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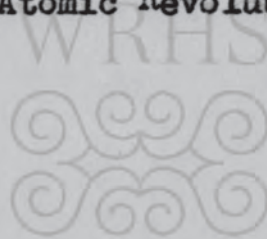
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Enter the atomic age, 1945.

663
ENTER THE ATOMIC AGE
"The Atomic Revolution — What it Will Mean to Civilization"



By
Dr. Abba Hillel Silver

At
The Temple

On
Sunday morning, October 14, 1945

It was about three months ago when the first test of the atomic bomb was made in New Mexico. One of the eminent scientists was present at that test. He moved a considerable distance from the bomb for personal safety but still close enough to watch its effect. Thus he describes his impression of the explosion of the atomic bomb on July 16, 1945: He said: "One felt as tho he had been privileged to witness the birth of the world - to be present at the moment of Creation when the Lord said: Let there be light."

Now it was not merely a column of fire and flame which rose up to a thunder of a thousand explosives forty thousand feet in the air and lighted up and shook the earth for hundreds of miles around. It wasn't merely that. It was rather the revelation with the light of many suns, of a new power on earth which had been locked up for billions of years in the core of the material universe, which man now for the first time since he appeared on the stage of history was able to release, control, to put to his use. I assume that the spectacle was no less overwhelming, staggering to the scientists who watched it a few months ago than when the spectacle, no less revolutionary than that experienced by primitive man when in the Stone Age he first struck a piece of iron pyrites with a flint and the sparks fell into a bed of dry leaves and fire emerged. And fire has been man's friend and man's enemy for all these years.

The explosion of the first atomic bomb proclaimed to the world not the advent of a new invention, like wireless, or radio or the jet-propelled plane, rather the advent of a new day which will transform everything now out of order, a day which will usher in new marvels which the mind of man cannot as yet even grasp.

We have had revolutionary ages in the past. Following the Stone Age came the Metal Age, the Age of Steam and the Age of Electricity. And each one of these ages which brought to man new tools, new powers revolutionized the ~~man~~

economic, social, political, cultural life of mankind. To these ages must now be added the Atomic Age, for the Atomic Age which was ushered in this year has opened up vast new continents, has moved the frontier of mankind to immeasurable distances beyond. This Atomic Age is destined to give us a new civilization, a new culture, a new power. It is destined to give us a new Heaven and a new Earth.

I don't know why our generation is so privileged to experience so many revolutionary things. But there it is. Our generation will be destined to be a landmark, one of the great landmarks in human history, a new chapter in the history of the world.

One should not confuse atomic energy with this atomic bomb which was exploded some months ago. Often in the past, war has fathered many inventions, forced the development of certain things. Similarly the exigencies of the World War II forced the pace in the exploration of atomic energy. But the fabulous energies which are contained in the heart of the atom were known before the war. Professor Einstein had written the equation for the release of atomic energy and for the conversion of matter into energy forty years ago. Professor Rutherford had experimented with the smashing of the atom a quarter of a century ago.

There were many great scientists all over the world who were working in this field not with any idea of producing an explosive ~~from~~ which would lay waste cities and kill human beings. They were working on it in many laboratories all over the world as the first step in scientific research. Also because of the desire to make available to man incalculable ~~xxx~~ storehouses of power and energy which are locked up in matter and which would make life easier for man, which would enrich his power.

But the urgency of the war, the fact that the enemy was also seeking for the secret which would enable him to produce an atomic bomb to destroy us, prompted the United States and Great Britain to organize swiftly a vast enterprise to speed up production in this field until hundreds of scientists mobilized. Tens

of thousands of people were put to work. Huge plants were constructed. Two thousand million dollars were spent in three or four years of intensive correlated effort and the atomic bomb was finally produced. On August 6th it dropped on Hiroshima, and a few days later, over Nagasaki. After that, within eight days, the Japanese war was over.

Thus, while the atomic bomb is a war product, the basic scientific research gone into it cannot be said to be motivated by war. The use of that energy is not restricted to the uses of war. The fact that the atomic bomb made its first public appearance as an explosive bomb, in such a devastating way as a war weapon, man is becoming aware of the frightful implications of this thing, because this bomb, when it will be perfected, as it is destined to be perfected — the third bomb dropped made the second out-dated, and the second bomb might very well have wiped out a whole population, might conceivably have annihilated the whole of mankind. There is no limit to its destruction. And man is beginning to wonder whether it would have been better never to have discovered, whether it wouldn't have been advisable to bury its secret so that men would never chance upon it.

This fear has attended most every discovery in the history of mankind. One need only recall the first steam driven machinery which was introduced and put in the factories. Workingmen felt that the machine would displace them. Riots took place. Workingmen smashed machines, burned factories. And it so happened, of course, that in the course of time machines and factories did not worsen the opportunity of men but gave them a higher standard of living. Its first appearance was attended with great fear, as every great invention, because every human discovery, every new invention brings with it potentialities of good or evil. Of the Tree of Knowledge, of which our first ancestors ate, the Bible said: "The Lord knows on the day that you will eat of it, of the Tree of Knowledge,

your eyes will open and you will be God's children knowing good and evil."

Knowledge is not always good. Knowledge is not always evil. Knowledge can be used both for good and for evil. But you will recall that very cynical statement but yet one containing a large measure of truth in it — by that cynic, Kohelleth, in the Bible: "In much wisdom is much vexation; and he that increaseth knowledge, increaseth also sorrow."

The possibility, nay the certainty of increased vexation and increased sorry and danger which go with acquisition of new knowledge has never deterred man. Man ate of the Tree of Knowledge knowing of evil. Man continues to eat of the Tree of Knowledge. Man was beguiled by the serpent, something of spirit of adventure prodded him on, propelled him onward, seeing in everything that he doesn't know, a challenge to unravel its mysteries. That is the glory, the crown of man. Man built a tower of Babel with its top in the heavens... The Argonaut Jason who set out in search of the Golden Fleece which was guarded by a sleepless dragon. As the Greek myth has it — Icarus with his artificial wings did fly too near the sun and the wax of his wings melted and he fell into the sea and was drowned. But the spirit of man was ~~is~~ not drowned and others may fly, and others do fly towards the sun. This is the Godliness in man. This is the divine in the mind and the spirit. And so it is clear that man will not desist from exploring still further the atomic field. The door which he has now unlocked opens up before him, vistas too wonderful for man even to wish to shut it again. Man will move forward.

Man has always dreamt of converting matter into energy. Man has always experimented in his blundering way all through the ages with the problem of transmuting one element into another. The ancient Greeks had an inkling of it. The alchemists sought to find this secret which man has now found out.

Man now knows how elements can be transmuted, how many new elements can be transmuted, how new before unknown in matter can be created. In fact man

has already created two new elements, the 93rd and 94th in the Atomic Table. In 1940 Neptunium was created, and in 1941 Plutonium, entirely new elements with different physical and chemical reactions from Uranium, the 92nd element. Man now knows what thot-defying reservoirs of power he can command by a process which he now has worked out, which splits the atom and makes it yield up the boundless energy stored in its core, in its nucleus and which have been there since the beginning of creation.

One pound of matter man knows now contains the energy equivalent to ten billion kilowatt-hours. Here is how one scientist describes it:

"If this energy could be fully utilized it would take only twenty-two pounds of matter to supply all the electrical power requirements of the United States for a year.

"One-third of a gram of water would yield enough heat to turn 1,000 tons of water into steam.

"One gram of water would raise a load of a million tons to the top of a mountain six miles high.

"A breath of air would operate a powerful airplane continuously for a year.

"A handful of snow would heat a large apartment house for a year.

"The pasteboard in a small railroad ticket would run a heavy passenger train several times around the world."

Now this is frightening of course, when one conceives of such stupendous power that can be released in relation to the use of that power in waging war and flying bombs -- another world war in which the atomic bomb will be used will destroy the world. As someone clearly said: "Man's survival is now absolutely dependent on his ability to avoid a new war." General Henry H. Arnold, Commander of our Army Air Forces, speaking of an improved atomic bom of tomorrow said this:

"They will be destructive beyond the wildest nightmares of the imagination, a ~~new~~ weapon ideally suited to sudden unannounced attacks in which a country's major

cities might be destroyed over night by an ostensibly friendly Power."

The next war, and scientists have indicated it time and again, will be a push button war. A scientist sitting here at a switch board may release a flood of radio controlled rocket bombs carrying devastating explosives in any part of the world directly to the target, and hit that target.

There is no way of averting it. There is no way of keeping the secret any more than there was any way of keeping secret of the discovery of radar, the rocket bomb, the jet plane. In fact to try to keep the secret will encourage other nations to experimentation and discovery and a most bitter competition and rivalry will result. And if one has a secret weapon, another nation will naturally try to strike us -- as the sneak Pearl Harbor attack. The only solution of course is the international control, not only of the atomic bomb, but of atomic energy, its experimentation, development. The only solution is a powerful world organization to avert war. The choice is now clear. "I have put before you this -- life and death. Blessing and the curse." That is the choice.

I believe that mankind wishes life. And I am not frightened about the prospects of the use of atomic energy. The atomic bomb, I believe, will put an end to war. I always believed the twentieth century would end war in one war or another. Because life cannot go on with war.

There is much that is inspiring in this great discovery. First of all one stands in deep reverence, awed before the amazing potentiality of the human mind, the capacity of the human mind as revealed in this discovery, the richness of imagination, its subtlety, its power of penetration, because these great scientists, physicists were dealing with abstract, most delicate invisible realities of nature. Yet the human mind was able to probe that mystery and create that apparatus whereby these ~~general~~ chained elemental forces of nature have been released for the use of mankind.

What is also very inspiring is the fact of man's teamwork in bringing it about.

The discovery of atomic energy, the experimentation — it is not the work of one man or the achievement of one country or of one people. It is the cooperative effort of the world's greatest minds, of all races, many of them of a race which the Nazis had said were inferior and therefore that they should be destroyed. Seventy percent of those who worked in this field were Jews. The concentration of so much of human intellect on one problem is an inspiring phenomenon, and the results a tribute to human cooperation.

The same great power, the same imagination, the same skill which has here been applied to the atomic bomb may from here on be applied to its good use in industry, commerce, trade, for the advancement, enrichment of human life. One writer has this to say about the possibility of atomic energies:

With this power at his disposal man for the first time stands close to remold his world nearer his heart's desire. The chemist, the physicist, the biologist, the engineer are on the threshold of new worlds. Instead of being circumscribed by the basic elements found in nature, they can now create new elements to order, elements that could be used for a better, richer, healthier and more abundant life.

A number of these new substances, particularly new forms of carbon, nitrogen and oxygen, basic elements of living matter, could be used to elucidate many major mysteries of life and to provide new understanding of baffling disease processes, such as cancer, for example. They could shed light on the mysterious processes involved in growing old.

Incalculable, infinite are the possibilities which can now be had for constructive beneficent use in life. The burden of poverty may be lifted finally from the shoulders of mankind. It may bring prosperity to every human being.

The important thing is that spiritually, man must begin to prepare himself more adequately for this new age. It is clear that this new discovery has made

life more dangerous. A larger measure of discipline will have to be exercised, for the more man controls matter, the less he controls himself. A larger measure of discipline must be exercised in order not to be destroyed by this Frankenstein which he himself brought into being. Unfortunately it seems that the more man controls matter the less he is able to control himself. Mankind in the field of economics, culturally, must learn to exploit that same cooperation of teamwork which he has been able to do in this scientific field. If he fails to do that, the split atom is likely to tear his entire social structure apart .

So what needs really to be done is for man to begin to attack the spiritual atom in his own being, in his own soul, to release those spiritual energies, powers which God put in his soul, just as God put them in Uranium and other elements. There are powers within which we must now master to control the powers without.

My dear friends, naked, fireless, toolless, homeless, man began thousands of years ago his relentless march on earth. He crosses deserts and ice-fields through forest, through jungles; through centuries of blood and fear and want man has pushed his way, always forward, always ahead. Disease, ignorance and all forms of tyranny slowed his progress. But man moved on always forward, hungering, seeking and questing, driven by a power which he himself did not always understand. And as he marched on here and there, a little more of light would come to him, a little bit more of knowledge, of beauty, of power. And so he moved through the ages more recently his march has become more purposeful. His power has increased enormously. His ~~find~~ feet have brought him to our day, to these amazing new frontiers when he has a right to feel himself a little lower than the angels. Will man falter now? Will man destroy himself by his own handiworks? No, we all have faith, believe that the power which preserved him through all these long weary centuries will not foresake him now when he is about to enter his promised land.

1) an eminent ^{clown} se - July 16. 1945 - New Mexico - Test

"One felt as tho he had been privileged to witness the Birth of the World - to be present at the moment of Creation when the Lord said: Let there be light."

2) It was not merely the columns of fire & flames which rose with the thunder of thousand of explosions 40,000 ft into the air & lighted up & shook the earth for hundred of miles around.

It was rather the ^{with the light of many suns} ~~revelation~~ of a New Paradise on earth, an energy which had been locked up for billions of years in the core of the material universe, which man, ~~was now~~ for the first time since he appeared upon the stage of the world, ^{was now} able to release, and control & put to his uses.

It was no less revolutionary a theatrical our best revel. ~~and~~ discovery than the primitive man, the Old Stone Age must have experienced when he first struck a piece of iron pyrites with a flint & the sparks fell into a bed of dry leaves & Fire emerged - Fire which was to prove man's friend & man's enemy throughout all succeeding time.

3) The explosion, the first G. Bomb proclaimed to the world was the advent of a new universe, ^{with its life, a new stage in play} but the advent of a new age which will transform almost everything which has gone before - & usher in new marvels which the mind / man cannot as yet even grasp.

- (2)
- To the Stone Age, the Metal Age, the Age of Steam & the Age of Electricity - must now be added the Atomic Age -
- Each one, the preceding age revolutionized the econ, social, pol. & cultural life of mankind.
 - So will the Atomic Age. It opens up new continents & moves our frontiers to immeasurably distances.
 - frontiers -

4). One should not confuse At. energy with the A. bomb. The experiences of war - as so often in the past when war fathered numerous inventions - forced the pace in the exploration of At. energy.

- The fabulous energies contained within the At. were known before the war.

- Einstein had written the equation for the releasing of A. energy & the converting mass into energy. 40 yrs. ago.
- Prof. Rutherford had experimented with splitting the A. 25 yrs. ago.

- They and many other sc. were working in that field not with the idea of producing an explosion but which would lay waste cities, but as a further step & the unimaginable storehouse of power locked up in matter available to man for his use - & the enrichment of his life -

- the urgency, the war - Nazis - prompted U.S. & G.B. to organize a vast research enterprise - to speed up the progress in this field. Hundreds of thousands of men - 10,000, 100,000, 200,000 dollars -

worked in secret for 4 yrs. - Bombs - Aug 6th Hiroshima
Nagasaki.

- Within 8 days Jap. War was over!

Of- But while the A. bomb is a war product - the basic
sc. research - not motivated by war. And the
use of A. energy ~~is not~~ ~~not~~ ~~be~~ limited to war.

- ~~In fact it must hereafter be limited to scientific~~
- The fact that it made its public appearance, as it
was, as a war weapon, gave such dramatic
character, has permanently marked.

- Men have become aware ~~it~~ if was to recur -
+ perfected A. bombs used - might well
wipe out our ~~world~~ ^{population} - + physically available
marked.

- Men are wondering whether it would not have been
better if it had never been discovered. Surely
its secret!

- Machine - Factory - Airplane -

6/. Every human discovery invention, every all add.
Knowledge gained - potentials for Good & Evil

① Tree of Knowledge - עץ הדעת - אדם אכל מנו הפירות
הטובים והרעים והיה כדור העולם באש העוול והיה העולם באש העוול

(2) עץ הדעת הוא העץ האשר אכל האדם מנו הפירות והיה כדור העולם באש העוול והיה העולם באש העוול

- (3) But the possibility, very certainly, of increased destruction
 and serious danger from a more defeated man -
- (1) Man did eat of Tree of Knowledge - continues to eat
 - beguiled by serpent - if you will, of injustice -
vice, of adventure -
- (2) Tower of Babel - with its top in heaven - scattered
- (3) Golden Fleece - the Argonaut Jason - guarded
 by a sleeping dragon -
- (4) Icarus - with his artificial wings
flying too near the sun - the wax of his wings
melting - fell into the sea & was drowned
- (5) This is the end in man - glory of the ancient

7). Man will not desist from exploring still further
 the atomic field. The door which he has unlocked
 opens up upon vistas too wonderful for man
 ever to wish to shut it again. - He will move
 forward -

He has always dreamt of converting matter into
 energy. He has always experimented in his
 blundering way thru the ages with transmuting
 one element into another. The ancient Greeks
 had an alchemy, & it. The alchemists of the
 Middle Ages sought the philosopher's stone -
 Well. He has found the secret now! Man now
 knows how elements can be transmuted.
 Yes - and how new elements can be discovered

unknown in Nature, can be created. He has
in fact, already created 2 new elements, the 93rd
the 94th in the atomic table — ~~the~~ In 1940 —
Neptunium was created & in 1941 Plutonium,
entirely new elements, diff. phys & chem. from Uranium
the 92nd element.

He now knows what that ~~defying~~ ^{reservoir}
of power he can command by ~~the~~ ^{the} ~~the~~ a process
which he has worked out, which splits the
atom & makes it yield ~~energy~~ up ~~the~~ boundless
energy stored in its core, in its nucleus.

One pound of matter contains the energy equivalent
of 10 B. kilowatt-hours. (Just)

8/ It is frightening, of course, when one conceives of
such stupendous power in relation to war — to
flying bombs.

And this world-war & this ^{A.} bomb will destroy the ~~world~~ ^{world}

"Man's survival is now absolutely dependent on his
ability to avoid a new war"

Speaking of the improved atomic bombs of to-morrow
Gen. Henry H. Arnold, Commander, in Army Air Forces

"They will be destructive beyond the wildest nightmares
of the imagination, a weapon ideally suited to sudden

unannounced attacks in which a country's major cities might be destroyed over night by an ostentatiously friendly Power!" 16
Partly better

David Dicks. "Atomic Energy" (p. 169)

2). No way of averting it - Partly effective defenses
weapons -

Keeping the secret - any man > radar - a jet plane
a rocket bomb - Encourage other nations to
experiment - & put over a sneak Pearl Harbor
attack -

Send over a fleet of radio controlled rocket planes
carrying cargoes of atomic explosives

10). Only solution - Internat. cooperation in its control -
and powerful world org. to avert war.

Choice is clear: or not we shall perish

11). I believe - will cross life!

Much that is missing -

① Unlimited potentials of Human Mind - subtly

② Cooperation ^{Team work} & world's leading phys-chemists

math. geniuses - exiles - all races -
concentration of so much intellect - bombs
same brain power for - (Dicks)

12) Split border, Poverty

Bring prosperity to all men everywhere -

13) We must move sp. into this altered world.
Life has not been made more secure - More dangerous.

A larger measure / moral self-destruction -

The more ^{man} ~~we~~ controls matters. The less he controls
himself.

There must be team-work ^{among} ~~in~~ statesmen ~~as in~~
among scientists

A the split atom will tear our social structure
apart.

We need to attack the sp. atom & our lives - &
release their energies - the drive power in man -

14) Naked, fireless, trolless, homeless man began ^{strange} his
^{wanderer} march on earth - across deserts + icefields ^{forests}
~~across the deserts~~ & through ~~forests~~
& jungles, through centuries & blood & fear and
want he has pushed his way - forward ever
forward. Beasts & men & players ~~and~~ warred him and
ignorance & superstition ~~and~~ ^{and} all forms of slavery
slaved his powers. ^{old} ~~But~~ ^{old} he pushed ~~on~~ ^{onward} for a questing - driven by a power which he himself
did not always understand. And as he marched on -

her other, a little more light would come from a
bit more, knowledge of beauty, of power. ^{her negative, repeat} This march
became more purposeful. His power ~~was~~ ^{has} increased
enormously. His feet have led him to the ~~hands~~ now
to ~~new~~ ^{new} ~~damaging~~ frontiers. He is a little lower &
the angle - all things are under his feet. Will he
father now? Will he destroy himself now?

The power which preserved him will not preserve
him now as he is about to enter his promised
land.



(7)

ABSTRACT OF SERMON DELIVERED BY DR. ABBA HILLEL SILVER ON NEW YEAR'S EVE, SEPTEMBER 7, 1945 AT THE TEMPLE, ANSEL ROAD AND E. 105TH STREET.

For America too

The war is over. A dark chapter is closed. Democracy has emerged triumphant. The free spirit of man has been vindicated. Out of the midst of the overthrow, mankind is rising to build anew upon stronger foundations a juster, kindlier world.

Great vistas are opening up before the eyes of men. The presses of the mind and the spirit are bursting with new wine. Great is the mind of man, fathomless in inventive-ness, high limitless in achievement. Great is the world of man, inexhaustible in resources, ample and sufficient for all. Great is the promise of man, pilot of the strathosphere, winged airman to the most distant lands brought near by vision, daring and the confidence of youth.

Everything that has happened in the last few years — the gathering of the forces of democracy, (taunted with decadence) against the power and might of an all-out tyranny and brutality, the quick rebound of America from the overwhelming disaster of Pearl Harbor, the amazing organization of the productive potential of this nation for war, the boundless energies which were unleashed by us in all parts of the world, and the emergence, in response to need, of the super-fortress and the atomic bomb, all proclaim in one mighty chorus that whatever we set our hearts and our minds to we can achieve, that a new heaven and a new earth can be created in this gracious land, once we free ourselves from the rust and tarnish of cynicism and complacency, once we respond to the challenge of our better nature, to the call of duty, honor and patriotism.

America will be greater than ever before in wealth, in shared prosperity, in culture and in all the arts of civilization — if so we will it. It is far more difficult to release new energies for justice, brotherhood and peace than for destruction and total annihilation; for you deal here not with things physical but with the tangled web of human emotions, passions, ambitions and fears, in all their waywardness and perversities. But it can be done, and through the same process of pooling our highest thinking, our noblest motives and our firm perseverance.

...at the time ... units, which
... ever could be found to
tap this cosmic source of elemental
energy.

In the mass-energy theorem, Einstein showed the existence of a definite relationship between the Cosmic Trinity of matter, energy and the velocity of light. The relationship is so simple that, once arrived at, a grammar school student could work it out.

In this formula the letter "M" stands for mass in terms of grams; the letter "E" represents energy in terms of ergs (a small unit of energy or work); while the letter "C" stands for the velocity of light in terms of centimeters per second. The energy content of any given quantity of any substance, the formula states, is equal to the mass of the substance (in terms of grams), multiplied by the square of the velocity of light (in terms of centimeters per second). The velocity of light (in round numbers) is 300,000 kilometers, or 30,000,000,000 centimeters, per second.

Take one gram of any substance. According to the Einstein formula the amount of energy ("E") in ergs in this mass is equal to 1 (the mass of the substance in grams) multiplied by 30,000,000,000 squared. In other words, the energy content of one gram of matter equals 900 billion billion ergs. Translated in terms of pounds and kilowatt-hours this means that one pound of matter contains the energy equivalent of 10,000,000,000 kilowatt-hours.

Possible Accomplishments

If this energy could be fully utilized it would take only twenty-two pounds of matter to supply all the electrical power requirements of the United States for a year.

One-third of a gram of water would yield enough heat to turn 1,000 tons of water into steam.

One gram of water would raise a load of a million tons to the top of a mountain six miles high.

A breath of air would operate a powerful airplane continuously for a year.

A handful of snow would heat a large apartment house for a year.

The pasteboard in a small railroad ticket would run a heavy passenger train several times around the world.

A cup of water would supply the power of a great generating station of 100,000-kilowatt capacity for a year.

One pound of any substance, if its atomic energy content could be utilized 100 per cent, is equivalent in power-content to 3,000,000,000 pounds of coal, or 1,500,000 tons. The energy we now are able to utilize in the atomic bombs, at maximum efficiency, constitutes only one-tenth of 1 per cent of the total energy present in the material. But even one-hundredth of 1 per cent still would be the most destructive force by far on this earth.

Atomic energy, released through the splitting of atoms, differs radically from ordinary types of energy hitherto available to man in that it involves annihilation of matter. When an atom is split, part of its matter is converted into energy.

This is materially different from obtaining power by the use of a water wheel, for example, or by

converted into pure energy. The amount of energy liberated in the process by the enormous quantities of hydrogen in the sun represents an actual loss of the sun's mass at the rate of 4,000,000 tons per second, a mere speck of dust in relation to the sun's total mass of two billion billion billion tons.

If the sun, however, were a mass of coal weighing the same amount it would have to burn 3,000,000,000 times the mass it is burning now to produce the same amount of energy. If that were the case it would have used up the entire store of molecular energy contained in its body of coal in the course of 5,750 years. In other words, it would have burned out long before the earth was born.

Long Life for Earth

By the use of atomic energy, the sun has been able to give off its enormous amounts of radiation for a period estimated at 10,000,000,000 years, and its mass, at the present rate of burning, is enough to last 15,000 billion years more, although, of course, the amount of its radiation would be greatly reduced long before that in proportion to the decrease of its mass. Radiations in amounts sufficient to support life on earth are estimated to continue for some 10,000,000,000 to 100,000,000,000 years longer.

Since the very existence of atomic energy was first discovered through the theory of relativity, the development of the atomic bomb constitutes the most dramatic proof so far offered for the correctness of the theory, and also marks the first time it has been put to practical use in mundane affairs.

It is one of the great ironies of history that the German war lords, who drove Einstein into exile, were forced to rely on the theory of relativity in their efforts to develop an atomic bomb to save them from defeat. America, which Einstein now is an honored citizen, succeeded where the Nazis failed. When the bombs fell on Hiroshima and Nagasaki they represented the fruition of what has been originally a pure mathematical concept.

Had that concept not come what it did, the development of atomic bomb also might have had to wait. This might have meant a prolongation of the war.

Thousands of young Americans thus may owe their lives to the theory of relativity. Which is another way of saying that pure science, no matter how impractical it may appear, pays high dividends in the end.

Additional articles by Mr. Lawrence will appear in early issues.

Paris to Honor Ste. Therese

By Wireless to THE NEW YORK TIMES.

PARIS, Sept. 27—Next Sunday the annual celebration in memory of Ste. Therese of Lisieux in Normandy, the "Rose Saint" of the First World War, will be held here at the orphanage in Auteuil in the presence of the Archbishop of Paris. A three-day prayer service began today with a salutation of the relics of the saint, brought here for the occasion.

So far chlorophyll, sunlight, and the greatest is much use of can now be shown that This can be by chlorophyll trap," step in become how the

What may be later trap thus be solving to find the end on the only utilize plant