**Thiotimoline and the Space Age**

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*(Transcript of a speech delivered at the 12th annual meeting of the American Chronochemical Society.)*

Gentlemen:

I have been called the founder of chronochemistry and in response I cannot resist a certain sense of pride. To have originated a new science is a privilege given to very few.

I can still remember, quite clearly, that day in 1947 when I first dropped a pinch of thiotimoline into water and thought I noticed something odd. To be sure, it dissolved rapidly; but I was used to that. It always seemed to vanish the instant it touched the water.

But I had never handled a sample of thiotimoline quite as pure as the pinch I had obtained that July day and, as I watched the white powder drop toward the water, I distinctly remember myself thinking, “Why, that dissolved *before* it hit the water.”

Well, it’s an old story to you, I know, though I still like to linger on the thrill of the slow awakening of certainty; of the measurements taken; of the first crude timings by eye; of the more delicate work of the original endochronometer—the same instrument now at the Smithsonian.

The announcement of endochronicity, of the fact that a substance existed which dissolved in water 1.12 seconds *before* the water was added created a stir. You all remember it, I’m sure. And yet, somehow, the impression arose that thiotimoline was a hoax. There was a distinct air of amusement in many of the comments in the learned journals. Private communications reaching me showed a distressing tendency to describe experiments which obviously lacked all scientific validity and which, I could but conclude, were meant as some sort of joke. Perhaps the final proof of the damage this has done is that after twelve years of existence, the American Chronochemical Society can muster an audience of exactly fifteen people to hear this talk.

It has been an expensive joke, gentlemen, one that has cost us our lead in the race for space. For while American researchers have, but with difficulty, obtained grants to continue their investigations of thiotimoline and have been starved into small-scale experiments, while withering under the genial air of disbelief on the part of their colleagues, the Soviet Union has established the town Khruschevsk in the Urals, whose popular nickname of “Tiotimolingrad” will well describe the nature of the activities that go on behind the walls of the modern and well-equipped scientific laboratories that have been established there.

That the Soviet Union has taken thiotimoline seriously and has done something about it is as sure as can be, and yet we remain sunk in complacency. No important political figure has viewed the matter with alarm. If they have said anything at all for publication, it is simply, “What’s thiotimoline?” I intend now to explain to these near-sighted politicos just what thiotimoline means to our space effort.

Thiotimoline research graduated from what we might now call the “classical” stage, to the “modern” with the development of the “telechronic battery” by Anne McLaren and Donald Michie of the University of Edinburgh. If you have read about it anywhere, you can only be clairvoyant, for the popular press and much of the learned press maintained a stubborn silence. In fact, the original paper appeared only in the small though highly respected, *Journal of Irreproducible Results,* edited by that able gentleman Alexander Kohn. Let me describe the telechronic battery.

A simple endochronometer—with which we are all acquainted—is a device which will automatically deliver water into a small tube containing thiotimoline. The thiotimoline will dissolve 1.12 seconds before the water is delivered.

Imagine the endochronometer so connected with a second similar unit that the solution of the thiotimoline in the first activates the water-delivering pipette of the second. The thiotimoline of the second unit will dissolve 1.12 seconds before that water is delivered, and therefore 2.24 seconds before the water is delivered to the first unit.

An indefinite number of endochronometers can thus be hooked up, the thiotimoline of each of the series dissolving 1.12 seconds before the preceding member. A battery consisting of about 77,000 such units would yield a final sample of thiotimoline which dissolved a full day before the initial quantity of water was delivered.

Such batteries have now been developed both at Edinburgh and in my own laboratories in Boston in extremely compact models, through use of printed circuits and advanced miniaturization. A device of not more than a cubic foot in volume can afford a twenty-four hour endochronic interval. There is strong, if indirect, evidence that the Soviet Union possesses even more sophisticated devices and is turning them out in commercial quantities.

The obvious practical application of the telechronic battery is that of weather prediction. In other words, if the first element of a battery is exposed to the air in such a way that rain, if any, will fall upon it, the final element will dissolve the day before and thus offer a foolproof method of predicting rain—or lack of rain—one day ahead.

I trust you will all see, gentlemen, that the telechronic battery can be used for generalized predictions as well.

Suppose, to take a frivolous example, you were interested in a particular horse race. Suppose you intended to place a wager that a particular horse would win that race. Twenty-four hours in advance of the race, you could make up your mind quite firmly that if the horse were to win the next day, you would, immediately upon receiving the news, add water to the first element of a telechronic battery. If it did not win, you would not.

Having made that decision, you need then but observe the last element. If the thiotimoline in that last element dissolves—followed by a chain of solutions all along the battery at 1.12 second intervals, with which you need not be concerned—you will know that the horse will win beyond doubt. You might even, if you were in a flamboyant mood, allow the solution of the final element to activate a flashing light, a fire gong, a charge of explosive; anything that will unmistakably attract your attention.

You laugh, gentlemen, and yet can this system not be applied, without change, to the launching of a satellite?

Suppose that four hours after launching, an automatic device on board the satellite telemeters a signal to the launching base. Suppose, next, that this radio signal is designed to activate the first element of a telechronic battery.

Do you see the consequences? The sending of the signal four hours after launching can only mean that the satellite is safely in orbit. If it were not, it would have plunged to destruction before the four hours had elapsed. If then, the final element of the telechronic battery dissolves today, we can be certain that there will be a successful launching tomorrow and all may proceed.

If the final element does not dissolve, the launching will not be successful and there must, therefore, be something wrong with the satellite assembly. A team of technicians will begin checking the device and at the moment when the defective item is corrected, the telechronic battery will operate. The launching will then be scheduled in the full expectation of success.

Do you still laugh, gentlemen?

Is this not the only feasible explanation for the consistent Soviet successes as compared with our own very spotty record? It is customary, of course, to attribute the appearance of unfailing success of Soviet launchings to the fact that they have been deliberately hiding many failures, but does this stand up? Have they not, with remarkable consistency, managed to score successes at such time as would most profit themselves?

Sputnik I went up within a month of the hundredth birthday of Tsiolkovsky, the soviet rocket pioneer. Sputnik II went up to celebrate the fortieth anniversary of the Russian Revolution. Lunik II went up just before Khrushchev’s visit to the United States. Lunik III went up on the second anniversary of Sputnik I.

Coincidence? Or did they simply have the foreknowledge of their telechronic batteries? Have they tested a number of possible rocket assemblies and selected that one for which success was forecast? How else can one explain that the United States has not yet succeeded in launching any of their many rockets on some significant day?

Nor, remember, do the Soviets invariably hold their announcements back until they are certain they have achieved success, as some have suggested. In at least one case, they announced an achievement in advance.

When Lunik III was on its way to circle the Moon, the Soviet scientists confidently announced it would take pictures of the hidden side of the Moon as it progressed round that body in its orbit. As far as the orbit of Lunik III was concerned, they were safe. From its motion and from the positions of Earth, Moon and Lunik, the orbit of Lunik III could be calculated with absolute precision.

How could the Soviet scientists, however, be so sure that the intricacies of the camera assemblage would work to perfection? Could it be that the successful completion of the camera-task was set to activate a telechronic battery at the launching base? Could its activation have allowed them to make their announcement a day before the pictures were taken with the full knowledge that success and a prestige-victory would result?

I say the answer is: Obviously, yes.

And what of future attempts to send a man into space? Suppose the man were to agree to send a signal, manually, after a certain time had elapsed after firing. A telechronic battery would then tell us, while the astronaut was still on the ground and unlaunched that not only would he be in orbit but that he would be alive and at least well enough to send the message.

If the telechronic battery remains inactive, the man will not be sent up. It is as simple as that. Since it is the chance of harm to an astronaut that is the deciding factor holding back the step of “man into space,” it seems certain that the Soviet Union will achieve this goal first, thanks to our government’s obtuseness with respect to thiotimoline.

Presumably, one can extend the principle to all manner of scientific and nonscientific investigations. Gigantic mega-batteries can even be built—in theory—to predict the result of an election to be held the following year—but I have labored the point long enough. Let me, instead, make a few remarks concerning the great dangers as well as the great benefits, which are involved in thiotimoline research.

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These begin with the oldest of all paradoxes of thiotimoline—the paradox of fooling. In other words, the chance of having thiotimoline dissolve and then being fooled by a refusal to add the water. The original argument against such a notion, as elucidated in my laboratory, involved the theory of the endochronic atom—which has since been confirmed by half a dozen other investigators. One pair of the bonds of one or more of the carbon atoms in the thiotimoline molecule are forced, through supersteric hindrance, to appoint in the temporal plane. One bond extends 1.12 seconds into the past and one extends 1.12 seconds into the future. When the future end of a thiotimoline molecule dissolves and drags the rest of the molecule with it, it is therefore not predicting a possible future event. It is recording an actual future event.

Nevertheless, it has been shown that fooling thiotimoline is possible in theory. Using Heisenberg’s principle of uncertainty, it can be demonstrated that one cannot say with certainty that an individual molecule of thiotimoline will dissolve before the water is added and that, in fact, the probability of its not doing so is quite appreciable.

That is undoubtedly true—for an individual molecule. When, however, quintillions of molecules are involved as is the case with even the most microscopic samples of thiotimoline actually used in the individual units of even the most sophisticated telechronic batteries, the chance that all of those quintillions, or even a detectable fraction of them, will fail to dissolve is infinitesimal.

To be sure, in setting up a telechronic battery, in which many thousands of units are involved, the failure of the instrument will depend on the failure to dissolve of any one of those units. The chance of “Heisenberg failure,” as it is called, can be calculated and some estimates at least seem to show that a battery will give a false positive one time out of rather more than a million.

In such a case, the final unit in a telechronic battery will dissolve even though water is not added to the first. Somewhat more often, the converse will be true; that the final unit will not dissolve in advance even though water is added to the first. Naturally the former alternative is more interesting from the theoretical viewpoint, the question arising: Then where did the water come from?

An attempt was made in my laboratories to actually record such a false negative involving solution without subsequent addition of water. The possibility of creation of matter out of nothing existed and this would be of great importance in connection with the Gold-Hoyle theory of the steady-state universe.

The principle involved in the attempt was simple. One of my students would set up a battery adjusted for the manual addition of water the next day, intending in all honesty to allow the experiment to take its course. The final unit would, theoretically, dissolve. I would then place the first student at a different task and put a second student in charge of the battery with instructions not to add water.

Our first great surprise was to find that the final unit actually dissolved, under these circumstances, about once in twenty efforts. This was a far greater incidence than could possibly be explained by “Heisenberg failure.” But, as it rapidly turned out, the thiotimoline was not “fooled.” Something, in every case, brought about the addition of water. In the first case, the original student returned to add the water and did so before he could be stopped. In another case, there Was accidental spillage. In another, a janitor—

But it would be tedious to describe the manner in which thiotimoline, so to speak, refused to be fooled. Suffice it that we did not have one true case of “Heisenberg failure.”

With time, of course, we began to guard against ordinary accidents and the incidence of “pseudofailure” declined. For instance, we placed the battery in closed, desiccated vessels; but, during pseudofailure, these cracked and broke.

In our final experiment we thought that surely we had a “Heisenberg failure” but in the end, the experiment was not reported in the literature. I tried instead, and without success, to report the implications of it to appropriate officials. Let me describe the experiment to you now.

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We placed the battery in a welded steel container after it had registered solution.

And as we waited for the moment when the water should be added but would not, Hurricane Diane struck New England. That was in August of 1955. The hurricane had been predicted, its course had been followed and we were ready for it. There had been several hurricanes in New England in ‘54 and ‘55 and we were hardened to it.

At one point, though, the Weather Bureau announced the danger to be passed, the hurricane was blowing out to sea. We all sighed with relief as we waited for zero minute.

However, if any of you were in New England that day you will remember that the Weather Bureau announced later that it had “lost” the hurricane; that the backlash struck surprisingly; that five inches of rain or more fell in many places within an hour; that rivers rose and extensive flooding began.

I watched that rain; it was a deluge. I watched the small river running across our campus become a torrent and begin to spread up and out across the lawns while the lines of shrubbery seemed to grow out of roiled sheets of water.

I shouted for an axe. One of my students brought one, remarking afterward that I sounded so wild he was almost afraid I had turned homicidal maniac.

I smashed that steel container. I removed the telechronic battery and in the flickering gray light of that storm-lashed day, I filled a beaker of water and waited for zero minute, ready to douse the battery at the proper moment.

As I did so, the rain slackened, the hurricane moved off.

I do not say we caused the hurricane to return and yet —water had to be added to that battery somehow. If the stainless steel container had to be floated away on a rising flood and smashed by wind and water to have that done, it would be done. The original solution of the final unit predicted that; or else it predicted my deliberate subversion of the experiment. I chose the latter.

As a result of all this, I can envisage what I can only call a “peace bomb.” Enemy agents working within a particular nation, can assemble telechronic batteries, operate them until a case occurs in which the final unit dissolves. That battery can then be encased in a steel capsule and placed near a stream well above high-water mark. Twenty-four hours later, a disastrous flood is bound to occur, since only so can water reach the container. This will be accompanied by high winds since only so can the container be smashed.

Damage will undoubtedly be as great in its way as would result from an H-Bomb blast and yet the telechronic battery would be a “peace bomb” for its use will not bring on retaliation and war. There would be no reason to suspect anything but an act of God.

Such a bomb requires little in the way of technology or expense. The smallest nation, the smallest of revolutionary or dissident groups could manage it.

Sometimes in my more morbid moment, I wonder if perhaps Noah’s flood—the prototype of which actually has been recorded in Mesopotamian sediments—was not brought about by thiotimoline experiments among the ancient Sumerians.

I tell you, gentlemen, if we have one urgent task ahead of us now it is to convince our government-to press for international control of all sources of thiotimoline. It is boundlessly useful when used properly; boundlessly harmful when used-improperly.

Not a milligram of it must be allowed to reach irresponsible hands.

Gentlemen, I call you to a crusade for the safety of the world!