the day after each election. Media platforms develop to support each side, intensifying party differences. Hatred of extremists in the opposing camp grows. Both camps want to enlist you and make you hate the other camp. For the sake of your planet, your nation, and yourself, I hope that you will not join this non-productive combat.

My goal is to help you think about needed policies, and therefore about politics. You have the power to change the political direction. Founders of the American democracy recognized that occasionally a ‘revolution’ would be needed. I will make the case that we have reached such an occasion. Fortunately, the Founders constructed a Constitution that allows the possibility of peaceful fundamental changes, i.e., a peaceful ‘revolution’.

Both of our major political parties are supported financially by special interests. Politicians in both parties are comfortable elites. They exhibit no groundswell of support for campaign finance reform, to take money out of politics. Big Money, to a substantial degree, runs our country.

However, problems in Washington now run deep, not fixable by campaign finance reform alone. I hope that you will carefully consider the evidence I present and the arguments that I make. My interest is preservation of a healthy life-supporting planet for you and future generations.

A witness. Why should kids pay attention to me? I am 77 years old. I may be out of touch. On the other hand, I have seen a lot. When Robert Pool, in Science magazine in 1990, described me as a witness – a religious metaphor for a person who believes he has information so important that he cannot keep silent – he was referring to testimony I gave to the United States Congress in the 1980s about climate change. But I was born before the United States entered World War II, I worked for the U.S. government for several decades, and I have had energy policy discussions with officials in several nations. I am a witness to more than climate change.

Our political parties, in sparring with each other, fail to address fundamental issues that have grown over decades. I believe that insights gained from experiences during the past three-quarters of a century can help identify policies that improve prospects for a bright future.

Age of Science and Reason. I will present what I have learned mainly via a story of events during my lifetime, but I must first relate that time to a longer history, the Age of Science and Reason, also called the Enlightenment, because of its influence on the American Constitution.
Rationalism was spurred by Galileo’s telescopic observations. Science dispelled myths, such as the belief that the sun orbited Earth. Medieval worldviews slowly began to change. But it was not as if a light bulb suddenly turned on. Galileo, for his own and his daughter’s sake, found it sensible to ‘confess’ his heresy, comforted by realization that history would provide fair assessment and judgement. A little delay in understanding was not harmful to the world.

Today science still competes with beliefs, and the major political parties, on both sides of the aisle, play on beliefs when that serves their purpose. As we will explore and discuss later, the need for rationalism in understanding of our planet has never been greater than it is today, and we do not have the luxury of ample time that Galileo enjoyed.

However, let us note the value of rationalism in our politics. Rationalism was at the heart of the Enlightenment philosophy. The principal philosophers of the Enlightenment, such as John Locke and Rene Descartes, were European, but the American Declaration of Independence and Constitution were the purest political products of the Enlightenment.

Concepts of freedom, equality, individual rights, and toleration of diversity were at the heart of this first democratic constitutional republican form of government. This American constitutional government was characterized by the rule of law with consent of the governed.

Specifically, the Founders established a tripartite government, with legislative, executive and judicial branches. Authorities of the three branches are defined by Articles I, II and III of the Constitution, with this Separation of Powers characterized by Checks and Balances, with the objective of protecting the rights of all people in the presence of competing interests.

The foresight of Checks and Balances provides a potential avenue, the Judiciary, to address the grievous failure of Congress and the President to protect the future of young people. The judiciary is affected less by the corruption that creates a pathetic Congress and has resulted in Presidents who are either ineffectual or indifferent toward the issue of climate change.

But the Judiciary provides only a tool to prod functioning of the other branches of government. The Judiciary can prevent, or at least attempt to prevent, unconstitutional behavior by the other branches, but it cannot impose specific solutions that usurp duties of the Congress or President.

Therefore, use of the judicial avenue must be part of a broader strategy, one front in a larger war. Young people must fight on the other fronts that a democracy provides and recognize that the forces they oppose, people gaining wealth and power from fossil fuels, will fight on all fronts.

**Post-war Era.** After World War II, unlike the period after World War I, the United States provided global leadership, supported reconstruction of war-torn regions, led formation of the United Nations, and promoted the Universal Declaration of Human Rights. Global cooperation and commerce increased. Standards of living improved in nations adopting constitutional governments with individual rights, including nations defeated in World War II.

The United States took the lead in establishing the international organizations that facilitated economic growth and security. Cooperation lifted all boats; it was not a zero-sum game.

In my view, the first few decades after the end of World War II were a golden era of progress. Progress of that period, at least in part, can be credited to the Presidents of the United States, who I believe deserve to be ranked a bit higher than historians have credited them. However, I do not mean to idealize that era. Early growth of the cancer of special financial interests was
already underway and growth of the Bureaucratic State that now weighs down our nation proceeded under those Presidential administrations.

Harry Truman was an exceptional President, in my opinion, an example of what can be achieved by plain honesty and the courage to make difficult decisions without concern about how one will be perceived. Truman supported civil rights in the 1948 elections. Truman deserves principal credit for the Marshall Plan. Truman’s firing of General Douglas MacArthur, in the face of overwhelming public support for MacArthur, affirmed civilian control of the military, consistent with our Constitution and the rule of law.

Dwight Eisenhower is remembered for infrastructure investments, especially the interstate highway system, and for his farewell address, in which he warned the public about the threat of excess power in the military-industrial complex, coining the terminology and bringing the issue to public awareness. Eisenhower had more intellectual depth than often reported. He referred to the members of his Science Advisory Committee, which included I.I Rabi, Hans Bethe, James Killian, Jerome Wiesner, Jerrold Zacharias, as “my scientists.” In Walter Reed Hospital, not long before his death, he said to his former Science Adviser, James Killian: “You know, Jim, this bunch of scientists was one of the few groups that I encountered in Washington who seemed to be there to help the country and not to help themselves.” Eisenhower recognized the threat posed by the secret part of our government, with its large invisible budget and lack of public accountability.

John Kennedy was inspirational; he summoned people to fight “against the common enemies of man: tyranny, poverty, disease and war itself”; he spoke of a “global alliance, North and South, East and West, that can assure a more fruitful life for all mankind”; he challenged the nation to go to the moon and he established the Peace Corp. Kennedy’s legacy was marred by the Secret Government, including its role in promoting the Cuba invasion at the Bay of Pigs, and by the United States assumption, from France, of Vietnam occupation. These fiascos, ultimately, were the President’s responsibility. In trying to understand Kennedy’s actions, it is helpful to remember the global situation at that time. Free-world democracies were in competition with expansionist Marxist governments; Kennedy’s decisions surely were influenced by that situation. However, given Kennedy’s convictions and intellect, I like to believe that, had he lived to serve two terms as President, he would have tightened civilian control of national security, constrained the role of the Secret Government, and found an early exit from the Vietnam War.

From my personal perspective, the pinnacle of rapid post-World War II progress occurred in the late 1960s when Neil Armstrong placed the first footprints on the moon. I was a post-doc at the Sterrewacht, an astronomical observatory in Leiden, Netherlands, about to return to the NASA Goddard Institute for Space Studies. I had been promised a staff position at the Goddard Institute with exciting potential to carry out planetary exploration, so I already felt that I was a part of NASA as Armstrong took his “small step” into thick lunar dust. That “great leap for mankind” occurred in the wee hours in the Netherlands, where I watched the television coverage with a beautiful Dutch young lady, now my wife Anniek, who I fell in love with that summer.

The next morning, at the Sterrewacht’s ritual 11 AM tea-time, Dutch scientists were effusive in congratulations about the remarkable Yankee achievement. But to me this success seemed to be

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normal, expected progress. I assumed that we would be continually moving to greater heights in our land of opportunity. After all, I had come from the depths of poverty, one of seven children of an itinerant, land-less sharecropper barely able to scratch out a living. Yet I did not have a dime of student debt, as I stood ready to explore other worlds.

I took for granted the generous support of education by Iowa citizens, and the foresight and investments in the future by Presidents Truman, Eisenhower and Kennedy. Project Apollo, conceived as a three-man spacecraft in the Eisenhower years and eventually dedicated to Kennedy’s goal of landing a man on the Moon and safely returning him to Earth in the 1960s, was the project visible to the world. However, that project was underlain by support for education. Students could attend college without mortgaging their future.

I did not even pay tuition (which was only $220 per semester) as I worked my way to a bachelor of sciences degree in physics and mathematics at the University of Iowa, because Iowa waived tuition for students with high tests scores, if they maintained good grades. I received a three-year NASA traineeship for graduate study in space sciences, which was sufficient for me to earn a master of sciences degree in astronomy and a Ph. D. in physics under Prof. James Van Allen.

United States taxpayers even financed my study at famous Leiden University. I had written a successful proposal to the U.S. National Science Foundation for a one-year post-doctoral fellowship in Leiden where I would be able to learn from Prof. Henk van de Hulst, the world’s leading authority on light scattering. My aim was to discover the nature of the veil of Venus, the foggy shroud that prevents us from seeing the surface of our nearest planetary neighbor. I worked on the Venus problem with Prof. van de Hulst’s top protégé, Joop Hovenier.

Hovenier was always careful and deliberate, looking at problems from different angles, and he was sometimes philosophic. So I was not surprised, at Sterrewacht tea time, when he followed his congratulations with an admonition. Although the United States seemed all-powerful at the moment, he cautioned, all empires in the past, sooner or later, fell into decay – so we should not be too cocky – we should beware of the forces that bring stagnation and deterioration.

**Post-Apollo Era.** I thought about Hovenier’s admonition many times during my nearly half-century in the United States government. There is a growing government bureaucratization and inefficiency, even in NASA, which is one of the better agencies. However, growing government bureaucratization and inefficiency are a symptom of the problem, rather than the root cause. We must look at policies and politics to understand the bigger picture.

Let me be clear: I recognize great achievements and technical progress in the post-Apollo era. I could fill pages listing them. Yet even this progress is in part a result of positive momentum from earlier decades, a product of our long-standing free democratic system.

Perhaps the greatest post-Apollo achievement, symbolized by the fall of the Berlin wall, was the triumph of western democracies over the Soviet Union’s communist system. Yet President Ronald Reagan would be the first to agree that this triumph was not because Reagan made a speech saying “Mr. Gorbachev, tear down that wall.” Reagan deserves credit for effective negotiating tactics, but the outcome was principally the result of a long-term competition between alternative systems of government.

Today students do not have opportunities comparable to what I had, but there is no good reason why they should not. The energy and climate challenge today exceeds the space challenge of the
The energy and climate challenge today would be an enormous opportunity for young people and our nation, if the energy challenge was managed well by our political system.

Yet our politicians have failed us. In the post-Apollo era we witness growing disparities in wealth, decline in the economic prospects of the middle class, and reduced upward mobility because of crushing costs for higher education. We are losing the innovation potential of a large fraction of society, because of our failure to provide all children a stimulating educational environment at early ages including pre-kindergarten. It is appropriate to question the abilities and motivation of the leaders in our present money-driven political system.

When Joop Hovenier visited the United States in 1972 he asked me, with reference to George McGovern and Richard Nixon, “Are these really the best two people that your great nation of 200,000,000 people can produce?” Many people asked a similar question in 2016. I will argue that young adults have potential to alter this electoral process.

Young people need to understand the problems in our political system, because the problems are fixable. Indeed, I will argue that the future for young people and the future for life on our planet depend upon young adults fixing the American political system.

Whoa! That’s a lot to lay on the shoulder of kids. True enough, but I believe that I can make a strong case that fixing the American political system is necessary to solve the climate problem. Further, young people have tremendous potential political power, as they have already shown. But that is not enough. They must actually look out after their own interests, and that requires understanding both the political system and the actions that are needed.

**Red Country, Blue Country.** I am both red and blue. I was born in a farmhouse in Charter Oak township, Iowa, and I grew up in nearby Denison, Iowa. Denison is the county seat of Crawford County and contains most of the population of the county. In the 2016 Presidential election Crawford County went 67 percent for Trump. The omnipresent political maps show our region as dark red country.

I was educated at the University of Iowa, in Iowa City, which is a university town, and of course liberal. I do not need to look up election statistics to know that it is dark blue on political maps.

I love both Denison and Iowa City. I cannot think of better places to grow up and go to school. I wish that young people today were as lucky as I was. The problem is not the place or the people. Red country people are good people. Blue country people are good people.

Liberals perhaps need a little reassurance about Denison, given its landslide vote for Trump. Here is one thing: in 2008 Obama handily won the Presidential vote in Crawford County. On election night in 2008, as results began to show an Obama victory, I had tears in my eyes. I was proud of our country. When Obama took office he had a lot of good will, even in red country.

Yet Obama failed miserably, in my opinion. Yes, he did some good things, and we have never had a more exemplary First Family. But Obama failed to convert opportunities to improve the prospects for the youth who had secured his election. In particular, he failed to address effectively the energy and climate matters, despite the fact that the required actions would have also addressed major economic and national security issues.

Instead, Obama took out the usual Democratic playbook. Special interests in Washington were the winners. It was as if the Washington swamp had won the election.
The problem, I hope to persuade you, is with our political parties. Both parties are elitist. Neither party is effectively looking out for the interests of young people.

Most American readers are either Democrats or Republicans. I will not try to persuade you, at this point, to abandon your party. I only ask that you keep an open mind.

I note that I am a political Independent, and that is how I am registered in Pennsylvania, where I now live. As a scientist, there is an advantage to be politically independent — it helps assure objectivity in science problems that relate to political issues.

Dedication: To my mother, Gladys Helen Ray, a determined, indomitable woman.

My mother was 8 years old when her father died in an influenza epidemic. Her grandmother died the next year. She was 13 when her mother, after a few years in pain, died of breast cancer.

Gladys was then taken in by Jack and Daisy Hunter, living on their farm near Dunlap, Iowa. She stayed out of school one year to help care for their four small children, but then attended and graduated from Dunlap High School. Her graduation photo is above.

Gladys fell in love with a farmhand seven years her senior, James Ivan Hansen. Against the wishes of the Hunters, she eloped at age 19 in 1930. It was not a propitious moment. Banks had crashed. The Great Depression was beginning. Ivan, as he was called, was educated through 8th grade, sufficient for farming, but he had neither land nor money. The future of farming was becoming tractors and powered equipment, but his experience was with a horse and plow.

Rundown small farms were failing and available for rent or sharecropping. It was backbreaking work, plowing the steep hills and valleys. With droughts, grasshoppers and dust storms, the
crops were meager. Once fences were mended and the farm functioning, the owner would sell the farm. My parents would start anew on another rundown farm.

Against these odds, my mother made a wonderful home, aided by skills learned from her mother, grandmother and Daisy Hunter. Her cooking and baking were unrivaled, said to be Pennsylvania Dutch, from her grandmother’s heritage. On each farm she planted a huge garden. Without aid of electricity or running water, she canned and preserved hundreds of jars of tomatoes, corn, beans, and peas. Potatoes, beets, cabbage, onions and carrots were stored in a dirt cellar. She made dresses for her girls from colored cotton feedbags. She milked cows that our collie, Pal, brought home in the evening. She separated cream, to be sold, from milk, and washed the separator daily. She gathered eggs, and butchered and cleaned chickens. All of this was part of the ‘housework,’ the woman’s work. Her energy seemed inexhaustible. In her frequent pregnancies, she worked up until the day of delivery.

Her first four children, born in the 1930s, were all girls. They didn’t work in the fields, but the older ones helped my mother. Sister #1, born in 1931, was chief helper. One task was protecting young chickens from predator hawks. My mother called them “chicken hawks”. Sister #4, a bird lover, thinks they were red-tailed hawks. Sister #1 would sit beside the chicken coop, reading, but ready to flap her arms when a hawk circled. I suspect that it was Sister #1 who spurred my other sisters to be voracious readers – all of them turned out to be “A” students.

Time colors our memories, but my sisters’ remembrances of the farm life tend to be joyful ones, despite the poverty. None of the farms had electricity, plumbing or running water. My sisters describe evenings around the big kitchen table, lit by a kerosene lamp, where they did their reading, writing, coloring and game playing. They remember the beauty of the wildflowers, especially the wild roses, the state flower that bloomed all summer along the dirt country roads. These were peaceful times. They were probably the best years of my mother’s life. My sisters remember her singing as she worked, especially in the garden. We were, then, a family, rather isolated, always together.

I have only a few vague memories of the last farm – our collie Pal, riding in a wagon pulled by a horse, the large circular water tank for animals that contained a few large goldfish – memories preserved by repetition over years. In early 1945, when I was 4 years old, we moved off this last farm to Denison, a wonderful town. Opportunities grew, but so did anxieties as life became more complex and threatening. Change would not all prove to be for the good.