

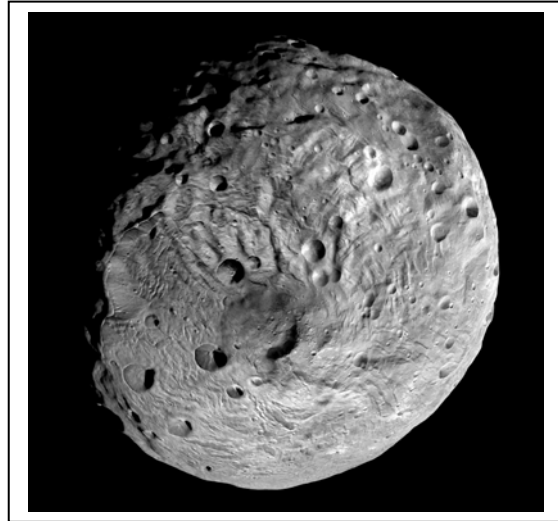
Day 6: Volume of Sphere

Math

Comparing the Volume of various space objects

Materials:

- Calculator



On July 15, 2011 the NASA spacecraft Dawn went into orbit around the asteroid Vesta (photo on the right). Vesta is the second largest asteroid in the Asteroid Belt. Its diameter is 530 kilometers. The diameter of the moon is 1,730 kilometers.

The equation for volume of sphere is $= \frac{4}{3} * \pi r^3$

Problem 1 - Assuming that it is shaped like a sphere, what is the volume of Vesta in cubic kilometers?

Problem 2 - About how many asteroids like Vesta could you fit inside our moon?

Problem 3 - If the Earth has a diameter of 12,756 km, what is the volume of Earth? What about Mars with a diameter of 6794 km?

Day 6: Characteristics of Mars

Science

Materials:

- Paper, colored pencils, markers, crayons, or any other materials to design an alien.
- Your Planet Chart from Day 4 and 5 Science

Using the information you have collected, create an alien from Mars. Plan out and start to design you alien and what they look like.

Alien Project

Imagine that you have arrived on another planet. You look around and see signs of life. What would you expect the alien to look like? As organisms, our characteristics are based on our planet. For example, we breathe oxygen because it is present on our planet. However, on another planet we would not be able to breathe. Another example is that our eyes are a certain size because of how close we are to the sun. If we were in an area of little or no light, we might either have very large eyes (to let in more light) or no eyes at all! Organisms change to meet their environment. The same goes with aliens.



What to do:

In this activity, you are going to be constructing an alien from a planet of your choice. When designing the alien, you need to consider facts about the planet for your alien. Most likely, it will not look like an alien from the movies.

Here are some things to consider when creating your alien:

- What does it eat?
- What does it breathe?
- Does it need a mouth?
- Does it need fur or something to keep warm?
- How does it move around the planet?
- Does it blend into the planet (camouflage) ?

You should draw your alien and label the parts of the alien that you considered when creating your alien. If you give the alien teeth, explain what it eats that it needs teeth. If it doesn't eat, maybe there is no mouth and you could explain that as well. Do not base facts on the name of the planet as that is irrelevant to life forms. For example, don't make an alien from Mars a warrior because Mars is the god of war. That is not important to your alien for survival.

Requirements:

You alien should have:

- Color
- At least 8 parts labeled as to why you designed it the way you did.
- A name
- The name of the planet

Additional Resources

Life on Mars? pbslearningmedia.org/resource/602a58a1-3ae5-46d3-abc0-c7e10c3157d1/life-on-mars-nasa-discovers-evidence-of-water/



Curiosity Rover Hits Paydirt on Mars | NASA Planetary Sciences <http://ow.ly/J0Fc50AWDSZ>



Mars | Crash Course Astronomy <https://www.youtube.com/watch?v=l-88YWx71gE>



Day 6: Cold War, the Space Race, and Exploration

Social Studies

- Describe America's response to Sputnik in the larger view of the Space Race and Cold War.
- Read "Sputnik' Impact on America (see attached):
www.pbs.org/wgbh/nova/article/sputnik-impact-on-america/
- If possible, view Civil Defense film titled "Duck and Cover" that displays the reality of the tension between the Soviet Union and the United States: www.loc.gov/item/mbrs01836081/
- If possible, view the short clip on Sputnik's Launch from PBS:
<https://bit.ly/3ar6FwX>
- Complete the attached Sputnik Impact Sheet.



Sputnik's Impact on America

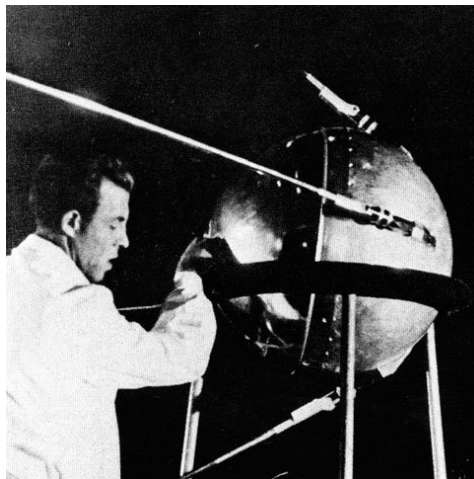
<https://www.pbs.org/wgbh/nova/article/sputnik-impact-on-america/>

Never before had so small and so harmless an object created such consternation.

—Daniel J. Boorstin, *The Americans: The Democratic Experience*

"Listen now," said the NBC radio network announcer on the night of October 4, 1957, "for the sound that forevermore separates the old from the new." Next came the chirping in the key of A-flat from outer space that the Associated Press called the "deep beep-beep." Emanating from a simple transmitter aboard the Soviet Sputnik satellite, the chirp lasted three-tenths of a second, followed by a three-tenths-of-a-second pause. This was repeated over and over again until it passed out of hearing range of the United States.

BY PAUL DICKSON TUESDAY, NOVEMBER 6, 2007 NOVA



Sergei Korolev, the engineer behind the 184-pound Soviet Sputnik satellite, was not credited by name until after his death. Courtesy of NASA

The mouse that roared

The satellite was silver in color, about the size of a beach ball, and weighed a mere 184 pounds. Yet for all its simplicity, small size, and inability to do more than orbit the Earth and transmit meaningless radio blips, the impact of Sputnik on the United States and the world was enormous and unprecedented. The vast majority of people living today, at the beginning of the 21st century, were born after Sputnik was launched and may be unaware of the degree to which it helped shape life as we know it.

Now is an especially good time to take a fresh and focused look at the event whose impact looms even larger with the passing of time. In the last decade an incredible amount of once-secret material has been declassified and made public. Scholars and writers both inside and outside government have coaxed key Cold War documents out of hiding. Collectively, this material has given new dimensions and twists to almost every aspect of the events leading up to and following the launch of Sputnik.

For example, one recently released document reveals evidence of a long-forgotten pre-Sputnik "olive branch" extended by Russian scientists, who asked their American counterparts to supply a piece of

scientific equipment for a planned launch. By most indications, this piece of equipment was meant for the third Sputnik.

It was as if this orderly march into the future was a part of America's destiny.

It is not widely known even now that one of the reasons President Dwight D. Eisenhower and those around him did not react with alarm over Sputnik going into space ahead of an American satellite was that Eisenhower welcomed the launch to help establish the principle of "freedom of space" [the idea that outer space belonged to everyone, thereby allowing satellite flights over foreign countries].

At the time of the Sputnik "crisis," the White House, Central Intelligence Agency, Air Force, and a few highly select and trustworthy defense contractors were creating a spy satellite that was so secret that only a few dozen people knew of it. Even its name, CORONA, was deemed secret for many years. Instead of being concerned with winning the first round of the space race, Eisenhower and his National Security Council were much more interested in launching surveillance satellites that could tell American intelligence where every Soviet missile was located.



Although he couldn't publicly admit it without risking national security, President Dwight D. Eisenhower was not greatly surprised by the launch of Sputnik. Courtesy Library of Congress

Heard 'round the world

For many of us born before the 1950s, the fascination and astonishment engendered by the launch of Sputnik remain fresh in our minds. Like many of my generation, I can recall exactly where I was when I heard about Sputnik's launch. I was 18 years old, a college freshman at Wesleyan University in Middletown, Connecticut. A friend stopped me in the middle of the campus to say that he had heard about it on the radio. Instinctively, we both looked up.

Within hours I would actually hear its signal rebroadcast on network radio. Before the weekend was over, I got to hear it directly on a shortwave radio as it passed overhead.

Not only could you hear Sputnik, but, depending on where you were, it was possible to see it with the naked eye on certain days in the early morning or the late evening when the sun was still close enough to the horizon to illuminate it. While standing in the middle of the college football field a week or so after the launch, I first saw the satellite scoting across a dark evening sky orbiting the Earth at a speed of 18,000 miles per hour. Watching Sputnik traverse the sky was seeing history happen with my own eyes. To me, it was as if Sputnik was the starter's pistol in an exciting new race. I was electrified, delirious, as I witnessed the beginning of the Space Age.



The 1939 "World of Tomorrow" World's Fair in Flushing Meadows, New York promoted belief in science and technology and had a powerful influence on a generation of Americans. © Bettmann/CORBIS

A new world

Prior to Sputnik, popular interest in science and technology had been on the rise since as early as the 1939 "World of Tomorrow" World's Fair in Flushing Meadows, New York. I attended the fair, albeit in utero, as I was born three days after my parents' last visit. But they saved many artifacts of the fair for me, including an official guidebook, which fascinated me as a kid and jump-started my interest in all sorts of things, particularly space travel.

That guidebook turned out to be a preview of the future. Exhibits like Ford's "Road of Tomorrow," General Motors' "Futurama," and the multisponsored "Town of Tomorrow" were more than fanciful prototypes; many of their imagined advances made their way into everyday life within a couple of decades. The fair's centerpiece was "Democracy," and it heralded wartime dreams and postwar realities: superhighways, ranch-style houses, rec rooms, workshops for "do-it-yourselfers," and booming suburbs (known as "satellites" in the Democracy display) replete with prefab houses, two-car garages, and stereophonic sound. Something called "television" was actually demonstrated at the RCA exhibit.

The fair's Transportation Pavilion was devoted to space exploration. There was a rocketport, a moonport, and a rocketship shot from a "rocketgun." In one lavish demonstration you could simulate blastoff on a trip to Venus. Once there, you could stroll a primeval jungle inhabited by immense Venusian beasts and a colony of Martians. The fair promised a day when sleek vehicles would take passengers to the planets as easily as they could fly from New York to Chicago. It was as if this orderly march into the future was a part of America's destiny.

As it turned out, the real "world of tomorrow" was delayed because of World War II, but its vision was carried intact into the late 1940s and early 1950s, when it began to be realized. Americans who had struggled through the Great Depression and the war embraced the promise of a burgeoning middle class having goods, services, and comforts that formerly had been the province of European royalty. The average family's car had more pure horsepower than existed in all the stables of Buckingham Palace a generation earlier.

"No event since Pearl Harbor set off such repercussions in public life."

By 1957, a new world was at hand for the United States. The country was creating an interstate highway system; the suburbs were growing; families with two cars and color televisions were becoming the norm. The highest peacetime federal budget in history (\$71.8 billion) was in place, and it was the first year in which more than 1,000 computers would be built, bought, and shipped. There were advances in public health, although none more stunning than Dr. Jonas Salk's discovery of a vaccine against polio, the scourge of an entire generation of children.

At the same time, social changes were beginning to transform the United States. A great struggle to achieve a more egalitarian society was beginning. The first civil rights legislation since Reconstruction had been enacted in Congress on September 9, less than a month before Sputnik's launch. The Arkansas National Guard was in Little Rock, Arkansas, enforcing the right of blacks to go to school with whites. Culturally as well, the country was moving to a different beat. Rock 'n' roll had come onto the scene, and Elvis Presley owned the summer of 1957 with his two-sided monster hit record of "Don't Be Cruel" and "Hound Dog."



The Army's Wernher von Braun, seen here with a model rocket, was prevented from making America's first attempt to put a satellite in orbit and was forced to defer to a team from the Naval Research Laboratory. When the Navy's Vanguard failed, von Braun put America in space with Explorer in January, 1958. © Bettmann/CORBIS

A Crisis of Confidence

Just when Americans were feeling self-confident and optimistic about the future, along came the crude, kerosene-powered Sputnik launch. The space race was under way, and the Soviets had won the first leg—the United States was agog and unnerved.

"No event since Pearl Harbor set off such repercussions in public life," wrote historian Walter A. McDougall in *The Heavens and the Earth—A Political History of the Space Age*. Simon Ramo, space pioneer and cofounder of Thompson Ramo Woolridge, later known as TRW, Inc., wrote in *The Business of Science* that "the American response to the accomplishment of the Soviet Union was comparable to the reaction I could remember to Lindbergh's landing in France, the Japanese bombing of Pearl Harbor, and Franklin D. Roosevelt's death."

There was a sudden crisis of confidence in American technology, values, politics, and the military. Science, technology, and engineering were totally reworked and massively funded in the shadow of

Sputnik. The Russian satellite essentially forced the United States to place a new national priority on research science, which led to the development of microelectronics—the technology used in today's laptop, personal, and handheld computers. Many essential technologies of modern life, including the Internet, owe their early development to the accelerated pace of applied research triggered by Sputnik.

On another level, Sputnik affected national attitudes toward conspicuous consumption as well, symbolically killing off the market for the Edsel automobile and the decadent automotive tail fin. It was argued that the engineering talents of the nation were being wasted on frivolities. Americans, wrote historian Samuel Flagg Bemis from the vantage point of 1962, "had been experiencing the world crisis from soft seats of comfort, debauched by [the] mass media..., pandering for selfish profit to the lowest level of our easy appetites, fed full of toys and gewgaws, our power, our manpower softened in will and body in a climate of amusement."



While Eisenhower opposed sending men to the moon, John Kennedy made it a national priority. Here, Kennedy views the Saturn launch system with von Braun (center) and NASA Deputy Administrator Robert Seamans. Courtesy NASA-HQ-GRIN

Spur for spacemen

Sputnik also changed people's lives in ways that filtered into modern popular culture. Sputnik was the instrument that gave Stephen King the "dread" that fuels his novels, caused the prolific Isaac Asimov to begin calling himself a science writer rather than a science fiction writer, inspired Ross Perot to create an electronics dynasty, and led others to become cosmonauts and astronauts.

NASA astronaut Franklin R. Chang-Díaz is a case in point. He was born on April 5, 1950, in San José, Costa Rica. On a trip to Venezuela in October 1957, the seven-year-old was told by his mother to look skyward to see the Russian satellite crossing the night sky. Although the young Franklin could not spot Sputnik, he became so infatuated with the fact that human influence had moved into space that he decided then and there that this was his future. Once the American manned space program was under way, he wrote to Wernher von Braun, director of the George C. Marshall Space Flight Center, to find out how he might apply to become an astronaut. In the form letter that came back, he was advised to get a scientific or engineering degree and learn to fly. He also was told that he would have to become an American citizen. The United States, after all, was in a race with the Soviet Union.

At 18 he came to the United States from Costa Rica; he received a bachelor of science degree in mechanical engineering from the University of Connecticut in 1973 and a doctorate in physics from the Massachusetts Institute of Technology in 1977. Along the way he became a U.S. citizen and then in 1981 an astronaut. Chang-Díaz hopes to go to Mars eventually.



On May 25, 1961, President Kennedy tells Congress of his intention for the nation to achieve the goal, "before this decade is out, of landing a man on the Moon...." Courtesy NASA

The space race begins

Politically, Sputnik created a perception of American weakness, complacency, and a "missile gap," which led to bitter accusations, resignations of key military figures, and contributed to the election of John F. Kennedy, who emphasized the space gap and the role of the Eisenhower-Nixon administration in creating it. But although the Sputnik episode publicly depicted Eisenhower as passive and unconcerned, he was fiercely dedicated to averting nuclear war at a time when the threat was very real. His concern for national security took precedence over any concerns about beating the Russians into Earth orbit.

Without Sputnik, it is all but certain that there would not have been a race to the moon.

When Kennedy as president decided to put Americans on the moon, he did so with the belief that voters who had been kids at the time of Sputnik were more willing than their parents to pay the high price of going into space.

Diplomatically, Sputnik helped realign the United States and Great Britain as allies. For a decade, ties between the two nations had weakened partly due to the 1946 Atomic Energy Act, which had deprived the United Kingdom of American nuclear secrets, and partly because of the strong position that the United States had taken against the British and French during the Suez Crisis, which had been prompted by Egypt's seizure of the Suez Canal in July 1956. Now with the common threat of Soviet power implied by Sputnik, NATO was strengthened, guaranteeing the placement of American nuclear arms in Europe. The satellite touched off a superpower competition that may well have acted as a surrogate contest for universal power—perhaps even a stand-in for nuclear world war.

NASA chief historian Roger D. Launius wrote on the 40th anniversary of the launch: "To a remarkable degree, the Soviet announcement changed the course of the Cold War.... Two generations after the event, words do not easily convey the American reaction to the Soviet satellite." Without Sputnik, it is all but certain that there would not have been a race to the moon, which became the centerpiece contest of the Cold War.



By 1968, when this photograph was taken, Wernher von Braun had been director of the Marshall Space Flight Center, developer of the Saturn rockets that got us to the moon, for eight years. A Saturn IB stands at the ready in the background. Courtesy NASA

To the moon

From the outset, wrangling among the branches of the military over control of the rockets that would take the United States into space threatened the success of the American space program even before Sputnik. Eisenhower was at odds with his generals over the program, and each branch of the service had its own aspirations of going into space. The main event pitted the Army's von Braun and his Rocket Team in Huntsville, Alabama against a team from the Naval Research Laboratory. The Army had the mighty Jupiter C rocket and its own Orbiter or Deal satellite (later to become Explorer) pitted against the Navy's experimental Viking rocket and Vanguard satellite.

The most powerful early rockets were developed as weapons—first as German V-2 technology from World War II and ultimately as intercontinental ballistic missiles. The space program seemed destined for civilian control just as the power of the atomic bomb had been taken from the military a decade earlier. The National Aeronautics and Space Administration began in 1958 as a reaction to Sputnik and as a means for turning missiles into launch vehicles for America's civilian space efforts.

President Eisenhower opposed sending men to the moon, but his successor, John F. Kennedy, made a lunar landing a national priority. Receiving virtual carte blanche in budget requests, NASA won the race for the United States, but victory was by no means an easy feat.

National insecurity, wounded national pride, infighting, political grandstanding, clandestine plots, and ruthless media frenzy were but a few of the things the United States had to overcome to bounce back from the blow dealt to the nation by Sputnik.

Editor's Notes

This feature originally appeared on the site for the NOVA program Sputnik Declassified.

Sputnik's Impact on America Responses

Directions:

1. Read "Sputnik' Impact on America: (www.pbs.org/wgbh/nova/article/sputnik-impact-on-america/)
2. If possible, view Civil Defense film titled "Duck and Cover" that displays the reality of the tension between the Soviet Union and the United States:
www.loc.gov/item/mbrs01836081/

Complete the following discussion questions regarding what you read and/or viewed in the article and the Duck and Cover video:

1. How did U.S. government officials react to the news of Sputnik in 1957?

2. How did everyday people react?

3. How did the "space race" escalate the Cold War between the United States and the Soviet Union? How was "space" linked to the fear of nuclear war?

Consider the following table of NASA and Defense (Military) spending after the launch of Sputnik. What was the American initial and long term response to the news based on the information presented in "Document I"?

Document I

Source: Office of Management and Budget, US Federal Government, chart created by Beth Scully.

Chart of Federal Spending 1958-1970

Year	NASA % of Budget	Defense % of Budget
1958	0.10%	56.80%
1959	0.20%	53.20%
1960	0.50%	52.20%
1961	0.90%	50.80%
1962	1.40%	49.00%
1963	2.80%	48.00%
1964	4.30%	46.20%
1965	5.30%	42.80%
1966	5.50%	43.20%
1967	3.10%	45.40%
1968	2.40%	46.00%
1969	2.10%	44.90%
1970	1.70%	41.80%

[https://www.nasa.gov/pdf/466719main AP ED Hist RacetoSpace 09-17-09.pdf](https://www.nasa.gov/pdf/466719main_AP_ED_Hist_RacetoSpace_09-17-09.pdf)

Response:

Day 7: Text Dependent Analysis and Theme

English Language Arts

- Now that you've read three primary sources, we are going to add in one more, President Reagan's national address following the explosion of the Space Shuttle Challenger. Using this new speech, you will write a text-dependent analysis that demonstrates your ability to link common themes together in a cohesive writing piece.
- Note: You do not have to complete the full TDA. However, you should use the planning area to describe how you might complete it to identify a common theme in all documents.
- Sketch out a possible response to the prompt. Note: you do not have to write the essay unless directed by your teacher(s).
 - TDA Prompt: Identify a common theme
 - Selection 1 (Kennedy)
 - Selection 2 (Jefferson)
 - Selection 3 (Reagan)

Day 7: Text Dependent Analysis and Theme English Language Arts

Name: _____ Period: _____ Score: _____/40

TEXT-DEPENDENT ANALYSIS QUESTION

E08.E.1.1

Within the selected sources, the authors each develop a theme to convey a central idea. Write an essay in which you identify a common theme set forth across each of the works. Within your response, use evidence from the multiple texts to support what you have identified as the common theme.

Writer's Checklist

PLAN before you write.

- Make sure you read the question carefully.
- Make sure you have read the entire passage carefully.
- Think about how the question relates to the passage.
- Organize your ideas on scratch paper. Use a thought map, outline, or other graphic organizer to plan your essay.

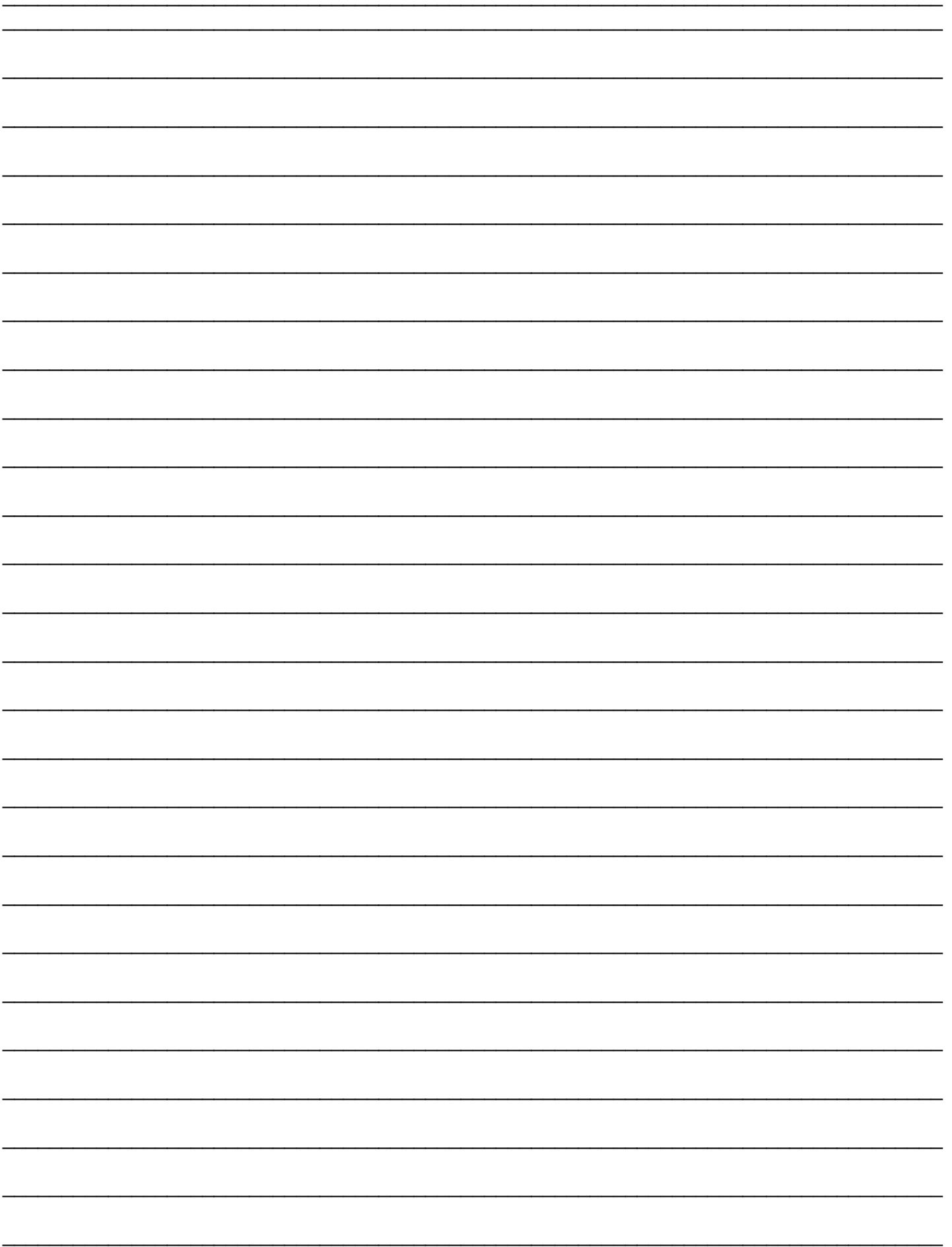
FOCUS while you write.

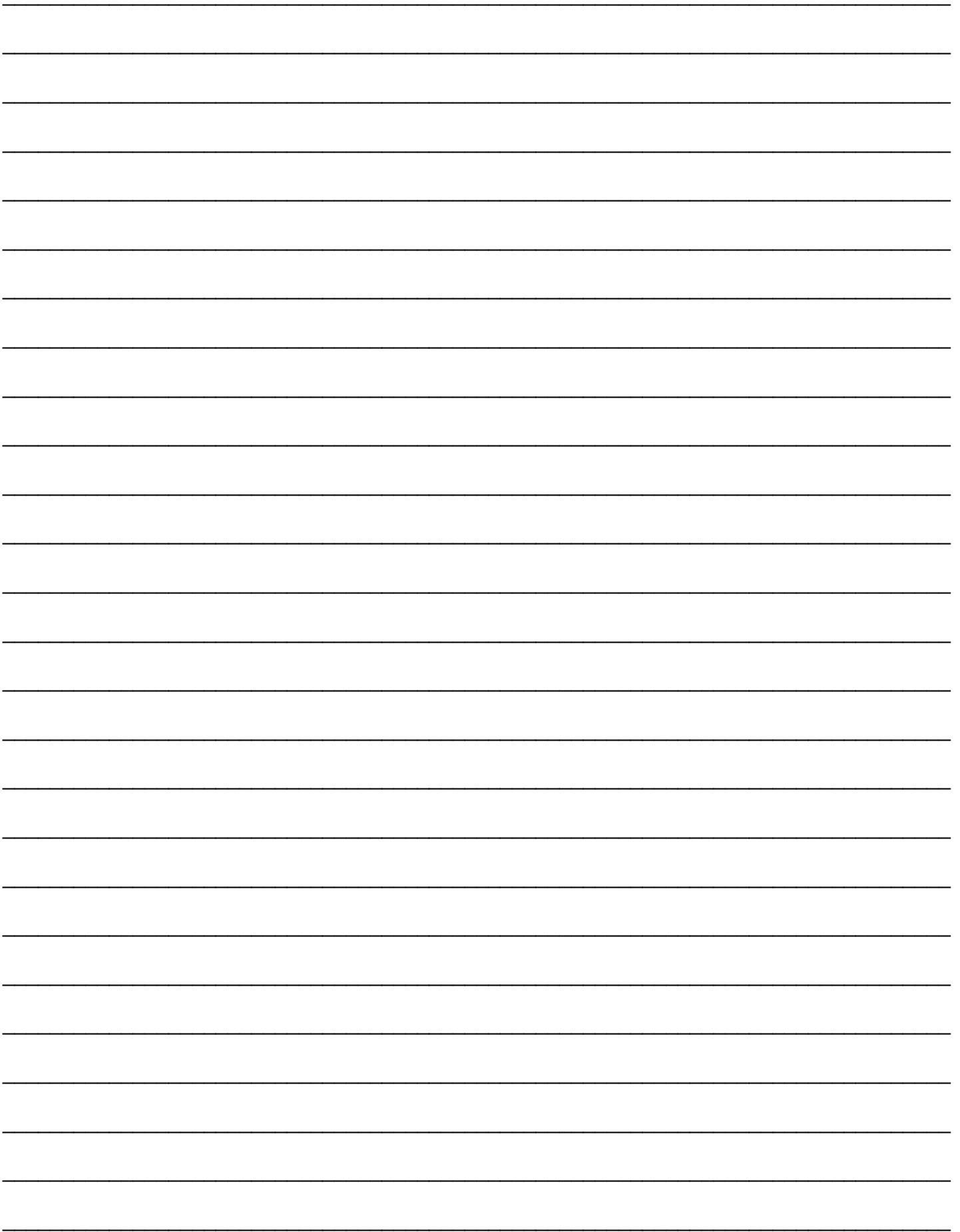
- Analyze the information from the passage as you write your essay.
- Make sure you use evidence from the passage to support your response.
- Use precise language, a variety of sentence types, and transitions in your essay.
- Organize your paper with an introduction, body, and conclusion.

PROOFREAD after you write.

- I wrote my final essay on the provided pages.
- I stayed focused on answering the question.
- I used evidence from the passage to support my response.
- I corrected errors in capitalization, spelling, sentence formation, punctuation, and word choice.

PLANNING AREA







Text Source 1: *John F. Kennedy Moonshot Speech*

TEXT OF PRESIDENT JOHN KENNEDY'S RICE STADIUM MOON SPEECH

President Pitzer, Mr. Vice President, Governor, Congressman Thomas, Senator Wiley, and Congressman Miller, Mr. Webb, Mr. Bell, scientists, distinguished guests, and ladies and gentlemen:

I appreciate your president having made me an honorary visiting professor, and I will assure you that my first lecture will be very brief.

I am delighted to be here, and I'm particularly delighted to be here on this occasion.

We meet at a college noted for knowledge, in a city noted for progress, in a State noted for strength, and we stand in need of all three, for we meet in an hour of change and challenge, in a decade of hope and fear, in an age of both knowledge and ignorance. The greater our knowledge increases, the greater our ignorance unfolds.

Despite the striking fact that most of the scientists that the world has ever known are alive and working today, despite the fact that this Nation¹'s own scientific manpower is doubling every 12 years in a rate of growth more than three times that of our population as a whole, despite that, the vast stretches of the unknown and the unanswered and the unfinished still far outstrip our collective comprehension.

No man can fully grasp how far and how fast we have come, but condense, if you will, the 50,000 years of man¹'s recorded history in a time span of but a half-century. Stated in these terms, we know very little about the first 40 years, except at the end of them advanced man had learned to use the skins of animals to cover them. Then about 10 years ago, under this standard, man emerged from his caves to construct other kinds of shelter. Only five years ago man learned to write and use a cart with wheels. Christianity began less than two years ago. The printing press came this year, and then less than two months ago, during this whole 50-year span of human history, the steam engine provided a new source of power.

Newton explored the meaning of gravity. Last month electric lights and telephones and automobiles and airplanes became available. Only last week did we develop penicillin and television and nuclear power, and now if America's new spacecraft succeeds in reaching Venus, we will have literally reached the stars before midnight tonight.

This is a breathtaking pace, and such a pace cannot help but create new ills as it dispels old, new ignorance, new problems, new dangers. Surely the opening vistas of space promise high costs and hardships, as well as high reward.

So it is not surprising that some would have us stay where we are a little longer to rest, to wait. But this city of Houston, this State of Texas, this country of the United States was not built by those who waited and rested and wished to look behind them. This country was conquered by those who moved forward--and so will space.

William Bradford, speaking in 1630 of the founding of the Plymouth Bay Colony, said that all great and honorable actions are accompanied with great difficulties, and both must be enterprised and overcome with answerable courage.

If this capsule history of our progress teaches us anything, it is that man, in his quest for knowledge and progress, is determined and cannot be deterred. The exploration of space will go ahead, whether we join in it or not, and it is one of the great adventures of all time, and no nation which expects to be the leader of other nations can expect to stay behind in the race for space.

Those who came before us made certain that this country rode the first waves of the industrial revolutions, the first waves of modern invention, and the first wave of nuclear power, and this generation does not intend to founder in the backwash of the coming age of space. We mean to be a part of it--we mean to lead it. For the eyes of the world now look into space, to the moon and to the planets beyond, and we have vowed that we shall not see it governed by a hostile flag of conquest, but by a banner of freedom and peace. We have vowed that we shall not see space filled with weapons of mass destruction, but with instruments of knowledge and understanding.

Yet the vows of this Nation can only be fulfilled if we in this Nation are first, and, therefore, we intend to be first. In short, our leadership in science and in industry, our hopes for peace and security, our obligations to ourselves as well as others, all require us to make this effort, to solve these mysteries, to solve them for the good of all men, and to become the world's leading space-faring nation.

We set sail on this new sea because there is new knowledge to be gained, and new rights to be won, and they must be won and used for the progress of all people. For space science, like nuclear science and all technology, has no conscience of its own. Whether it will become a force for good or ill depends on man, and only if the United States occupies a position of pre-eminence can we help decide whether this new ocean will be a sea of peace or a new terrifying theater of war. I do not say that we should or will go unprotected against the hostile misuse of space any more than we go unprotected against the hostile use of land or sea, but I do say that space can be explored and mastered without feeding the fires of war, without repeating the mistakes that man has made in extending his writ around this globe of ours.

There is no strife, no prejudice, no national conflict in outer space as yet. Its hazards are hostile to us all. Its conquest deserves the best of all mankind, and its opportunity for peaceful cooperation many never come again. But why, some say, the moon? Why choose this as our goal? And they may well ask why climb the highest mountain? Why, 35 years ago, fly the Atlantic? Why does Rice play Texas?

We choose to go to the moon. We choose to go to the moon in this decade and do the other things, not because they are easy, but because they are hard, because that goal will serve to organize and measure the best of our energies and skills, because that challenge is one that we are willing to accept, one we are unwilling to postpone, and one which we intend to win, and the others, too.

It is for these reasons that I regard the decision last year to shift our efforts in space from low to high gear as among the most important decisions that will be made during my incumbency in the office of the Presidency.

In the last 24 hours we have seen facilities now being created for the greatest and most complex exploration in man's history. We have felt the ground shake and the air shattered by the testing of a Saturn C-1 booster rocket, many times as powerful as the Atlas which launched John Glenn, generating power equivalent to 10,000 automobiles with their accelerators on the floor. We have seen the site where the F-1 rocket engines, each one as powerful as all eight engines of the Saturn combined, will be clustered together to make the advanced Saturn missile, assembled in a new building to be built at Cape Canaveral as tall as a 48 story structure, as wide as a city block, and as long as two lengths of this field.

Within these last 19 months at least 45 satellites have circled the earth. Some 40 of them were "made in the United States of America" and they were far more sophisticated and supplied far more knowledge to the people of the world than those of the Soviet Union.

The Mariner spacecraft now on its way to Venus is the most intricate instrument in the history of space science. The accuracy of that shot is comparable to firing a missile from Cape Canaveral and dropping it in this stadium between the the 40-yard lines.

Transit satellites are helping our ships at sea to steer a safer course. Tiros satellites have given us unprecedented warnings of hurricanes and storms, and will do the same for forest fires and icebergs.

We have had our failures, but so have others, even if they do not admit them. And they may be less public.

To be sure, we are behind, and will be behind for some time in manned flight. But we do not intend to stay behind, and in this decade, we shall make up and move ahead.

The growth of our science and education will be enriched by new knowledge of our universe and environment, by new techniques of learning and mapping and observation, by new tools and computers for industry, medicine, the home as well as the school. Technical institutions, such as Rice, will reap the harvest of these gains.

And finally, the space effort itself, while still in its infancy, has already created a great number of new companies, and tens of thousands of new jobs. Space and related industries are generating new demands in investment and skilled personnel, and this city and this State, and this region, will share greatly in this growth. What was once the furthest outpost on the old frontier of the West will be the furthest outpost on the new frontier of science and space. Houston, your City of Houston, with its Manned Spacecraft Center, will become the heart of a large scientific and engineering community. During the next 5 years the National Aeronautics and Space Administration expects to double the number of scientists and engineers in this area, to increase its outlays for salaries and expenses to \$60 million a year; to invest some \$200 million in plant and laboratory facilities; and to direct or contract for new space efforts over \$1 billion from this Center in this City.

To be sure, all this costs us all a good deal of money. This year¹'s space budget is three times what it was in January 1961, and it is greater than the space budget of the previous eight years combined. That budget now stands at \$5,400 million a year--a staggering sum, though somewhat less than we pay for cigarettes and cigars every year. Space expenditures will soon rise some more, from 40 cents per person per week to more than 50 cents a week for every man, woman and child in the United States, for we have given this program a high national priority--even though I realize that this is in some measure an act of faith and vision, for we do not now know what benefits await us.

But if I were to say, my fellow citizens, that we shall send to the moon, 240,000 miles away from the control station in Houston, a giant rocket more than 300 feet tall, the length of this football field, made of new metal alloys, some of which have not yet been invented, capable of standing heat and stresses several times more than have ever been experienced, fitted together with a precision better than the finest watch, carrying all the equipment needed for propulsion, guidance, control, communications, food and survival, on an untried mission, to an unknown celestial body, and then return it safely to earth, re-entering the atmosphere at speeds of over 25,000 miles per hour, causing heat about half that of the temperature of the sun--almost as hot as it is here today--and do all this, and do it right, and do it first before this decade is out--then we must be bold.

I'm the one who is doing all the work, so we just want you to stay cool for a minute. [laughter]

However, I think we're going to do it, and I think that we must pay what needs to be paid. I don't think we ought to waste any money, but I think we ought to do the job. And this will be done in the decade of the sixties. It may be done while some of you are still here at school at this college and university. It will be done during the term of office of some of the people who sit here on this platform. But it will be done. And it will be done before the end of this decade.

I am delighted that this university is playing a part in putting a man on the moon as part of a great national effort of the United States of America.

Many years ago the great British explorer George Mallory, who was to die on Mount Everest, was asked why did he want to climb it. He said, "Because it is there."

Well, space is there, and we're going to climb it, and the moon and the planets are there, and new hopes for knowledge and peace are there. And, therefore, as we set sail we ask God's blessing on the most hazardous and dangerous and greatest adventure on which man has ever embarked.

Text Source 2: *Jefferson's Letter to Lewis (1803)*
Transcript: Jefferson's Instructions for Meriwether Lewis

Thomas Jefferson and Early Western Explorers

Transcribed and Edited by Gerard W. Gawalt, Manuscript Division, Library of Congress. June 20 1803

To: Captain Meriwether Lewis esq. Capt. of the 1st. regimt, of Infantry of the United States

Full Transcript Available at <https://www.loc.gov/exhibits/lewisandclark/transcript57.html>

[ante June 20 1803]

To <Captain> Meriwether Lewis esq. Capt. of the 1st. regimt, of Infantry of the US. of A.

Your situation as Secretary of the President of the US has made you acquainted with the objects of my confidential message of Jan. 18. 1803 to the legislature; you have seen the act they passed, which they expressed in general terms, was meant to sanction these objects, and you are appointed to carry them into execution.

(5) Instruments for ascertaining by celestial observations, the geography of the country through which you will pass, have been already provided. Light articles for barter and presents among the Indians, arms for your attendants, say from 10. to 12. men, boats, tents, & other travelling apparatus with ammunition, medicine, surgical instruments and provisions you will have prepared with such aids as the Secretary at War can yield in his department; & from him also you will receive authority to (10) engage among our troops, by voluntary agreement, the number of attendants above mentioned, over whom you, as their commanding officer, are invested with all the powers the laws give in such a case.

The object of your mission is to explore the Missouri river, & such principal stream of it as by it's course and communication with the waters of the Pacific ocean whether the Columbia, Oregon, Colorado or any other river may offer the most direct & practicable water communication across this (15) continent for the purposes of commerce.

Beginning at the mouth of the Missouri, you will take careful observations of latitude & longitude at all remarkable points on the river, & especially at the mouth of rivers, at rapids, at islands, & other places & objects distinguished by such durable natural marks & characters of a durable nature kind as that they may with certainty be recognized hereafter.

(20) The course of the river between these points of observation may be supplied by the compass, the log-line & by time, corrected by the observations themselves. The variations of the compass too, in different places should be noticed.

The interesting points of the portage between the heads of the Missouri, & of the water offering the best communication with the Pacific ocean, should also be fixed by observation, & the course of that (25) water to the ocean, in the same manner as that of the Missouri.

Your observations are to be taken with great pains & accuracy, to be entered distinctly & intelligibly for others...fix the latitude and longitude of the places at which they were taken, and are to be rendered to the war office for the purpose of having the calculations made concurrently by proper persons within the US. several copies of these as well as of your other notes should be made at

(30) leisure times, & put into the care of the most trust-worthy of your attendants, to guard by multiplying them against the accidental losses to which they will be exposed. A further guard would be that one these copies be on the paper of the birch, as less liable to injury from damp than

common paper.

The commerce which may be carried on with the people inhabiting the line you will pursue, renders a (35) knowledge of those people important. You will therefore **endeavor** to make yourself acquainted with as far as a **diligent** pursuit of your journey shall admit, with the names of the nations & their numbers; the extent & limits of their possessions; their relations with other tribes of nations; their language, traditions, monuments; their ordinary occupations in agriculture, fishing, hunting, war, arts & the implements for these; their food, clothing, & domestic accommodations; the diseases prevalent (40) among them, & the remedies they use; moral & physical circumstances which distinguish them from the tribes we know; peculiarities in their laws, customs & dispositions; and articles of commerce they may need or furnish & to what extent.

Other objects worthy of notice will be the soil & face of the country, its growth & vegetable productions, especially those not of the US. the animals of the country generally, & especially those (45) not known in the US. the remains & accounts of any which may be deemed rare or extinct; the mineral productions of every kind; but more particularly metals; limestone, pit-coal, & salt-petre; salines & mineral waters, noting the temperature of the last & such circumstances as may indicate their character; volcanic appearances; climate, as characterized by the thermometer, by the proportion of rainy, cloudy, & clear days, by lightening, hail, snow, ice, by the access & recess of (50) frost, by the winds prevailing at different seasons, the dates at which particular plants put forth or lose their flower, or leaf, times of appearance of particular birds, reptiles or insects.

Although' your route will be along the channel of the Missouri, yet you will endeavor to inform yourself, by enquiry, of the character & extent of the country watered by its branches & especially on its Southern side, the North river or Rio Bravo which runs into the gulph of Mexico, and the North (55) river, or Rio Colorado which runs into the gulph of California, are understood to be the principal streams heading opposite to the waters of the Missouri, and running Southwardly. Whether the dividing grounds between the Missouri & them are mountains or flat lands, what are their distance from the Missouri, the character of the intermediate country, & the people inhabiting it, are worthy of particular enquiry.

(60) The Northern waters of the Missouri are less to be enquired after, because they have been ascertained to a considerable degree, & are still in a course of ascertainment by English traders, and travellers. But if you can learn anything certain of the most Northern source of the Mississippi, & of its position relatively to the lake of the woods, it will be interesting to us. Two copies of your notes at least & as many more as leisure will admit, should be made & confided to (65) the care of the most trusty individuals of your attendants.

In all your intercourse with the natives, treat them in the most friendly & **conciliatory** manner which their own conduct will admit; allay all jealousies as to the object of your journey, satisfy them of its innocence, make them acquainted with the position, extent character, peaceable & commercial dispositions of the US. of our wish to be neighborly, friendly, & useful to them.

(70) If a few of their influential chiefs within practicable distance, wish to visit us, arrange such a visit with them, and furnish them with authority to call on our officers, on their entering the US. to have them conveyed to this place at the public expense.

If any of them should wish to have some of their young people brought up with us, & taught such arts as may be useful to them, we will receive, instruct & take care of them. Such a mission whether of (75) influential chiefs or of young people would give some security to your own party.

Carry with you some matter of the kinexox; inform those of them with whom you may be, of it's efficacy as a preservative from the smallpox; & instruct & encourage them in the use of it. This may be especially done wherever you winter.

As it is impossible for us to foresee in what manner you will be received by those people, whether (80) with hospitality or hostility, so is it impossible to prescribe the exact degree of perseverance with which you are to pursue your journey. We value too much the lives of citizens to offer them to probable destruction. Your numbers will be sufficient to secure you against the unauthorized opposition of individuals or of small parties: but if a superior force authorized, or not authorized by a nation, should be arrayed against your further passage, and inflexibly determined to arrest it, you (85) must decline it's farther pursuit, and return.

In the loss of yourselves, we should lose also the information you will have acquired. By returning safely with that, you may enable us to renew the essay with better calculated means. To your own discretion therefore must be left the degree of danger you risk, and the point at which you should decline, only saying we wish you to err on the side of your safety, and to bring back your party safe (90) even if it be with less information.

Should you reach the Pacific Ocean inform yourself of the circumstances which may decide whether the furs of those parts may not be collected as advantageously at the head of the Missouri

...

On your arrival on that coast endeavor to learn if there by any port within your reach frequented by the sea-vessels of any nation, & to send two of your trusty people back by sea, in such way as they (95) shall judge shall appear practicable, with a copy of your notes: and should you be of opinion that the return of your party by the way they went will be eminently dangerous, then ship the whole, & return by sea, by the way either of cape Horn, or the cape of good Hope, as you shall be able. As you will be without money, clothes or provisions, you must endeavor to use the credit of the U.S. to obtain them, for which purpose open letters of credit shall be furnished you, authorizing you to draw upon (100) the Executive of the U.S. or any of it's officers...

Should you find it safe to return by the way you go, after sending two of your party round by sea, or with your whole party, if no conveyance by sea can be found, do so; making such observations on your return, as may serve to supply, correct or confirm those made on your outward journey.

On re-entering the U.S. and reaching a place of safety, discharge any of your attendants who may (105) desire & deserve it, procuring for them immediate payment of all arrears of pay & clothing which may have incurred since their departure, and assure them that they shall be recommended to the liberality of the legislature for the grant of a soldier's portion of land each, as proposed in my message to Congress; & repair yourself with your papers to the seat of government

To provide, on the accident of your death, against **anarchy**, **dispersion**, & the consequent danger to (110) your party, and total failure of the enterprise, you are hereby authorized, by any instrument signed & written in your own hand, to name the person among them who shall succeed to the command on your decease, and by like instruments to change the nomination from time to time as further experience of the characters accompanying you shall point out superior fitness...

Given under my hand at the city of Washington this 20th day of June 1803.

Th. J. Pr. U.S. of A.

Text Source 3: Address to the Nation on the Challenger Accident President Reagan

January 28, 1986

"Ladies and Gentlemen, I'd planned to speak to you tonight to report on the state of the Union, but the events of earlier today have led me to change those plans. Today is a day for mourning and remembering. Nancy and I are pained to the core by the tragedy of the shuttle Challenger. We know we share this pain with all of the people of our country. This is truly a national loss.

Nineteen years ago, almost to the day, we lost three astronauts in a terrible accident on the ground. But we've never lost an astronaut in flight; we've never had a tragedy like this. And perhaps we've forgotten the courage it took for the crew of the shuttle. But they, the Challenger Seven, were aware of the dangers, overcame them and did their jobs brilliantly. We mourn seven heroes: Michael Smith, Dick Scobee, Judith Resnik, Ronald McNair, Ellison Onizuka, Gregory Jarvis, and Christa McAuliffe. We mourn their loss as a nation together.

[To] the families of the seven: we cannot bear, as you do, the full impact of this tragedy. But we feel the loss, and we're thinking about you so very much. Your loved ones were daring and brave, and they had that special grace, that special spirit that says, "Give me a challenge, and I'll meet it with joy." They had a hunger to explore the universe and discover its truths. They wished to serve, and they did. They served all of us. We've grown used to wonders in this century. It's hard to dazzle us. But for 25 years the United States space program has been doing just that. We've grown used to the idea of space, and perhaps we forget that we've only just begun. We're still pioneers. They, the members of the Challenger crew, were pioneers.

And I want to say something to the schoolchildren of America who were watching the live coverage of the shuttle's takeoff. I know it is hard to understand, but sometimes painful things like this happen. It's all part of the process of exploration and discovery. It's all part of taking a chance and expanding man's horizons. The future doesn't belong to the fainthearted; it belongs to the brave. The Challenger crew was pulling us into the future, and we'll continue to follow them.

I've always had great faith in and respect for our space program, and what happened today does nothing to diminish it. We don't hide our space program. We don't keep secrets and cover things up. We do it all up front and in public. That's the way freedom is, and we wouldn't change it for a minute. We'll continue our quest in space. There will be more shuttle flights and more shuttle crews and, yes, more

volunteers, more civilians, more teachers in space. Nothing ends here; our hopes and our journeys continue. I want to add that I wish I could talk to every man and woman who works for NASA or who worked on this mission and tell them: 'Your dedication and professionalism have moved and impressed us for decades. And we know of your anguish. We share it.'

There's a coincidence today. On this day 390 years ago, the great explorer Sir Francis Drake died aboard ship off the coast of Panama. In his lifetime the great frontiers were the oceans, and an historian later said, 'He lived by the sea, died on it, and was buried in it.' Well today we can say of the Challenger crew: Their dedication was, like Drake's, complete.

The crew of the space shuttle Challenger honored us by the manner in which they lived their lives. We will never forget them, nor the last time we saw them, this morning, as they prepared for their journey and waved goodbye and 'slipped the surly bonds of Earth' to 'touch the face of God. Thank you.'