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Developing Creative Science Talent

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A number of thinkers have proposed the idea that at birth every child is a potential creative scientist. The young child is curious and is much interested in the world about him. I have suggested that if one observes the ways infants handle things, shake them, smell them, feel them, twist them, and manipulate them in many ways, he might find some of the beginnings of the manifestation of creative thinking. We may also see some of these beginnings, if we observe the infant's use of facial expressions, his efforts to interpret the facial expressions of others, and the process by which he differentiates his own body from the remainder of the environment. Since the infant has no vocabulary, he is limited in the extent to which he can learn by authority. Thus, by necessity, much of his learning must be creative—sensing problems, making guesses, testing and modifying them, and communicating them in his limited way.

A number of science educators have tried to trace the process by which we begin with every child as a potential creative scientist and step by step eliminate them until we have all too few truly creative scientists. In tracing the course of this process, Watson (1958) maintains that even by the end of elementary school possibilities of a career in science are widely but not uniformly attractive. Thereafter, irrevocable negative decisions cut down on the "pool" of potential scientists in response to what is offered in high school in the name of science, a distaste for mathematics and a termination of studies in mathematics. He maintains that rarely does a student in high school or college who has become disinterested in science re-enter the diminishing pool of potential scientists. Further, Watson maintains, prevalent stereotypes of scientists as "eggheads," communists, or asocial beings; parental and peer attitudes; personal economic factors, and the like deter still others. Cooley (1958) in a far more detailed and meticulous manner has shown how potential creative scientists are eliminated one by one through the operation of such external variables as: religion, socio-economic status, ethnic background, geographic position, sex, race, social structure, home climate, siblings, economic conditions, college admissions policies, availability of scholarships, and discrimination practices.

A number of educators in recent years (Cole, 1956) have deplored the loss of intellectual talent represented by the failure of about 50% of the top 30% or so of the nation's high school seniors to enter college. Personally, I think that this represents an even greater loss than it appears on the surface. In the first place, I think it would be a fairly safe guess to estimate that of the 50% who choose not to enter college includes a disproportionate number of the highly creative ones. Even among highly intelligent and creative kindergarteners, some can hardly wait for a school vacation, after they have been stopped "cold" in their enthusiastic efforts to learn and have been forced to learn by authority. After years of frustration, they start counting the days until they will be old enough to leave school, or to graduate. In the second place, I am concerned because I know that about 70% of those who would rank in the upper 30% on creative thinking would not even be among those counted among the top 30% on measures of scholastic aptitude.

In my book, *Guiding Creative Talent*, I have tried to show how I think this loss of talent can be greatly reduced. I have tried to show how creative talent can be identified both by tests and by non-test methods, why creative individuals behave as they do, and how they can be guided into productive, creative careers. Since the preparation of this book, we have conducted over 30 experiments to test various procedures for helping individuals and groups behave in more creative, original ways. Today, however, I would like to go back and re-emphasize some of the simple, obvious principles which seemed clear to me near the beginning of our research. These are principles which need to be applied by educators at all levels, if we are to succeed in the task of developing creative scientific talent.

1. VALUE CREATIVE THINKING: I must place "Value Creative Thinking" at the head of my list, because it is my firm belief that every educator from nursery school through graduate school should always be on the alert to notice new ideas and to encourage the development of creative talents. Every educator should consider this as important, or more important, than teaching information. Furthermore, creative thinking can be important in acquiring information and in motivating its acquisition.

I say "value creative thinking" because children are going to achieve those things which are valued by the society in which they live. For years, we have known that students learn those things on which they are evaluated or graded. Recent experiments of our own in creative writing and in problems requiring inventiveness have shown that we obtain even the *kind* of creative thinking we reward. If we reward originality, responses will become more original; if we reward fluency, a larger num-

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ber of ideas will be produced; if we reward elaboration, more detailed and elaborate products will result.

There are, as I see it, two major obstacles to valuing creative thinking. The first is the difficulty of recognizing and appreciating the child's creative productions. It is hard for a conventional teacher to see and appreciate the contribution of an unconventional or an unloved and unlovely child. Recent research by Getzels and Jackson (1962) and by my own staff (Torrance, 1962) give eloquent witness of this fact. In spite of average differences in IQ as high as 26 points, we have found that highly creative but less intelligent students achieve as well as the highly intelligent but less creative ones. Teachers, however, rate the highly intelligent ones as more desirable students, more ambitious and hard-working, less unruly, and more friendly. Teachers also say that they know and understand the highly intelligent pupils better than the highly creative ones.

A second obstacle to valuing creativity is our tendency to over-rate the finished product – the completed poem, the masterpiece of music or art, the organized behavior of the championship team. We are too easily deceived by the comparative perfection and smoothness of these masterpieces and evaluate them as if they were the immediate deliveries of a creative act.

2. Teach Children to Value Their Creative Thinking. Children almost always depreciate and sometimes even despise their own creative talents. It is important, however, that children learn early to place value on their own ideas and trust their perceptions of reality. One approach to this is to have children form the habit of recording what they think. This helps them to appreciate the value of their imagination and at the same time discourages excessive daydreaming. As children see their own ideas expressed in some concrete form, they are encouraged to continue their efforts. With older students, it is useful to have them form the notebook or the "idea-trap" habit. We frequently let valuable ideas slip away from us, because we do not memorize them or record them on paper. Even though the idea may at the time seem a little far-fetched and it is difficult to determine its real significance, it is wise to record it. The idea can be criticized, modified, or rejected at a later time, or it may stimulate another really important idea. Many inventors (Rossman, 1931) and idea men (Clark, 1958) report that this habit pays off richly.

Usually, we are disturbed if we see a student sitting and thinking. We are afraid that he is just daydreaming or engaging in some fantasy. We place a great deal of value upon being industrious. Teachers, in fact, place it very near the top of the list of characteristics of their ideal pupil in every part of the United States and in most other countries. To them, being industrious means being visibly busy doing something. We need to extend this definition to include thinking.

Most teachers consider students incapable of thinking of ideas which have value. They would do well to take stock of the large number of great discoveries which have been conceived by students. The medical sciences have an outstanding tradition in this respect (Gibson, 1958). Many medical discoveries were initiated or even worked out during the discoverer's undergraduate years. In anatomy, we have among this company such eminent contributors as Vesalius, Huxley, and Lister. On digestion, we have such young discoverers as Claude Bernard, Ivan Pavlov, and Walter B. Cannon. In other fields, we have Langerhans, Jenner, Darwin, Sherrington, Von Helmholtz, and others who started working on their discoveries or actually completed them during their undergraduate days. Then we have Louis Braille who first started working on his idea for a kind of writing for the blind at age 10 and had the system fairly well perfected by age 15. Robert Goddard, our American rocket pioneer, started thinking about the possibilities of inter-planetary travel at the age of 17. Perhaps, we should not even worry about the daydreams and fantasies of thoughtful students.

3. Give Information about the Creative Process. Historically, the creative process has been left pretty much to chance. Psychologists surveying the educational scene at all levels have become increasingly convinced that the processes of acquisition, impression, intake, and learning skills have dominated over those concerned with production, expression, output, and creation (Patrick, 1955:161). It would seem that educational psychologists can do much to reduce the fears of teachers and pupils that their creative abilities are absent or negligible by acquainting them with the nature of the creative process and the conditions under which creativity flourishes.

Although there are unique features in the details, the general nature of the creative process seems to be well established. The process appears to be essentially the same regardless of the activity. First, there is apparently the sensing of a need or deficiency, random exploration, and a clarification or "pinning down" of the problem. Then ensues a period of preparation accompanied by reading, discussing, exploring, formulating many possible solutions, and critically analyzing these solutions. Out of all of this activity comes the birth of a new idea – flash of insight, illumination. Finally, there is experimentation to evaluate the most promising solution and the selection and perfection of the idea.

The work of Osborn (1957), Gordon (1961), and a series of experimenters have done much to promote the idea that individuals and groups can be taught principles which will increase markedly their ability to develop original ideas of importance. We have been testing and modifying some of these principles and trying to develop instructional materials which make use of these principles as they have been tested.

4. Other Principles: There are a number of other principles I should like to discuss. I should like to illustrate how the three principles I have just discussed can be fed into a set of instructional materials. Thus, I shall content myself with listing some of the other principles:

4. Make children more sensitive to environmental stimuli – more aware.

5. Encourage the manipulation of objects and ideas.

6. Teach how to test systematically each idea.

7. Develop in children tolerance of new ideas.
8. Beware of forcing a set pattern; there are many "good" ways of learning and thinking.
9. Develop a creative classroom atmosphere where limitations and resources are used creatively.
10. Teach skills for avoiding peer sanctions or for becoming less obnoxious without sacrificing creativity.
11. Dispel the sense of awe of masterpieces.
12. Encourage and evaluate self-initiated learning.
13. Create "thorns in the flesh."
14. Create necessities for creative thinking.
15. Provide for active and quiet periods, for individual and for group work.
16. Make available resources for working out ideas but teach the creative use of limitations.
17. Encourage the habit of working out the full implication of ideas.
18. Develop constructive criticism — not just criticism.
19. Encourage acquisition of knowledge in a variety of fields.
20. As a teacher, become more adventurous-spirited yourself.

5. AN EXAMPLE OF ONE SET OF MATERIALS: In the Bureau of Educational Research, we are in the process of creating a set of experimental instructional materials in which we are trying to recreate dramatically some of the great moments of discovery. Together with background biographical information, the moments of discovery are recorded on tapes. Major aims of these dramatizations are to acquaint children with the nature and value of the creative process, to help them recognize that *their own* ideas have value, and to stimulate them to engage in some kind of creative thinking.

The following tape dramatization, "Trailblazer to the Stars" has been prepared for this purpose:

GODDARD: Stand by for firing . . . five seconds . . . four . . . three . . . two . . . one . . . FIRE!

SOUND: ROCKET EXPLOSION: UP TO ESTABLISH — MERGES WITH FOLLOWING MUSIC CUE, THEN SLIPS UNDER AND OUT.

MUSIC: INITIALLY AGITATED, THEN ASSUMES A QUIETER, YET HIGHLY SUSPENSEFUL QUALITY: ESTABLISH—THEN PULL UNDER FOR FOLLOWING NARRATION

NARR: The time: a few minutes past dawn. The place: a flat, brown plain several miles north of Roswell, New Mexico. From the sandy desert floor, a tower of cold steel stretches sixty feet up into the gray morning air. A half-hundred feet to the left of this tower is a concrete dugout. Behind its narrow observation window stands a slim mustached, balding man. His dark eyes seem riveted to that framework out there before him. Now, he reaches for a stopwatch . . . Suddenly, he raises his free hand, and prepares to signal a nearby assistant. The next voice you will hear will be that of the famous American rocket scientist, Dr. Robert Goddard.

GODDARD: (FADE IN) Stand by for firing . . . five seconds . . . four . . . three . . . two . . . one . . . FIRE!

SOUND: ROCKET EXPLOSION: UP TO ESTABLISH — THEN PULL UNDER AND SLOWLY FADE OUT BENEATH FOLLOWING NARRATION:

NARR: The noise you're hearing is that of a liquid-fueled, high-altitude research rocket, streaking 2000 feet into the pale New Mexico sky. Maximum speed — 500 miles per hour. Overall length — 11 feet from nose to tail. Weight, minus fuel — 33½ pounds. Small and slow, as rockets go. But of tremendous importance in the light of history. For this is the first rocket ever to be fired from this experimental rocket base, deep within the great New Mexico desert. Of more importance still is the date. This is NOT the 1960's, for *this* rocket experiment took place over 30 years ago—December the 30th, 1930.

MUSIC: STAB

VOICE: Imagi/Craft Productions presents the story of America's first rocket pioneer, Robert Hutchings Goddard —"Trailblazer to the Stars"!

MUSIC: STING: ESTABLISH — THEN PULL UNDER AND FADE OUT BENEATH FOLLOWING

NARR: "Trailblazer to the Stars." A phrase charged with excitement and imagination. You may well wonder how a man could earn such a ringing title as this one. But even if you DID know, you'd be surprised how few people could agree whether this trailblazer was a miracle man — or a menace.

VOICE I: (FADE IN) Robert Goddard? Y'mean that absent-minded professor that's always shootin' off them wild rockets? He's a CRACKPOT, that one!

VOICE II: (FADE IN) So he's at it agin, is he? It's the work of the divil hisself that's leadin' him to it! Mark me, no good can ivver come o'THAT man!

VOICE III: (FADE IN) The good Lord made the sky with a glass ceiling. That crazy professor's rockets might punch holes in it 'n let all the air out! An' I just heard the other day he's buildin' a ship to fly to the moon! (FADING) He's gone, I tell you — completely gone!

NARR: (TOPPING THE LAST SPEECH AT ITS FADE) No, the average citizen didn't really understand Robert Goddard, or his experiments. On the other hand, most leading scientists took the opposite view. They were firmly behind him, and openly praised him for his work.

SCIENTIST I: (BRITISH ACCENT — FADE IN) Take my word for it, Robert Goddard is a rare genius. He was experimenting with rockets years before the rest of the world. Beginning with nothing — no money, no decent equipment, no one else's ideas to follow —but paving the way to modern rocket science — THAT takes genius.

SCIENTIST II: (DUTCH ACCENT — FADE IN) The dream of Dr. Goddard is the conquest of space. He is a firm believer of the possibilities of interplanetary travel, and his work is a source of great inspiration for many of us. This Robert Goddard — he is a trailblazer! (FADING) I am quite certain that in the very near future, the first spaceship to leave this planet for other worlds will be named after this fabulous worker.

NARR: (TOPPING HIM AT HIS FADE) "A trailblazer." His fellow-scientists called him a trailblazer. But there weren't too many rocket scientists in those days, back in the 20's and the early 30's. Those that were, looked to Robert Goddard as the real leader, a courageous explorer of the Unknown. But on the other side of the coin, there was the laughter and the scorn of the public. Why? Who WAS this man who attracted so much praise from his fellow scientists . . . but collected so much ridicule from almost everyone else . . . this man who paved the world's way for the rocket conquest of space? To find the answers, let's go back to the beginning . . . October the 5th, 1882.

MUSIC: SNEAK IN SOMETHING PLEASANT, SLOW AND WARMHEARTED

NARR: It was on this date that Robert Hutchings Goddard was born to an old and well-established New England family of farmers. His was a family that had for years been interested in the mechanics of machinery and transportation. But, unlike the rest of the family, young Goddard's interest was never in the good green earth his forebears had so well known. Rather, his vision was lifted to the sky and the stars above it — a realm NO one knew of.

MUSIC: SLIPS OUT QUIETLY UNDER FOLLOWING

NARR: Bob Goddard was only seventeen when he decided to make this form of exploration his lifetime work. Yet, his decision came in a rather odd way, through an experience he was never to forget. As he told his father about it later . . .

YOUNG BOB: (FADE IN) I finished cutting those dead branches off that cherry tree back of the barn, Pa, like you asked me.

FATHER: (FIRM, BUT KINDLY) Certainly took you enough time, Bob! I know it's a pretty tall tree, son, but whatever took you so long to trim it?

YOUNG BOB: Well — it was a really wonderful afternoon . . . and I had a fine view of the countryside 'way up there . . . watching the falling leaves and the blue sky and the white clouds . . . And I got to thinking — how wonderful it would be to make some kind of flying machine that could reach beyond the clouds to the moon and the other planets. When I climbed down again, I — well, I knew what I wanted to do with my life. I want to design that kind of machine! . . . Does that sound crazy, Pa?

FATHER: Son — you sure you're feeling well?

MUSIC: SOMETHING INITIALLY HUMOROUS AND THEN PLEASANT, WHICH SUSTAINS THROUGH NEXT SPEECH

NARR: The idea of rocket travel might have seemed fantastic to Bob Goddard's father, but to the boy himself, it was the most exciting idea a fellow could think of.

After high school, he enrolled at a nearby university — and several years later he graduated as a full-fledged doctor of physics. In the fall of 1911 he began a teaching career. All through his college days he had experimented long and hard with powder rockets. So it came as no surprise that he now divided his time about equally between his physics classes — and rocket experiments.

Five years later, Professor Goddard was given financial backing for his rocket research by the Smithsonian Institution in Washington, D.C. Not long afterwards, he published a report of his experiments. Copies of this report were circulated around the world, and fell into the hands of many people. Many thought his ideas about rocket travel and shots to the moon were utter nonsense, and they laughed at him for his beliefs. Others, though, took him very seriously indeed — among them, several important rocket scientists in Germany. They realized that Goddard's information was years ahead of their own findings. With the facts his report gave them, they were able, in time, to design the mighty war rockets that brought so much death and destruction to our side during World War II. And because Soviet Russia captured many of these German scientists AFTER the war, she was able to develop her own rocket and space program much more quickly than if she had had to start from scratch. And strange as it may seem, it was actually America's Robert Goddard who was at the bottom of all this fantastic development — a man whose rocket research during the 1920's was almost a full 15 years ahead of the rest of the world.

Let's return now to another, earlier date in history — the year 1914. This was the year that the Smithsonian Institution began providing Dr. Goddard with money for his rocket experiments. It was also the year the scientist began looking for a new kind of rocket fuel. He had come to realize that gunpowder would no longer do for the sort of rockets HE wanted to build . . .

MUSIC: SOMETHING SUGGESTIVE OF THE PASSAGE OF TIME: SLIP IN UNDER THE FOLLOWING

. . . and in a long, drawn-out series of experiments, Goddard slowly began to find the answers he had been looking for.

GODDARD: (FADE IN) What I must find is a more powerful, more easily controlled fuel . . . something that'll give me a more powerful thrust . . . much more thrust! It's got to be a fuel that'll burn more slowly, and with far more control than gunpowder. If only someone else before me had even *tried* working out just a *part* of the problem — to blaze just a bit of the trail for me — at least then I'd have *something* to go on! But this way, I'm all on my own with nothing more than — Wait a minute! Maybe a liquefied gas is the answer to this fuel problem . . . Ye-e-e-e-ssss — liquefied gas — as in simple gasoline!

MUSIC: UP — BACK AGAIN

More months of research, trials and errors have slipped by . . . and still I've only got the basic thinking out of the way. My figures show that I should get the most power out of burning oxygen with either carbon or hydrogen. The problem now is to make these gases burn at the right time, at the right place, and under the right conditions . . .

MUSIC: UP — BACK AGAIN

More months of research and experimentation have gone by, but at last I'm making real headway. My laboratory tests have shown that the best fuel for rocket flight should be a mixture of hydrogen and carbon. I've also found I'll need liquid oxygen to best do the job. So my fuel will be a mixture of liquid oxygen and gasoline — a true liquid fuel!

MUSIC: UP — BACK AGAIN TO SLOWLY FADE OUT UNDER FOLLOWING NARRATION

NARR: Thus Robert Goddard's search for the ideal rocket fuel at last came to an end. After eight long years of patience and hard work, he was now ready to take the final step in his great experiment — the actual field-trial of a liquid-fueled rocket. Would it be a success? Or would it simply fizzle out and undo in one awful flash of smoke and fire all the work he had so painfully dedicated himself to for so many years?

(FADE IN) Fate held all the cards that cold, wintry day on March 16, 1926 — the date that Goddard selected to field-test his liquid-fuel dream.

SOUND: SNEAK IN LOW WIND GUSTS

His choice of location was an open meadow near Auburn, Massachusetts. With him was his wife, Esther, and two other rocket experts — Dr. P. M. Roope and Henry Sachs. They were heavily bundled up in woolen coats, caps and scarves, for it was bitter cold and there was still snow on the ground. As Dr. Goddard fitted the rocket to its launching stand, he discussed the experiment which was about to take place.

GODDARD: (FADE IN) There we are — that should just about do it. As we planned before, Henry, you'll stay here and wait for my signal.

HENRY: Yes, sir.

GODDARD: Meanwhile, the rest of us'll move out to those maple trees over there, where we can observe the firing from a better position. And while we're at it, people, we'd better cross our fingers . . . Let's go.

SOUND: CRUNCH OF FOOTSTEPS IN THE SNOW

ESTHER: It'll work, Bob — I'm sure it will! All the lab tests have shown that —

GODDARD: (INTERRUPTING HER) Lab tests aren't field tests, Esther — Heaven knows. But two years of laboratory experiments had BETTER not have been in vain!

ROOPE: (DUTCH ACCENT) If it DOESN'T work, what then? More lab trials or back again to the old gunpowder rockets?

GODDARD: Dr. Roope, science must not stand still. The powder rocket's been around since the Chinese invented fireworks. And although we've made a few improvements on it, it's still the same primitive rocket with the same low performance — low thrust and low speed.

ESTHER: And the liquid fuel rocket whips those problems, Dr. Roope. Bob's using a mixture of liquid oxygen and gasoline for this rocket's fuel. He expects very high performance with it.

ROOPE: Yes, I know, Mrs. Goddard. The lab tests showed THAT. But will it actually FLY?

GODDARD: We'll know in about 30 seconds. I think we can stop about here, folks . . .

SOUND: FOOTSTEPS CEASE

This should be far enough away to get a pretty decent view. (CALLS) All set, Henry?

HENRY: (CALLS BACK FROM A DISTANCE) All set, Doctor!

GODDARD: Keep those fingers crossed, people! (CALLS AGAIN) OKAY, HENRY — LET 'ER RIP!!

SOUND: ROCKET EXPLOSION: ESTABLISH — THEN PULL UNDER FOR FOLLOWING CONVERSATION

GODDARD: She's going up! She's really going UP!

ESTHER: Oh, Bob — it's a beautiful lift-off!

ROOPE: Congratulations, Dr. Goddard! Your experiment — it is a SUCCESS!

MUSIC: TRIUMPHANT STAB — UP, THEN PULL UNDER AND SUSTAIN BENEATH THE FOLLOWING

NARR: And so, the world's first liquid-fueled rocket was test-fired with complete triumph on a snow-covered meadow near the town of Auburn, Massachusetts. And from that moment on, the course of rocket development was to be changed forever. Meanwhile, it was to take European scientists another five years to puzzle out the liquid-fuel problem on their own. For Dr. Goddard refused to reveal his precious secret to the world until many years later. Goddard went on performing further liquid-fuel experiments in that open meadow for three more years. Then, one day in 1929, the famous Guggenheim Research Institute unexpectedly gave him a large sum of money to help him develop his rocket projects still further. With this money he was able to build a new laboratory and testing site in New Mexico. The area's climate and geography proved ideal for his research projects. And with the Guggenheim Institute behind him, his progress now was very rapid indeed.

In 1932 he developed the world's first self-controlled rocket. And in 1941, he designed a genuine guided missile.

MUSIC: SLIPS OUT

When the United States entered World War II, Professor Goddard at once offered the armed services his guided missile, and later, the U.S. Navy put him to work on top-secret rocket and jet propulsion research. Then one day near the end of the war, Goddard's doctor had a serious talk with him.

DOCTOR: (FADE IN) Bob, I consider it my duty to warn you to slow down, and start taking things quite a bit easier. You've been working from dawn till dark every day now for months. Your system's going to break down if you don't —

GODDARD: (INTERRUPTING HIM) Doctor, I know I'm not a well man. But we're at war. Millions of American lives are at stake. If I keep working — God willing — a lot of those lives may well be saved.

DOCTOR: If you don't you'll be lucky to save YOURSELF.

GODDARD: Is it that bad?

DOCTOR: Yes, Bob — it's that bad.

GODDARD: Suppose I refuse to stop working?

DOCTOR: You won't live more than six months.

GODDARD: Doctor, I'm sorry — but I think my country needs those six months more than I do.

MUSIC: SINGLE STAB: ONE CHORD WHICH DIES OUT QUICKLY UNDER NEXT NARRATION

NARR: So Goddard went on working, aware that his days were numbered. In time — and with his help — the war eventually ended. A few short days afterward, on August 10, 1945, life for Robert Hutchings Goddard ended too.

MUSIC: SOMETHING QUIETLY TRIUMPHANT SLIPS IN, ALMOST IMPERCEPTIBLY

While he lived, the quiet man from Massachusetts had done more to advance the science of rocketry than had any other human being in the history of mankind. Now, in death, he was finally recognized as a scientific genius.

When he arrived on the world's stage, the rocket was at best a flimsy toy, a frail device of paper, powder and wood. When he left it 62 years later, the flimsy toy had become a fire-breathing giant of gasoline, liquid oxygen and steel. And because he held onto his dream — blazing new paths for later rocket science to follow — we are today deeply indebted to him for giving us a strong and sturdy base upon which to build the mighty space programs of tomorrow. Many honors have come to Robert Goddard since his death in 1945. The new research center of the National Aeronautics and Space Administration in Greenbelt, Maryland, has been named the Goddard Space Flight Center. A congressional medal has been named in his honor. And on June 28, 1960, the Smithsonian Institution awarded in his memory the Langley Medal, the nation's most precious aeronautics prize. Receiving it on his behalf that day was the scientist's wife. Presenting it to her was Clinton P. Anderson, a United States Senator from New Mexico and a distinguished regent from the Smithsonian Institution.

ANDERSON: (ECHO EFFECT — FADE IN) . . . And so, Mrs. Goddard, by authority of the Board of Regents, I have the honor to present to you — as the one who deserves to share it — the Langley Medal of the Smithsonian Institution, awarded to the memory of Robert Hutchings Goddard . . . "in recognition of his specially meritorious investigations into the science of rocketry and controlled flight through the atmosphere and the space beyond."

MRS. GODDARD: (ECHO EFFECT) Gentlemen, this great medal is your way of saying, after so many long years of struggle, "Well done." I am sure my husband would wish me to echo those words to you — "well done — and thank you."

NARR: And thus a grateful nation paid tribute to one of its greatest scientists. It paid tribute, also, to hard work, patience and vision . . . and how, in Robert Goddard's case, these things finally made the fantastic dream of a 17-year-old boy come true. Because of his dream a new science was created, a new industry was launched, and the course of human events was to be changed forever. Truly, an inspiring chapter in the history of mankind is the life story of Robert Hutchings Goddard. He was one of America's giants of the space age . . . and the world's first "Trailblazer to the Stars"!

MUSIC: UP AND OUT

CONCLUSION: The dramatization could then be discussed to reinforce whatever insights you might want to develop. Ideas concerning the nature and value of the creative process are rather obvious. I would hope also that the recognition of the need for *courage* would also be obvious. Or, the tape could be followed immediately by some kind of creative activity — some kind of invention, a story of interplanetary travel, a drawing, or the like. There remains plenty of room for the teacher and pupils to use their creative imagination.

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