THE FATHER OF TITANIUM

by

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Knapp and Gruner were eating lunch at a picnic table across from the assembly building at the *Astro* plant. They had a view into the open building where colonies of workers put the Atlas missiles together before rolling them onto the Tarmac. In and around the building were the golf carts and snack trucks, fork lifts and pickups, all diminished by the massive stainless steel missiles arrayed in gleaming, phallic ranks. The two men worked in windowless labs and were glad to be outside in the sun and desert breeze. For some time they ate without speaking, their attention held by the swarm of Liliputians moving through the heat ripples. Such was the scene's hypnotic effect that even after Gruner announced the reason for the meeting - he'd been offered Knapp's job - the two men continued to observe the activity before them as though nothing had been said.

Eventually Knapp's mouth began to twitch, but as Gruner observed, the younger man was often in motion - feet tapping, fingers drumming - giving the impression that if the moving part were forcibly stilled, the energy would be shunted to another extremity.

When Knapp was under stress, this nervousness went to a poorly mustached lip, which flickered involuntarily. To mask the twitch, Knapp would sniffle and blow his nose with a large, colored handkerchief.

"Understand now, Hurlock came to me," Gruner said. "And I told him I wouldn't take the job unless you felt right about it." With that Gruner rested his case, folding his sandwich wrapper in half and pressing it over his knee to take the wrinkles out. There was no need to remind Knapp that Hugh Hurlock was a hard man to work for. This had been clear from Hurlock's first day as head of the Materials Research Group.

Knapp moved his lips as if talking to himself. It was hard to look at Gruner directly. Gruner was a retired Navy Chief whose obsequious smile never left his face. He could speak about the *Astro* 'mission' with a straight face. Like Knapp, he was a photographer. But unlike Knapp, who worked with altered images, Gruner took straight on color shots of desert flowers, super clear close-ups of dew on petals. Knapp couldn't stand his work.

"Do me one favor." said Knapp.

"Sure, what is it."

"Wait two weeks before you say yes."

After shaking hands on the agreement, Gruner went back to his job and Knapp looked across the Tarmac to the shady interior of the assembly building. The colonies of workers in colored hard hats swarmed all over a prone, silvery Atlas, wiring, welding, creating clouds of smoke and sparks. The burning drift of semi-conductors and superalloys forced into oxidation wafted toward him. The *Astro* aroma. Why this expense

for an already obsolete missile? The Atlas would soon be replaced by the Titan, with smaller, more powerful rockets run on solid fuel. That too would end up on the junk pile when the next generation came along. An *Astro* job was a junk pile job.

Knapp drummed his fingers rapidly on his knee. Now that Gruner was gone he could smile. He was ready for battle. He was a general with his crack brigade in reserve: the new job secured in anticipation of being fired, and the freedom to walk away on his own terms. Never before had Knapp been touched by the arrogance of bosses. Before *Astro* he'd been a photographer at a newspaper up the coast where the managing editor held his photographs by one corner to avoid soiling his fingers. Knapp hadn't been bothered. His ego was impervious. But Hurlock was more offensive, and he'd chosen Knapp as the sacrificial lamb on which to establish his reputation. This was clear from the first day.

Preceded by the Director of Materials Research, the affable Dr. Erhardt, Hugh Hurlock marched into the Metals Research Lab and began shaking hands. Standing because he had no desk, Knapp observed Hurlock doling out his deference in proportion to each man's level of education, the record of which Hurlock held in his hand. Hurlock moved from desk to desk with his hand out, politic to those with Ph.D.'s, less so with M.S.'s, and downright disdainful toward the mere B.S.'s, the minority at the MRL. In the process of introducing himself, Hurlock held forth on the decay of values and institutions. He also gave out the slogans by which he lived: "I'm a taskmaster," favorite expression. "A Renaissance Man," next favorite. "Every member of this staff should be able to write clear English. It's become a lost art," his motto.

Finished at the desks, Hurlock approached the standees, secretaries, technicians, and Knapp - whose desk was across the hall in the metallography lab. Knapp was prominent among this group not only because of his striped engineer's badge, or even because his lip chose that moment to quiver. Knapp was distinct even among the eccentrics in the MRL. His style was nineteen-fifties teen age: loafers with shiny pennies in the tongues, white athletic socks, a double-breasted suit with oversized shoulder pads, bow tie with handkerchief to match.

Arrested by the sight of Knapp, Hurlock said, "And what have we here?" He then read the name from Knapp's badge and consulted his record.

"Frank Knapp?"

"One and the same, Sir."

"Knapp, why are you wearing an engineer's badge when you don't even have a B.S. degree?"

While the remark sent Knapp to the colored handkerchief, it didn't intimidate him. He said, "Degrees have nothing to do with a man's real value."

To which Hurlock replied, "We'll see about that."

Older staff members warned Knapp to stay clear of Hurlock, who'd transferred from the Aircraft Division where he'd been a head of research and part of the biggest financial loss in the company's history. This transfer to *Astro* was a demotion, but Hurlock would try to restore his reputation by shaking up the MRL. For this he would need a victim, and one had already been chosen.

Knapp had the rank of Lead Man, a lower management level usually occupied by engineers. He was in charge of the Metallography Lab, where he supervised two technicians. But the key work was his own. He etched and polished metal samples. He operated the delicate cameras which took pictures at thousands of magnifications. He also developed the resulting photos, which were called micrographs.

Knapp soon became the only staff member whose work was openly criticized. Hurlock complained that the lab was less accessible. He found defects in the micrographs. He attributed all this not only to Knapp's sloppiness, but to the fact, which he repeated in front of everyone, that Knapp wasn't qualified for his job because he didn't have a B.S. degree. At one point Knapp believed a change in performance would save him. He found more microscopes for the engineers. He kept the lab spotless. He put covers on all the instruments and posted reminders to use them with care, three-by-five cards each with the neatly printed heading, *Nota Bene*. These measures only earned him more disapproval.

Hurlock kept up his attacks. His problem was that he couldn't fire Knapp outright. He needed a replacement, but under company policy Knapp had to be offered another job within *Astro* at the same pay. Dr. Erhardt wouldn't bend this rule. But when Hurlock found Gruner, his problem was halfway solved. Gruner was an ex-metallographer with a Community College degree. Good enough. All that remained was to find Knapp another job. While waiting for the opening, Hurlock borrowed Gruner on Knapp's sick days and let it be known that he liked the new man. Gruner was hard working and deferential. He kept a diaper in his back pocket to dust every surface he

touched. He had a firm way of telling the technicians what to do. When Hurlock secretly offered him Knapp's job, Gruner accepted. Hurlock now voiced his displeasure more openly. One day he came out of his office holding a report which Knapp had put together.

"Where the hell is Knapp? Get him in here!"

Knapp came in from the lab, drying his hands on a rag. Hurlock slammed down the report and opened it to the last section. He bent back a page to show the offending micrographs. "These are unacceptable," he said. "They're out of focus and water marked." Knapp brought the report close to his eye. "I believe, Sir, if you would perhaps look closely at these particular micrographs, the areas of concern are well focused, which necessitated the surrounding fields to be somewhat out of focus."

"And the water marks? What's your excuse there?"

"We need a new dryer, Sir, something I already requisitioned and you turned down."

"That's because there's nothing wrong with the dryer."

"I beg to differ with you, Sir."

"Keep begging then."

As Knapp turned to go, Hurlock said loudly, "We need a better man here. I'd love to get Charley Gruner. He does perfect work. He also has a degree."

On that day, Knapp made his plan.

Hurlock moved fast through a long corridor. Pink-faced and breathing hard, he expended great energy keeping his cumbrous body in motion. A blue gabardine

suit shone from lack of pressing. The unmatched shirt and wrinkled tie had been yanked from a drawer his wife was forbidden to organize. His glasses were held together at the nosepiece with a wad of masking tape. He was too busy to get a new pair.

Hurlock wasn't interested in personal appearance. He was an R&D man with no room for vanity, an essential attitude in a company on the forefront of military technology. He was also a metallurgist, educated in the least known branch of engineering, a qualitative field retaining the aura of armory and alchemy. Among the thousands of engineers at *Astro*, only a few dozen were metallurgists, and all worked for Hurlock, who spent much of his time promoting an awareness of metals within the company. This near boasting, as well as an incident from his past, had nicknamed Hurlock *The Father of Titanium*. He wondered if those who whispered the name behind his back, or who placed dim-witted notes in the leaves of his desk calendar were aware of the irony: there was room for the title. If his latest project bore fruit, he would introduce the sleeping metal to the aerospace industry and not only staunch the flow of company money, but earn himself a permanent niche in the world of metals.

Hurlock had formerly worked for U.S. Army Ordinance in Maryland at the Aberdeen Proving Ground, where he won an award for developing steel alloys to resist armor-piercing shells. He was recruited by *Astro* because the company needed someone who knew its only customer, the military. Although hired into aerospace, Hurlock was first sent to the Aircraft Division. The company had built a fighter plane called the F-10 Hornet, the fastest one man fighter aircraft in its class. Because the Hornet flew so well, the Air Force wanted a Super Hornet, the F10-A, faster and more heavily armed. But

once built, the Super Hornet didn't fly any faster than the first model, and the Air Force threatened to cancel. Only a faster airplane could recoup the development money, and since the design couldn't be modified for bigger engines, the Super Hornet had to lose weight. The only solution was a materials change, and the company looked to Hurlock, who'd spent most of his career shooting holes in armor plate. He was amazed to find himself the only metallurgist on an aircraft project. This was a technology vacuum he could fill.

Titanium, the space-age metal, had lost its future on the discovery that welding oxidized and embrittled the metal. Hurlock developed a technique which prevented the welds from oxidizing. He built a vacuum-tight welding chamber and a large annealing furnace. He fabricated the Super Hornet in sections and one year after beginning the project he found himself at the company test field adjacent to San Diego Bay. The Super Hornet waited on the runway with its engines whistling, its under-wings laden with dummy munitions. The engineers and Air Force officers remarked and even cheered those parts of the plane they'd been responsible for. Hurlock sat alone in the grandstand holding a page full of tensile test data done on Titanium welds. He kept himself apart from small men's antics. At the same time he'd never before felt himself so correctly placed in his life. His creation stood before him, a death dealing war machine. He was the armor maker of his time, Hephaestus, the god of metallurgy. He'd come out of the east like a bolt, and he was teaching these California idiots that science needed attention to first principles. Science had a tradition.

The Super Hornet revved up to an ear-hurting pitch. It was a fussy thing with a turned down nose, swing wings, and landing gear like a pelican's legs. Its speed, they hoped, would exceed 1500 miles per hour. But speed depended on the ability of the titanium wings and body to bear the stress of air friction and high speed turns. With cheers from the crowd the Super Hornet slid away and took flight abruptly. A lone cloud passed a hand over its wings. For the rest, the great sky mercifully absorbed the harsher details. There'd been no time for the pilot to radio ground since the failure, like all catastrophic failures, was instantaneous. After two passes at successively higher altitudes and a third sharp turn, the Super Hornet's wings separated from the fuselage with a muffled pop. The fuselage tumbled like a punted football. The pilot had the presence of mind and the sense of timing to eject when the fuselage was right side up. The three-piece aircraft now continued beyond the bay and over the ocean, its eccentrically weighted wings spurting flaming fuel until all three parts came together in a globe of fire and black smoke.

The pilot was fished from the water and Hurlock blamed the failure on wing design. He argued that the aerodynamic people had underestimated the high speed wing stress. Since he was a lone voice, the titanium idea was abandoned, along with the project. The Super Hornet became an object of derision among company engineers who hadn't been part of it, especially those at *Astro*, who saw missile making as more vital to defense than fighter planes. Hurlock became associated with the unwise choice of titanium. His part in the Super Hornet disaster became local lore, a tale told to young

engineers by the old: how the ambitious Hurlock wasted millions on a textbook dream. They dubbed him *The Father of Titanium.*

Hurlock continued through the long halls, passing giant rooms with endless rows of drafting tables and laboratories festive with blown glass or cold with computer banks. Fluorescent lights flickered as spaces began to fill with those coming to work early. Another day of science was beginning. This was a vulnerable time for the company, a time to complete one contract, the Atlas, and either roll back or keep climbing. The next priority in aerospace wasn't defense, but exploration. NASA had already awarded *Astro* the first moon-related project. This was Centaur, a vehicle which would study the moon. Centaur was a single vehicle mounted as a second stage on the Atlas and boosted into lunar orbit with its own engines. The spacecraft would orbit the moon, take pictures, eventually succumb to the moon's gravity, and crash into the surface. But eager to vindicate itself for the Super Hornet disaster, *Astro* agreed that Centaur had to fly or it would eat the cost, or a good part of it anyway. The problem was that the vehicle came apart at the welds as soon as it was fueled. Delivery had been put off, and Centaur was now a bone in the company's throat. Unfortunately the situation resembled that of the Super Hornet. A materials change was in order. The Centaur skin was made of a Stainless Steel alloy which had carried liquid oxygen so well in the Atlas, but which had less tolerance for the new fuel, liquid hydrogen, a substance nearly one hundred degrees colder. No metal could serve at that temperature, except, as Hurlock hoped to show, titanium. This was a special day for Hurlock, a day when the war would be won on

two related fronts. Personnel had found a position for Knapp, and test results on titanium welds were good enough to push for a material change on the Centaur.

As he swept into the MRL, ignoring the secretary waving her phone message slips, Hurlock had a single image in his mind: himself as a subatomic particle speeding through a magnetic field and colliding with a proton to release unbounded energy. By-passing his office, which was partitioned from the rest of the room, Hurlock caught a glimpse of his assistant chief, Ted Tefelski. "Terrible Ted," was buzzard-faced, with a sharp Adam's Apple and a sandpaper voice, a Chicago boy gone southwest: shoestring ties, tropical shirts, Navajo jewelry, an unlit Toscano cigar between his teeth. Tefelski burst out of his office to follow Hurlock, who stopped at the nearest desk to use the phone.

"Hello! Hello! Is this NASA-Houston? Thank you, operator. Hello! This is Hugh Hurlock speaking! Head of the Metals Research Lab at General Dynamics, Astronautics Division! I'd like to speak with Colonel Smalley of your Liaison Section!" Hurlock covered the mouthpiece and turned to Tefelski, who was leaning against a nearby desk, ignoring its occupant. He rolled the stogie around in his mouth as he waited for Hurlock's command.

"I want a three-way *telecon* with Doctor Jack!"

Tefelski picked up a phone and began pushing buttons. "Doctor Jack? Get him to the phone! Just have a technician take down the data!" Covering the mouthpiece, he said to Hurlock, "He's in the goddam cryogenics lab!" Then uncovering the mouthpiece, he

said, "Get him out of the lab! We're going to blow this Centaur project wide open and he's in the lab! Tell him we've got NASA on the line!"

This sudden activity had energized the office. Slackers began moving. To the sound of the supervisors' voices was added the more subdued conversation of the engineers as they took up their work by phone, or fled for the labs with broken pieces of metal.

"Colonel Smalley? This is Hugh Hurlock. Will you be at this afternoon's meeting? Good, Sir, I wanted to inform you in advance that we're requesting a materials change in the Centaur Lunar Orbiter, from a Three Hundred Series Stainless to Titanium Alloy Seven-Triple-X. That's right, Sir. We can't give the go-ahead on stainless at this point."

While Hurlock spoke, and for the benefit of those remaining in the office, Tefelski performed theatrical movements to show how all hell had broken loose at NASA's end of the line.

"Sir, we have the data to show Triple-X superior to Stainless at liquid hydrogen temperatures and we're moving for a mandatory change. I've got Doctor Warner of the Cryogenics Laboratory on the line, Sir, if you want to talk about our tests in more detail." Hurlock put the receiver to his heart momentarily. He breathed deeply and winked at Tefelski, who worked the phone buttons for the three-way. That conversation had barely started when Hurlock interrupted.

"Yes! Yes! But Colonel, Sir! The Stainless welds rupture every time we pressurize the fuel tanks! We're saying titanium can do the job based on tests so far! At least we deserve a chance to prove it."

Then something was said which made Hurlock slap his forehead to mark Smalley's stupidity. Tefelski looked around the office and shook one hand like a chimpanzee as if the anger of Tarzan had been aroused.

Hurlock went on. "No Sir! You don't have to remind me of the Super Hornet! That decision was based on faulty wing design! This is an entirely different application! Dr. Warner's already told you about our cryogenic tensile data, and this afternoon you'll see a report. Can I give you a guarantee? I'll say this. If titanium doesn't do better than stainless I'll go back to armor plate in Maryland! You'll see a report this afternoon, with micrographs to back it up."

He put down the phone, and turning to Tefelski and the few remaining men in the room, said, "Super Hornet! Why don't they see it's not the same!"

"Either they ignore us or they want a rabbit out of a hat," Tefelski said.

"He's convinced but won't admit it," said Hurlock, speaking to everyone in the room. "He has no choice. The Centaur flies with titanium. Now, where's Knapp? I want sixteen copies of that report by this afternoon!"

"He's in the metallography lab," said Tefelski.

Hurlock's first observation upon entering the lab was that the signs were still up. These were three-by-five cards taped on the cameras and microscopes with condescending reminders for care and usage - as if engineers didn't know how to keep

instruments clean. Even more irritating was the pretentious headline on every card: *Nota Bene*. As if Knapp knew Italian. Hurlock, who'd read Boccaccio, moved through the lab calling, "Knapp! Frank Knapp!" He pulled down every note card in his path. He stopped at the darkroom - the safe light was lit. Hurlock called through the door.

"Knapp? Are you avoiding me?"

"No Sir, Mr. Hurlock."

"Are the micrographs ready?"

"The proofs are in the dryer, Sir."

"Proofs? I need sixteen sets by this afternoon, mounted in the reports! You've had weeks to prepare all this!"

"The micrographs are in the wash, Sir. The complete reports will be ready on time, and you can count on it."

"They'd better be first quality."

"First quality to be sure, Sir. No dust particles, no water marks. They've all been reshot."

"I want to see a set before you do the rest."

"Not a problem."

"This is why budgets go up. Everything has to be done over. Luckily this situation is coming to an end. Knapp, bring that set as soon as possible. Then we'll discuss other business."

Hunched over his desk, Hurlock proofread the NASA report. It explained why titanium, when stressed by contact with liquid hydrogen, was nearly twice as strong as

stainless steel. Hurlock's theory was that welded titanium at liquid hydrogen temperature possessed a near-perfect crystalline structure. The energy powering its atomic flaws was greatly reduced, in effect cancelled by what he termed "the negative potential of supercooling." A new metallic phase obtained, titanium in a previously unknown and nearly perfect packing of molecular spheres. This was the reason for its great strength, a dearth of structural flaws which could be seen in the micrographs Knapp was preparing. Of course NASA wouldn't give a fig for his theory. It wanted performance. The theory was for the world of metallurgy, the noble scientific pursuit which supported all this mindless posturing by the military.

While Hurlock was absorbed in this speculation, which extended to an image of himself presenting a paper at the American Society for Metals yearly meeting, Tefelski came into the office and said, "Frank Knapp is quitting!"

"How do you know?"

"He just told me. He's on his way in here."

Tefelski left the office and Hurlock spun on his chair to watch the lower opening in his office partition. A pair of penny loafers approached, then turned into the doorway. The feet came to attention under a well-starched lab coat. What stood before Hurlock was a timorous, blemished mouse screwing up his courage, clearing his throat, working his mouth evasively, whether to form words or suppress a smirk, Hurlock couldn't tell. Knapp was holding out the set of micrographs. Hurlock took them and looked through. Luckily, they were acceptable.

Knapp said, "As you know, several micrographs had to be reprinted in accordance with your, I should say *our*, new standard of quality."

Hurlock's face heated up. "There's been no change in the standard here, Knapp, except as initiated by you, in the negative direction. I can't countenance your sarcasm any more, and we both know I won't have to. Charley Gruner has agreed to take your place."

"That's very well, Sir. You can consider this meeting my two weeks notice. I thought it was best we had a parting of the ways."

"A parting of the ways! Where is your truth, Knapp? Where do you stand? Have you ever expressed yourself honestly?"

"I have my truth, Sir. I have my private truth."

"Well you should make it public," said Hurlock, gripping his armrests tightly and rocking back and forth. This was the rotten underside of the country, moral vandalism, loss of pride in self and work. A man works for a company for several years, is removed for incompetence, and learns nothing. There was no way to tell him either.

"You are aware of company policy, that you can choose to leave us completely, or accept a position at equal pay. A job is open for you, but I must say it's not suited to a man of your qualities."

"And what qualities are required in this new post, Sir."

Ignoring the sarcasm, Hurlock read the job description. A technician was needed in Manned Environmental Subsystems, a group which packaged and sterilized everything in contact with an astronaut: food, clothing, all personal gear. Hurlock knew the department: everyone worked with hospital clothes and breathing masks.

"A job for a fastidious man," Hurlock said, feeling his blood settle with the satisfaction that Knapp would soon be gone. "Fastidious," he repeated. "Do you know what the word means?"

"I think so, Sir," replied Knapp, his eyes flitting to one of the partitioned walls, on the other side of which some staff had gathered to listen. "It means, I would think, a careful, well-organized man."

Hurlock nodded and dismissed Knapp with a wave of his hand. "Just get me sixteen reports by this afternoon."

Inside the locked darkroom Knapp worked on the reports. Collating reports was his most distasteful chore, something the secretaries did until Hurlock gave him the job as a means of harassment. But today he worked with great anticipation, for despite what he'd said to Hurlock, this was not the first day of his two week notice. This was his last day at *Astro*. After delivering the reports he would walk out the door. Knapp hummed while he worked. He had a little secret. The 'micrographs' being mounted in the reports did not correspond to the proofs just given to Hurlock. But they'd been developed with more care, more *fastidiousness*, than ever before. They'd taken nearly two weeks to prepare, which was why he'd asked Gruner to delay his answer when they were eating lunch that day.

Upon leaving *Astro*, Knapp would become art director for an ad agency in La Jolla. His new boss, in a hand painted tie and mismatched shirt, had looked over Knapp's portfolio and nearly lost his breath. Knapp's type of work suited the agency's style perfectly. The early photos were mainly a fascination with the process of multiple

exposure. They were simple juxtapositions: his nude wife stretched over a tuna can in an attitude of melting, cowboy boots on a pizza, a gravy covered breast on a dinner plate set with wrench and screwdriver. But as he refined the technique, he sought more meaningful backgrounds against which to place his subjects, which were often partial nudes reshot from photos bought at adult bookstores. Knapp then hit upon the idea of using microscopic metallic structures for background. A micrograph was a cross section through metal crystals. Since metals were diverse, infinite colors and patterns were available, all reminiscent of that kind of abstract art of which it had been said, "monkeys can do it." Such art was a metaphor for the modern condition. Knapp's work was found art. The combination which won the job was the placement of human images against metallic microstructures, macro to micro, the body in a matrix of nature's hidden secrets. And what more appropriate content for this form than Hugh Hurlock himself, *The Father of Titanium* on a field of his favorite metal.

Knapp had taken a mug shot of Hurlock with a stereoscopic camera when the supervisor had carelessly left his I.D. badge in the lab. The magnified photo exaggerated the original distortion of the institutional camera. A swarthy, unshaven Hurlock squinted from behind his tape-repaired glasses. He had the indirect look of the stunned refugee, the terrorist, the man surprised and hostile. It was easy to place the mug in different contexts. This would be no gratuitously obscene presentation, but a story in montage, something to secure Hurlock's legend in the *Astro* annals. Here was Hurlock with the body of Michelangelo's Creator, reaching into the void and touching a dialog bubble enclosing the chemical symbol for titanium, Ti. Here was The Fall, multiple Hurlock images with Porn

King bodies tumbling into the infernal region in a storm of aircraft debris marked *Super Hornet.* Next came Redemption, a Hurlock faced Centaur in flight, rising from the Burning Lake and galloping toward the moon with Hurlock's startled mug turned to the viewer.

Hurlock headed down the hall with the sixteen reports stuffed into his book bag, reports Knapp had cravenly dropped off while he was out of the office. He'd expected that. Now he hoped the rapid walk and the NASA meeting would do away with the unpleasant feeling in his stomach caused by the tension with Knapp. Picturing once again a particle whirling through a cyclotron, he swept into the meeting room, his footsteps immediately muffled by a sound absorbing carpet. He placed himself at the head of the long, polished wood table with executive swivel chairs at each place.

The audience was waiting: Erhardt, Tefelski, Dr. Jack, Colonel Smalley and assorted military aides, other interested staff from the MRL. Even Charley Gruner was there, at Hurlock's invitation. He sat next to Tefelski, who was rolling the unlit Toscano around in his mouth. Hurlock gave Gruner a pat on the shoulder to put him at ease. He would know the importance of his job today.

When all were all seated Hurlock handed out the reports. He apologized for not having advance copies, wanting to include "every last available datum." Then he announced he would allow the group some time to read the report before he gave his presentation.

In the rustle of pages Hurlock observed that the men read the report lazily, not looking for purpose or premise, only conclusions. And like magazine readers familiar

with format, they soon turned to the micrographs, the evidence which could be perused without being understood. When a look of intense scrutiny rippled over their faces, Hurlock wondered whether his observation had been unfair, whether these men, perhaps expert at speed reading, had discovered his report to be profound. Perhaps some of the military were metallurgists too. No doubt the report challenged them.

Hurlock saw Tefelski shake his head as if a longshot had come in. Dr. Jack looked poker faced, but Dr. Erhardt, usually smiling, now looked strangely serious as he flipped through the pages. He was reading now, getting down to business. Was the idea of a cryogenic transformation tickling the old Doc's gray cells? Did he understand Hurlock's theory? Might this sudden strengthening of titanium be called *The Hurlock Transformation?* Now Hurlock saw everyone smiling. They seemed to stop reading all at once, and their collective look was prolonged and pleasant, as if Hurlock were a different person. They seemed ready to applaud. Hurlock raised both hands for restraint, like a performer thankful to the audience but still having more to give. *The Father of Titanium*, indeed! He heard himself say, "Thank you, gentlemen. Thank you. Now I'll move into the substance of the report."

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