

The Subways of Tazoo

by colin kapp

While archaeologists continue to unravel the mysteries of former civilizations on Earth, science-fiction writers have been speculating on the possibility that one day we may find similar traces of alien intelligence on other worlds—Mars, for instance. Author Colin Kapp, however, takes us further away, to an alien planet with a lost civilization and the incomprehensible artifacts they left behind in their flight from what?

ONE

"Lieutenant Van Noon, report to Colonel Belling's office."

"Damn!" Fritz Van Noon glared at the loudspeaker. "Sounds as though Belling's back and on the warpath again."

"Can you wonder?" Jacko Hine helped him out from under the miscellanea of half-assembled pieces. "Let's face it, Fritz, some of our recent projects have come unstuck in a rather spectacular manner."

"True," said Fritz, "but never let it be said that the Un-orthodox Engineers have produced a damp squib. Always our results have exceeded our wildest expectations."

"Or Belling's wildest fears," said Jacko morosely.

As Fritz entered the office Colonel Belling half raised him-self from his chair in greeting. "Ah, Van Noon! Just the fellow I wanted to see."

"Sir?" asked Fritz suspiciously. Colonel Belling was not a man given to cordiality towards his subordinates.

Belling smiled wolfishly. "I've just returned from the General Staff conference. Since you re-instated the railways up on Cannis even the Old Man has been forced to admit that there may be occasions when unorthodox engineering has its virtues. For my part I felt impelled to point out that I'm trying to run a specialist engineering reserve, and that carrying the can for a complete squad of engineering illegiti-mates was not strictly within my terms of reference. As I explained, always I get stuck with the one engineer in a thousand who should never have left kindergarten, let alone graduated. The only repository I have for these mechanical misfits is the U.E. squad, where the damage they can do, if not exactly nullified, is at least anticipated."

"Isn't that a little unfair, sir? I mean . . ."

"I know just what you mean, Fritz, and I don't accept it. Engineering is a discipline, but the brand you apply is strictly delinquent. The outcome of the conference was that Colonel Nash, whom I'm beginning to suspect has masoch-istic tendencies, has volunteered to take the U.E. squad on the Tazoon enterprise."

Fritz considered this for a moment. "Exactly what are they doing on Tazoo, sir?"

"Supporting an archaeological team. Life on Tazoo is now extinct, but evidence tends to show that it once held a civi-lization as highly developed or more so than our own. In terms of knowledge to be gained it is probably the greatest find that space has ever given to us. It is doubtful if the Tazoons were human or even humanoid, and they became extinct at least two million years ago. Our problem is to pick up the remains of a complex mechanical culture as alien and as old as that and attempt to understand it

for what it was."

"I shouldn't have thought that was too difficult, sir."

"No, Fritz, I never supposed you would. That's partly the reason you're going. Your inverted-sideways approach is the nearest thing to an alien technology that we've got. That makes you a specialist."

"Thank you, sir," said Fritz warily. "And the other part of the reason we're going?"

"The climatic conditions on Tazoo are such hell that the average rugged ground-cat has a useful working life of about two weeks. That means the archaeologists can't explore enough from base to get at the really big finds they are certain exist. Fritz, I want you to provide them with transport to where they'll be most use—and if you don't, you'd better find another engineering reserve to come back to, because if you come back here . . ."

"I know," said Fritz unhappily, "you'll make me wish I'd opted to transfer my retirement pay to Tazoo."

"You know, Fritz," said Colonel Belling, "for a moment we reached a point of real understanding there. I think I'm going to rather enjoy the thoughts of you and the U.E. squad sweating it out in a hell-spot like Tazoo."

Touchdown on Tazoo. The transfer ferry had no viewports and afforded no opportunity for its passengers to receive a preview of their destination. Even the ground-cat which rendezvoused at the landing site close-coupled its hatches with the ferry's air lock before the transfer of passengers and goods began. In the cabin of the ground-cat, shutters likewise obscured the view and cheated Fritz of his moment of revelation.

"Allow me to introduce myself," said the cabin's occupant. "The name is Philip Nevill, Archaeologist in Charge."

"Van Noon," said Fritz. "Engineer extraordinary—and this is Jacko Hine, one of my staff."

Nevill grinned affably. "Your reputation preceded you, my boy. Frankly, when I heard of you I persuaded Colonel Nash to get you here at any cost. There are things on Tazoo it'll take a very liberal mind indeed to understand."

The ground-cat struggled away from the ferry, its engine coughing in asthmatic complaint.

"So I've heard," said Fritz. "Look, do you mind if I open the shutter for a second? I'd like to know the worst right from the start."

"Help yourself," said Nevill, "but I promise you it's a passion you'll soon lose."

Fritz fought the shutter from the window and peered out for his first glimpse of Tazoo. Heavy cloudbanks filtered the furious sunlight to a brilliant monochromatic red which hurt his eyes and rendered all colours as shades of red or the darkest, sooty black. The terrain itself was nothing but a lumpy, featureless waste as far as the eye could see.

"Satisfied?" asked Nevill.

Fritz dropped the shutter back with a clang and closed his eyes.

"Painful, isn't it?" asked Nevill. "Normal endurance is about forty minutes before red-blindness sets in. Very bad for the eyes, to say nothing of the psychological effects. Incidentally, the ultraviolet radiation for two hours after dawn and two hours before sunset is strong enough to take the skin off you in about three minutes flat."

"Charming!" said Fritz. "And what's it like at midday?"

Nevill raised his eyes to the ceiling. "Ruddy awful!" he said.

At the blare of the ground-cat's horn Nevill opened the shutter again. "There's the base—way over yonder."

Fritz scowled at the blood-red panorama. Perhaps half a kilometre away was the base, like a cluster of cherries half-submerged in a waste of pink icing.

"Underground, eh? A very sensible precaution."

"It isn't underground," said Nevill in a slightly aggrieved tone. "It's a surface installation."

"But I don't see anything but some almighty balls of mud."

"They're standard Knudsen huts with a protective skin on. There's a sandstorm that whips up every night which would sandblast an unprotected Knudsen to a skeleton before dawn. We spray each hut weekly with a highly plasticized poly-polymer which is reasonably abrasive resistant. The plastic traps some of the sand and this materially increases its resistance, but builds up and completely ruins the shape."

Abruptly the engine of the ground-cat coughed and died. Nevill held a rapid exchange over the intercom with the driver.

"Engine's gone," he said finally. "Either the carburettor's etched away or the damn sand has got into the cylinders— or both. Anyway, the cat is a write-off for all practical purposes, so there's nothing for it but to walk—and it's too near evening for that to be funny."

They descended from the cabin, Fritz and Jacko choking quietly in the acrid air which caught at their noses and made their lungs feel raw. Nevill, acclimatized, was surveying the sky anxiously. Above them the swirling cloudbanks, blood-red trailing into purple and black, plunged across the darkening sky so low that Fritz had an almost compulsive desire to put up his hands to see if he could touch them. There must have been a high wind above, for the cloudrace was certainly moving at better than a hundred kilometres an hour, yet on the ground the warm humidity was deathly still, as though a sheet of glass insulated them from the driving turbulence.

Nevill was worried. "Looks like a storm," he said.

"Is that bad?" asked Fritz.

"Only if you're unlucky enough to be out in it. Let's hope it's a wet storm. They're decidedly uncomfortable, but not usually fatal if you can get to shelter quickly enough,"

"Why, what happens?"

"Nothing spectacular if you can find shelter from a hundred kilometre per hour damp sandstorm and if you happen to have sufficient alkali available to neutralize the rain on your skin."

"Neutralize the rain?" said Fritz, his voice rising. "What the blazes is in it?"

"Oh, about five per cent sulphuric acid plus a trace of hydrogen chloride with a little free ionized chlorine. Stings like hell, but it's better than a dry storm."

"I'll buy it," Fritz said helplessly. "If a wet sandstorm is equal to an accelerated metal descaling process, what's a dry storm equal to?"

By now Nevill was deeply concerned, scanning the furious cloudrace with worried and experienced eyes. They were still three hundred metres from the nearest part of the base, with Jacko and the driver close behind.

"I think you're going to have a practical demonstration of a dry storm, Fritz. If the smell of ozone becomes intolerable or if you hear anything like a bee buzzing don't hesitate —just drop to the ground as fast as you are able. If you can find a hollow then roll into it, otherwise don't bother —but whatever you do, be quick."

"A bee buzzing?"

"Air ionization path, the prelude to a lightning bolt. There's a few mega-megavolt not many metres up in the cloudrace, and it packs a current that can not only char a man but also fuse him very neatly into the sand. The carbon from the body reduces a great many metal oxides in the ground so that the resultant slag forms a remarkable range of glasses."

"Forget the chemistry," said Fritz hastily. "I never could see myself making a very convincing paperweight."

"Then drop!" said Nevill, suiting action to the words.

They all dropped to the ground. Fritz's nose didn't have time to detect the ozone, virtually paralysed as it was by the existing acidity, but his ears did register the sudden buzz which Nevill had anticipated by a half second. Then the lightning bolt, a blaze of vivid energy a mere thirty metres distant, spat like a column of angry fire rising to the heavens. The noise and the shock-wave of its passing stunned them momentarily. By the time they had collected their wits only a generous patch of fused sand and a choking concentration of ozone marked the spot where the bolt had struck.

"Bad!" said Nevill, "Worst I've seen. It's striking low ground, which means we have no possible cover out here. Best throw away any metal you may have on you and try to crawl back nearer to the cat—but for Pete's sake keep your heads low."

Another bolt of lightning, bigger and nearer than the first, stabbed into the sand behind them like the bursting of a shell, followed by three almost simultaneously in the near vicinity.

Desperately slowly the party crawled back towards the cat, which stood as the pitifully-low high-spot of this particular area of terrain. On all sides of them now the jagged lightning cut into the ground with burning shafts of vicious energy, like the arrows of retribution fired by some crazed electric god. Then a shaft burned down on the cat itself. The fantastic current fused the metal into a white-hot bauble which was ripped open by the expanding air within. Before their horrified eyes the cat sank like a lead toy thrown on to glowing embers, and became a duty, slag-shot puddle of mixed metal and silicates alloying with the red sand of Tazoo. Then mercifully it began to rain. Nevill turned his face to the stinging, acrid precipitation and let out a howl of pure relief. A few seconds later they were running like half-blinded madmen through the corrosive waters in the direction of the base camp, heedless now of the cracking lightning which had withdrawn to the edge of the rain belt. They were fortunately within a few steps of the base when the wall of sharp, abrasive sand, whipped to fury by a fantastic driving wind, bore down upon them out of the deep purples of the approaching night.

two

"Welcome to Tazoo, Lieutenant!" Colonel Nash beckoned him into the office.

Fritz explored the still-smarting skin on his face and hands, and was still painfully aware of the puffiness around his eyes. "Thank you, Colonel. That was quite an initiation ceremony out there!"

Colonel Nash smiled fleetingly. "Unpremeditated, I assure you, but the weather is part of the reason you're here. A ground-cat is the toughest machine available, but as you saw for yourself it is totally incapable of standing up to the environment. The low pH of the celestial waters conspires with the sand to etch and tear the guts out of any transportation contrivance we've yet imported to Tazoo. When you consider atmospheric chlorine, hydrogen chloride, free sulphuric acid and ozone, plus high humidity and extreme ultraviolet radiation together with an additional nightly sand-blast, you can guess that corrosion prevention is not the least of our troubles."

Fritz shuddered involuntarily.

"I must admit," said Nash, "that I haven't always seen eye to eye with you before on the subject of unorthodox engineering, but if you can solve our transport problem I shall at least be open to persuasion. Certainly no orthodox engineers can give us transport on Tazoo at a cost less than the total budget for the entire enterprise."

"What facilities have we?" asked Fritz.

"On Tazoo—anything you can find. If you need anything shipped out from Terra you'll need a damn good case to get it because of shipping costs. Certainly we can't afford to bring any more vehicles out here. Now it's up to you to delve into your unorthodoxy and come up with something practical."

"How is the Tazoo enterprise going?" asked Fritz.

"Slowly," said Nash, "largely because of the aforementioned transport limitations. Nevill's team have uncovered a lot of architectural monstrosities, but the real prize will come if they can find some of the Tazoon mechanical artifacts. If they do, and if they are one half as weird as the rest of the finds so far, it will require all of your peculiar genius to identify and interpret them. We're expecting to find some very unorthodox engineering from a culture which died before the end of the Pliocene period on Terra."

"What signs are there to indicate that they had a highly scientific culture?" asked Fritz. "Surely the finds so far don't indicate very much."

"The preliminary survey party found signs that the Tazoons had reached both of the Tazoon satellites, and we're reasonably certain that they also reached the next planet sunward in this system and actually established a base there."

"All this sounds highly promising," said Fritz. "But two million years is a long time. Would there be anything left of machines and mechanisms after such a period?"

"Nevill theorizes that to develop a high-level functional civilization the Tazoons must have had some pretty good engineers who would have been making due allowance for the make-up of the Tazoon atmosphere. Furthermore, the moist conditions don't penetrate very far down into the sand, so that the deeper an artifact is buried the greater are its chances of almost infinite survival. Deep exploration at a really promising site should give us a slice of Tazoon civilization in a very reasonable state of preservation. We need only one good site to justify the whole Tazoon enterprise."

The next day Fritz found Philip Nevill in the Archaeological H.Q., apparently none the worse for his previous day's exposure.

"Hullo, Fritz, my boy! What can we do for you?"

"I hope you can answer a question. Do you know what happened to the Tazoons themselves—I mean, why did they become extinct so swiftly when they had achieved such an apparently high technological level?"

Nevill scowled. "You're equating technology with the ability to manipulate environment and thus ensure a higher survival potential. Well, I'm afraid I can't answer that. Indications are that they abandoned the populated areas *en-masse* and migrated towards the equatorial regions. From distribution figures it looks as though the entire population set out for the tropics and were decimated on the way. This suggests they were fleeing from something biologically intolerable which claimed a great number in flight."

"Drastic climatic change?" asked Fritz.

"Climatic, no—environmental, possibly. We looked for evidence of major climatic changes, but there's nothing significant that we can trace. The only thing that is recent, geologically speaking, is the sand."

"The sand?"

"Mm! Probably the result of some ecological imbalance. The major plains appear to have once included prolific forests such as are still to be found in places around the temperate belts. For some reason, drought or fire or blight perhaps, these forests died. The results were typically Ter-ran in their pattern."

"Soil erosion?"

"Yes, and on a catastrophic scale. Once the sand got to work on the unprotected soil nothing thereafter got the chance to germinate. We're still picking up viable seeds from the deep diggings, but all the shallow seeds are either dead or had started growth and been uprooted."

"When did this happen—the erosion?"

"We can't tell with certainty, but it appears to slightly pre-date the extinction of the Tazoons themselves. Whether these two factors are related is something only further re-search can prove. Does that answer your question?"

"Yes, but only to pose another," said Fritz. "I don't understand how any culture technically able to explore the neighbouring satellites could have been wiped out by anything as foreseeable and reversible as soil erosion. And why migrate to the tropics when the soil fertility remained in the temperate belts?"

"I don't know," said Nevill. "It's a difficult problem. The Tazoons were not even humanoid, and the probability is that neither their physiology nor their logic had anything in common with our own. It could be misleading if we attempted to interpret their actions by simple extrapolation of what we might have done in similar circumstances."

"A good point," said Fritz. "I don't necessarily agree with it, but I'll bear it in mind. Thanks, Philip, you've given me something to think about."

Having established that the U.E. squad was reasonably well quartered, Fritz turned his attention to the transport problem. This brought him back to Jacko who had compiled a transport survey which he presented with as much enthusiasm as if it had been his own death warrant.

"We're in trouble, Fritz. Of the hundred ground-cats originally provided for the enterprise only twenty are still functioning. Two hundred hours operating life on Tazoo reduces a cat to a condition where you couldn't sell it for scrap value. By sorting bits and pieces we could probably reconstruct another five cats, but we can only reckon on a maximum of six thousand operating-cat-hours before we start walking."

Fritz stared disconsolately at a virgin notebook. "What about tractors and heavy equipment?"

"They're not too bad—but only by virtue of the fact that most of them are still in sealed crates. Once they're broken-out there's no reason to suppose they'll last any longer than the cats do. This combination of corrosion and abrasion is something to which I'd not cheerfully expose a clockwork mouse."

"I take your point," said Fritz. "As I see the present requirements it doesn't give us much over a sixty-day trans-*port* potential. What protection can we give to the cats to extend their working life?"

"A lot of a vehicle we can plastic coat, as they do with the Knudsens. The engines are a more difficult problem. Some genius thought of providing them with standard aluminium-alloy turbine housings, and what the Tazoon atmosphere does to the alloy makes my flesh creep. Even the vitreous liners devitrify and release particles of silica into the bearings."

"Don't bother to describe," said Fritz, "what silica does to the bearings. I think we have to face the fact that while we might save most of the cats themselves we aren't going to be able to save many of the engines. We could devise a system of enclosing the engines in an inert atmosphere—but I doubt if we have the facilities here to do a permanent job. We then also need a supply of controlled pH, moisture-free oxygen for the air intake. I think we could produce that by electrolysis, but I doubt if we can handle it in sufficient quantities to be of much value."

"And so on *ad-infinitum*," said Jacko ruefully.

Fritz nodded. "Let's try it anyway. I want two cats modified. Plastic spray them everywhere possible, and seal the engine compartment and fill it with a nitrogen and hydrogen mixture of non-ignitable composition. Get our micro-Linde column working for the nitrogen and make an electrolysis plant for the hydrogen. You'll need both the Linde and the electrolytic plant to get enough oxygen for the air-supply for the engine intakes, and you'd better dilute the oxygen with any nitrogen you can spare, then adjust the turbines to run on that."

"And what do I keep the oxygen in?" asked Jacko.

"They've a fair supply of the plastic poly-polymer they use for spraying the huts. It shouldn't be beyond our capacity to blow a gasbag from that."

"It all sounds feasible," said Jacko, "but I doubt the capacity of the micro-Linde to give us all the nitrogen we need."

"So do I," said Fritz, "that's why I said to modify two cats only. There's plenty of other things to try, but this is the most obvious, and we've neither time nor the resources to start nitrogen fixation in a big way." He went to the window, opened the shutter and stared moodily out at the red and featureless wasteland.

"Sand," he said. "Nothing but sand, fine-grained, abrasive and all-pervading. What we need, Jacko, is something completely new in the way of transport on Tazoo. I wonder what the Tazoons themselves employed."

Three days later and the modification of the cats was in full swing when the telephone rang.

"Van Noon speaking."

"Fritz, Nevill here. I've got some work for you."

"Bring it over," said Fritz. "A little more won't make much difference."

"Right. Be with you in about ten minutes. It's one of these Tazoon mechanisms we've been looking for."

"Now you have me interested," said Fritz. "Exactly what is it?"

"That's what I want you to tell me."

Ten minutes later Nevill arrived and ceremonially knocked out his pipe on the threshold in deference to a large no-smoking notice over the jury-rigged electrolysis plant. Then he signalled to his assistants who dragged a large object into the hut and dropped it on the floor. Fritz looked at it dubiously.

"I think you've come to the wrong department. It looks like the great granddaddy of an alien chicken wishbone once belonging to some granddaddy alien chicken. Why not present it to the biology boys?"

"I did," said Nevill, "but they sent it right back with the message that you were responsible for investigating ma-chinery."

"Machinery?" Fritz surveyed the acquisition moodily. "Have you tried it on the catering department? Perhaps they could turn it into some sort of broth."

"Machinery," said Nevill firmly. "And I'll tell you why. It isn't animal, it's vegetable—Tazoon ironwood to be pre-cise. Also, it didn't grow that way. It was manufactured, or at least trimmed to shape, as witness the tooling marks. Furthermore, the Tazoons were plenty fond of them because the Southern plain out yonder has them at an estimated density of nearly half a million to the square kilometre."

Fritz choked for a full half minute. "Half a million?"

Nevill nodded. "And that plain is pretty big. If the sampling we have done is representative of the whole area there could be something like five thousand million of those on that one plain alone. I know the Tazoons were alien beyond our conception of the word, but I just can't see them producing that many just for the hell of it. That would be an exercise akin to paving the Sahara desert with pencil sharpeners. It's my belief that the wishbones are something functional. I want you to tell me what they were and what their function was."

Fritz nodded. "I'll let you have a preliminary report in a day or so, but if that's a machine I should hate to see their idea of a great big alien chicken wishbone."

After Nevill had left, Fritz spent a quiet hour examining the wishbone from all angles and going all over the surface of it with a magnifying glass looking for clues as to its function. Then Jacko had the wishbone hauled to the work-shop for a more thorough examination. He reported back when the work was completed.

"I think we have something here, Fritz. You know those nodules on the inner surfaces, well, the fluoroscope shows a dark mass of some foreign material in each. If you're agreeable we're proposing to cut one out and see what it is."

"Start cutting," Fritz said, "because if this is a sample of Tazoon engineering then the sooner we start to come to grips with it the better."

Reluctantly the handsaw cut into the ancient ironwood. Halfway through, the blade screeched complainingly on some hard inclusion. Then the nodule became detached, and from inside it Jacko shook a large, bright crystal on to the table.

"I thought as much," said Fritz. "There are metal fibres in the structure of the wishbone and metallized facets on the crystal. On this evidence I'd say this was some form of piezo-electric device. And see how the crystal is drilled— do you suppose there could have been strings across the wishbone?"

Jacko counted the nodules equal on both sides. "Lord, a harp!" he said in a voice heavy with incredulity.

"Or a sound-transducer," said Fritz. "There are common electrical paths through the ironwood, and connections to the crystals. If you applied an alternating current to those contacts, the crystals would excite the strings in sympathy according to the resonant frequency of the particular system. I wonder what on earth it would sound like? Jacko, start re-stringing what's left of this thing while I sort out a power amplifier and a few bits and pieces. Together we can make some beautiful music."

"Right," said Jacko, "but if your conception of music is anything like your engineering I'm going to take time out to make some earplugs too."

THREE

It took three hours to complete the assembly. Fritz disappeared to the communications hut and returned with an assortment of equipment which he appeared to assemble more by inspiration than by design. When everything was ready he switched on. The first results were shattering, and the electronics needed drastic revision before a reasonably tolerable result was obtained.

After some final adjustments Fritz pronounced himself satisfied with the results and dropped into a chair to listen attentively, his gaze wandering to the open shutter and the blood-red sunset trailing nakedly beyond.

"Listen to it, Jacko!" said Fritz happily. "Alien and beautiful beyond recall."

"I might just point out," said Jacko, "that if somebody attempted to re-string a two-million years old grand piano with stranded cable and without any idea of the scale and pitch involved, the results would sound equally alien."

"I'm in no mood to quibble with one who possesses such a tiny soul," said Fritz. "To me this is music

such as the ancient Tazoons knew it as they walked hand in hand in the eyeless evenings of old Tazoo. Can't you imagine it, Jacko, this incredible music voiced by a million harps in the blood-red twilight of this alien land?"

"It makes my head ache," said Jacko. "What are you feed-ing into the blasted thing, anyway?"

Fritz coughed. "Actually it's the telemetry signals from the satellite monitoring the Tazoon ionosphere, but the harp con-tributes about five-hundred per cent distortion, so you never know it from music."

"I can't help feeling distinctly uneasy," said Jacko, "about the notion of anybody wanting half a million crazy self-playing harps to the square kilometre. No culture could be that fond of music and yet survive."

"They didn't survive. And we can't yet hope to understand so alien a culture. If you want a parallel, think of all the millions of personal transistor radios taken to the beaches on Terra on a public holiday. Think how much simpler life would be if they erected loudspeakers at four-foot intervals on all beaches and made full-time listening compulsory instead of merely unavoidable."

Despite the warmth Jacko shuddered visibly and closed his eyes, while the complex tones of the harp sang strangely with unfathomable harmonies which did curious things to his stomach. "I'm beginning to get the idea," he said, "exactly why the Tazoons decided to migrate. Listening to this, I get precisely the same urge myself."

At that moment the door was flung open and Nevill, eyes aglow with jubilation, burst into the hut.

"Fritz, we've done it! A real find at last. To judge from the extent of our soundings we seem to have hit upon the location of a whole damn Tazoon city under the sand."

Fritz bounded up with enthusiasm. "Congratulations, Philip! This sounds like the breakthrough we've been wait-ing for. Exactly where is this site?"

"Under our very noses—about twenty kilometres east of here. I tell you, Fritz, my boy, there's a real metropolis down there."

He stopped, aware for the first time of the singing harp.

"What in the name of Thunder is that?"

"A genuine Tazoon harp in action," said Fritz modestly. "Don't you like it?"

"No," said Nevill, "because it isn't right. Nobody, however alien, would want more than one of anything that sounds like that. Besides"—he mopped the moisture which had risen on his brow—"the Tazoons had very small ear cavities. Their audible range was undoubtedly in the medium ultrasonic. Frankly they could never have heard anything pitched as low as that. Sorry! Try and make it do something else like light-ing fires or something."

And so saying, he was gone, leaving Fritz looking miser-ably at his equipment and trying to avoid Jacko's eyes.

"All right," said Fritz, "so even I can't always be right first tune." He turned off the amplifier disconsolately. "I still think it was a good idea."

"That's the second of your good ideas that has run off the rails today," said Jacko, fingering his ears.

"Second?" Fritz looked mildly surprised.

"Yes, I forgot to tell you. Your idea for obtaining pure nitrogen for the cats by fractional distillation in the micro-Linde didn't solve the problem, it merely transferred it. The blasted Tazoon atmosphere's eaten the guts out of the Linde compressor."

"That was all I needed to make my day!" said Fritz. "You'd better get the boys together, Jacko. I want every repairable ground-cat and tractor prepared for operation, and as much heavy lifting and moving tackle as we can acquire."

"What are you planning, Fritz?"

"Let's face it, Jacko, we can't keep enough transport in service to do the daily forty-kilometre round-trips to the new site for very long. If that's a major site they've found there won't be much point in having a base camp this far distant. The logical thing to do is expend all our resources, moving the whole base to the new site."

"Are you crazy?" asked Jacko. "It'd take months to dis-mantle this lot and transport it that far."

"I said nothing about dismantling. A Knudsen hut is a unit structure. It is capable of being moved as a whole. Can you think of any reason why we shouldn't just attach a cat or tractor to each hut and haul it bodily over the sand to the new site?"

"Yes, Colonel Nash and the base psychiatrist, to name only two. A Knudsen could never stand a belting like that and finish in one piece."

"Ordinarily, no, but these have been covered with alter-nate layers of resin and sand to a thickness which has be-come ridiculous. Dammit, Jacko, you've got a metal and sand-filled resin laminate there which must have all of a hundred and fifty times the strength of the original hut."

"You're dead right, of course," said Jacko. "But I'm going to love thinking of you trying to explain it to Colonel Nash."

"All right," said Nash at last. "You can start moving the base just as soon as the necessary cables and services have been laid. I don't need to remind you that everything has to be fully secured by sundown. And I warn you that if anything goes wrong ..."

He leaned back speculatively for a moment.

"You know, Fritz, I must confess I'm disappointed. I'd expected great things from unorthodoxy, but when it comes to the point you can't even promise to keep a decent transport system in operation."

"A snowflake," Fritz protested, "wouldn't stand much chance in Hell unless you had a ton of refrigeration equip-ment alongside. The fault is not being in Hell, but in being a snowflake. You've got a roughly similar position with your cats on Tazoo. A suitable cat could easily be designed for these

conditions, but it would need Terran resources to build it and a long haul to bring it out here. The cost would be astronomical. The limitation is in associating transport with the idea of a ground-cat."

"I'm perfectly aware of that," said Nash. "In fact it's the reason I sent for you. You have the reputation for producing the impossible at very short notice. All right—I challenge you to produce."

"Miracles we perform immediately," said Fritz quietly. "The impossible takes a little longer. After all, we've only been here a week."

Nash watched him narrowly for a moment. "Fritz, frankly I don't believe anybody has the remotest chance of doing what I ask, but I'm calling your bluff. If you have any sort of transport running on Tazoo in three months' time I'll be glad to take back all the harsh things I've ever said about U.E. If you don't I'll have to send you back to Terra. The Tazoon enterprise wasn't designed to carry any dead weight."

"It's a challenge I'll accept," said Fritz, "but don't expect to equate transportation with any vehicular form you're used to, because the chances are a million to one against it looking like anything you've ever seen before."

Jacko was waiting for him outside the office.

"Bad?" he asked.

"Not good," said Fritz. "We've got three months to crack the transport problem or get kicked out as a bunch of no-good layabouts. The honour—even the continuance of U.E. —is very much at stake. Somehow we've got to contrive some sort of vehicle, and this in the face of the fact that we have no source of constructional material capable of withstanding the Tazoon environment."

"So where do we go from here, Fritz?"

"Damned if I know. You go and check the arrangements for the big move. I'm going over to the site to see how friend Nevill is doing. He may have dug up a little inspiration out there—and Heaven knows I could use a little right now."

Nevill saw the cat drawing across the rouge desert, and came to the edge of the workings to await Fritz's arrival.

"How're things going, Philip?"

"Wonderful, my boy. We knew we had a major find, but this—this is paradise! We're going straight down on a major city by the look of it, and the stuff on the lower levels where the sand is dry is in a perfect state of preservation. Some of the three-storied buildings are so sound that we'll be able to use them for our own purposes. I tell you, Fritz, the Tazoon enterprise looks like paying off about two million per cent interest. The complete analysis of the stuff found here will occupy generations."

Fritz gazed down into the broad quarry which was the site of the workings. On every hand the feverish activity of the archaeological teams pointed a measure of the excitement and enthusiasm which infected everyone concerned. The shifts had been voluntarily lengthened, but even so, the end of the shift

period had to be declared a compulsory cessation of work lest those on the trail of such immeasurable archaeological delights should endanger their health by continuing until they dropped from exhaustion.

Here and there alien towers were already exposed above the sand, unimaginable obelisks of incomprehensible architecture, curiously distorted and decayed by time and the ravages of wind and sand. Some, the sand shored back to greater depths, were firmer on the lower levels, and the architecture was even more marvellously and more inconceivably wrought. Occasionally, vertical pits descended at points where logic had decreed there lay something more intriguing or exciting or yielding greater bounty for the effort it entailed.

Fritz was fascinated beyond measure. The clawing other-worldliness drew his imagination on with an inescapable lure. As an engineer he fought to tame the logic of the structures which were being uncovered before him, but something in his soul, poesy perhaps, denied him an identification of parts and trapped him in the wonder of the whole. He was the technician who came for a dispassionate analysis and stayed to worship.

With great resolve he wrenched his mind from its journeyings and looked at Nevill appealingly. The latter patted him on the shoulder sympathetically. "I know, my boy," he said. "It takes us all like that. It's both wonderful and sad to be uncovering the remains of so great a culture: wonderful because the culture was so great, and sad because we find their city empty of the creatures who created it."

"Why the hell did they have to go?" asked Fritz. "After they'd got all this way? They had mastered their environment to a degree comparable to ourselves, then in the space of a few short centuries they faded and died away and the sand moved in and covered all then" marvels. But for what reason did they go? It's something we must discover lest it also comes upon us."

four

By sundown the last hut had been transferred to its new position near the workings. The day had been one of great activity intermixed with frustration. As Fritz had foreseen the huts had proved themselves capable of being moved bodily across the sand, but the condition of the cats and tractors was such that the path of the move was plainly marked with a trail of abandoned vehicles spread broadly across the sandy steppes. Indeed, by the end of the day only five cats remained in operation.

After organizing a team to recover any repairable cats, Jacko went to look for Fritz and found him in the work-shop idly strumming the Tazoon harp with the air of a man evoking the muses as an aid to inspiration.

"You know, Jacko, I wish I could work out what happened to the Tazoons. I simply can't understand

why such a highly advanced and organized culture should suddenly fall to pieces. There's no suggestion of a major war, and there's not sufficient radioactive material on the planet to make a nuclear holocaust a possibility. It's a highly disturbing thought that a catastrophe which could destroy a race with that level of technology could leave so little trace. It's as though they suddenly closed up their cities and walked out to die on a mass trek to the equator."

"What about famine?" asked Jacko.

"Possibly. That's virtually what Nevill suggested—wide-spread soil erosion. For some reason the major forests in this zone died suddenly. That rather suggests a prolonged drought—but you'd think a major technology fighting for survival could cope with even that. The sea is an atrocious mineral stew, but I'm willing to bet you could distil enough water to maintain a pretty fair agricultural belt if the need arose."

"But without nuclear energy where would you get that sort of power?" asked Jacko. "Distillation of sea-water on that scale would take a great deal of energy."

"Power!" Fritz sat up. "Now there's an idea! Come to think of it, where did they get their power from anyway? Let's put a few facts together. We know that at a certain stage in the history of Tazoo something happened—some-thing which in the span of a couple of centuries destroyed the civilized inhabitants of the planet. Curiously, the wild-life forms survived for a considerable time afterwards, and some are still to be found in the forest belts. Now the basic difference between civilized and wild-life forms is that the former are power dependent animals while the latter are not. Jacko, my dear fellow, you may have hit upon some-thing there."

"It's just a gift," said Jacko modestly.

"Then seeing it didn't cost you anything, see if you can stretch it a little further. Let's play for a moment with the assumption that the Tazoons had become power-dependent animals—as we have ourselves. What would their basic source of energy have been if it could have failed suddenly and disastrously?"

"Oil or natural gas, perhaps," said Jacko.

"Not very convincing. By all appearances the Tazoons were great power users. From what Nevill's uncovered recently I'd say the power consumption in this area alone must have been quite fantastic even by Terran standards. Now, you don't develop a heavy power-consuming technology unless you've a good idea that you have the resources to maintain it. To do otherwise would be technological suicide."

"That's assuming they thought about the problem in the same way that a human being would."

"I wouldn't know about human beings," said Fritz drily, "but engineers I do know about, and their thought processes must be essentially similar whether they have one head or six. There are an infinite number of ways of solving any engineering problem, but the simpler answers will always look familiar. It's just the nature of the beast. Give a ten-armed Dingbat a head of steam and tell him to convert it into electrical energy. I don't care what the influence of his racial characteristics, training or personal

geometry, somewhere, at some point, he's going to fall into a chain of logic familiar to engineers of similar calibre anywhere. Ergo, I don't think we can go far wrong if we tackle this problem from our own standpoint, and currently we are assuming they had a power supply which appeared infallible yet failed. Now we need to know what was the source of that energy. If we knew that maybe we could work out why it stopped."

The telephone rang and Fritz answered it. Nevill had been searching for him,

"Fritz, I'd like to see you first thing in the morning. There's something I want you to take a look at."

"Right! Something promising?"

"I imagine so. The team has just uncovered something which looks like the entrance to a mine of some sort. Perhaps you'd like to look it over."

"We'll be there first thing," said Fritz.

"What's up?" asked Jacko.

"Nevill's team have discovered what he thinks may be the entrance to a mine."

"In the centre of a city?"

"The same question occurred to me," said Fritz. "I don't think that a mine is particularly probable, though it might just be connected with our lost energy source—or he may have stumbled on something I've been looking for myself."

"What's that?"

"Jacko, in a city as large and as complex as this one appears to be, where's the logical place to put the bulk passenger transport system?"

"Underground," said Jacko, "same as always."

"Precisely, and that's what I'm hoping Nevill's hit upon."

"God!" said Jacko. "An alien subway scarcely bears think-ing about."

Further in from the door they had to use flashlights. Here the sand had not penetrated so deeply, and by the time they had reached the head of the shaft only a brief dusting covered the floor.

The shaft was equipped with the normal Tazoon-type stair-way—a central pole with round horizontal bars set in a helix, but on a broader pattern than they had encountered hitherto and with a deeper pitch. Such a stairway was not adapted to human physiology, but it was traversable—just— by those with climbing experience or suicidal tendencies. Jacko had neither.

"Down?" he enquired, his flashlight failing to probe the darkness of the alien depths.

"Down," said Fritz. "Where's your sense of adventure?"

"It remained firmly embedded in my childhood," said Jacko, "along with the sense necessary not to get

into situations like this."

"Down!" said Fritz firmly, and suited actions to his words.

Together they climbed down perhaps one hundred metres. Since it was impossible both to climb and hold a flashlight, this was accomplished in total darkness, and the steady rhythm of the climb from bar to bar exercised its own almost hypnotic fascination. Both had to stand for many seconds at the bottom to re-orientate their senses.

The preservation of the passageways at that level was remarkable and probably complete, and the air was cooler and less aggressive than above. Remarkable also was the dryness of the connecting tunnels which had lain for so long at such a depth, indicating the complete lack of a water table above the level of the deep-welled seas of Tazoo. The walls here were of metal, curiously wrought in a manner which might have been functional or might have been symbolic; and the alien strangeness of a completely artificial Tazoo environment gripped at their hearts with a half fear which had nothing to do with self-preservation. For the first time they felt the full impact of standing in the presence of the logical but unimaginable achievements of a culture which had no common roots with their own. They could vaguely comprehend but never predict the unfolding of the unearthly technology which surrounded them.

Machine or effigies, they had no means of knowing which, stood like dark, mute sentries in the uncertain, shifting shadows of the flashlamp's beam: the tortuous walls and fluted ceilings were channelled and moulded with a thousand metal mouths connected to unguessable throats for unfathomable reasons—only the floor approximated its Terran counterpart, having a common engineering function of providing an unimpeded pedestrian passageway.

They turned another corner and stopped abruptly when the flashlamps' beams soared into empty darkness and encountered nothing. Their consternation was relieved by the realization that they were now looking along the length of a vastly greater tunnel than any they had so far traversed. Vaguely they could trace the complex vaulted roof rising to its apex in a series of panels shaped to some intriguing algebraic equation. At their feet the floor continued unchanged as far as the flash-beams could reveal, while to their right the level dropped abruptly perhaps two metres to form a channel of about seven metres width. Beyond the channel rose the walls again arching upwards.

"Are you thinking what I'm thinking?" asked Fritz.

"Uh!" said Jacko. "No matter how you build it, a subway station is a subway station is a subway station, and this is just one such."

"Good man," said Fritz. "I want to have a look at the rails."

Together they surveyed the channel, probing minutely with their flashlights.

"No lines," said Jacko at last, his voice tinged with disappointment. "It could be that we're wrong about this place. Perhaps a sewer .. ."

"I'm not wrong," said Fritz. "I'd know a subway when I found one even if I was deaf, blind and shut up

in a box. It's part of the chemistry of whatever genes conspire to make an engineer. Here, help me down, I want to explore."

"Don't you think we'd better go back and get some re-inforcements?" said Jacko. Fritz had started along the chan-nel to where it entered a somewhat smaller tunnel undeni-ably reminiscent of a Terran subway. "For Heaven's sake, Fritz, you don't know what you might find in there!"

"What's eating you, Jacko? Not losing your nerve all of a sudden?"

"No, it's just that walking down a tunnel that *might* con-tain an emergent subway train goes against my finer sensi-bilities—even if it is two million years behind schedule."

Fritz took fifteen paces into the tunnel and let out a whoop which paralysed Jacko with fright.

"Jacko, get down here quick! I've found one."

"Found one what?" asked Jacko when he had regained control of his vocal cords.

"A train, you idiot. I've found a blessed train! Fetch the other lamp."

Against his better judgment Jacko dropped into the channel and followed Fritz into the tunnel. Then with a churning stomach and racing brain he examined the artifact which barred their further entry.

"That," he asked finally, "is a train?"

"It can't be anything else," said Fritz, not very happily. "It doesn't appear to be a signal box and there's not much point in having a wrought-iron summer house this far under-ground. It appears to be the right shape to fit the tunnel so it's probably either a highly ornate tunnelling machine or else it's a train."

"Alien!" said Jacko in awe. "The connotations of that word get lost by common usage. It doesn't begin to convey the mind-twisting sense that everything you know and believe has been scrunched up and re-sorted by a different kind of logic. These people had different values and different basics, and it makes the mind squirm even trying to re-adjust."

"They didn't have different basics," said Fritz, "they merely had a different emphasis on the relative values of the same old basics. We can't yet try to comprehend the culture, but when it comes to unravelling their engineering I think we shall find we have a great deal in common."

"Like an iron-lace potting-shed without wheels or tracks which we presume to be a train simply because it doesn't appear to be anything else?"

"Just so," said Fritz. "We have to separate the mechanics from the culture. As far as we've gone we've found very few Tazoon applications of principles of which we were com-pletely ignorant. Of course, they were streets ahead of us in some fields and curiously lacking in others—they had no organic chemistry, for instance. But they don't appear to have dabbled in the occult, so if that's a train it's only a matter of time before we find out what made it go."

Cautiously they squeezed down between the curious ve-hicle and the tunnel wall, the better to examine the struc-ture's complexity and strangeness.

"It's a crazy, twisted birdcage," said Jacko finally. "An appliance for containing crazy, twisted birds."

Fritz looked up from the complex of curiously wrought mechanisms. "We'd better get some more lights down here, and muster some of the squad. I want this insane dumpling-container taken to pieces and put together again when I've had a chance to examine the pieces."

"Cannibalization I can understand," said Jacko, "but why the resurrection?"

"Because," said Fritz Van Noon, "if it's the last thing I do I'm going to put the subways of Tazoo back in operation. We obviously can't build a transportation system on the surface, but here we have a ready-made nucleus which already goes halfway to meet the problem."

"I demand to be invalidated out of the Service on the grounds of insanity," said Jacko, "your insanity. I thought we'd had enough of railways up on Cannis."

"That was different," said Fritz. "There we were merely up against physical obstacles such as errant volcanoes. This is specifically an exercise in matching technologies. All we have to do is to determine which part of the railway system moves and which part is intended to stay still. That shouldn't be too difficult, now should it?"

"Not when reduced to such basic terms," Jacko agreed dourly. "But I know you. You never realize when you're beaten,"

"I've told you before," said Fritz sternly, "there's no such thing as a physical impossibility. A limitation is a state of mind, not a question of fact. Here we are faced with the work of a completely alien race who nevertheless had a technological and scientific level roughly comparable to our own. Providing we hold that one fact paramount we ought to be able to unscramble any device this planet has to offer— and make it function for our own service if we wish."

"Providing one thing holds good," said Jacko. "We have first to be able to recognize a thing for what it is. It's no good dismantling a Tazoon milk-strainer if we're under the impression that it ought to be a transistor superhet—or *vice-versa*, come to think of it."

five

Fritz reported back to Philip Nevill. The latter listened to the details of the find with the air of suppressed jubilation which was rapidly becoming his permanent expression. Then he ran his fingers through his untidy hair and searched for his pipe with a distracted grin.

"Fritz, my boy, this is perfectly marvellous. What a day we've had! We've opened up so many promising new lines of research that the whole damned thing is getting out of hand. We could do with five hundred trained archaeologists to digest the meat in this lot, and even then we couldn't do more than scratch the surface. The impact of building techniques alone on Terra is going to be fantastic, and when the whole complex is assembled into Terran know-how its impact on the human race will be so great that

our own culture will never be quite the same again.

"If you really want to make your mark on the enterprise, then take over this subway completely, because I shan't be able to get round to it for five years at least. Do a complete technical run-down on it, as detailed as you like. Do any-thing you like with it which won't impair its archaeological value. All I ask is a comprehensive progress report in tune for each data shipment to Terra."

"Fair enough!" said Fritz. "I want to open up the build-ings directly above the station to look for ancillaries."

Nevill glanced at his sketch map and drew a line through two diagrammatical blocks. "It's all yours," he said, "but don't drive yourself daft trying to comprehend too much too fast. You'll find you have to absorb Tazoon environments rather than understand them. Sooner or later the pieces fit themselves into place. And Heaven knows there's enough pieces available for fitting—a jigsaw embracing the life and work of a complete culture."

"We've just got ourselves a subway," said Fritz, as he re-joined Jacko at the workings. "We're going to open up the building here and see what's inside."

"Who's we?" asked Jacko suspiciously.

"You," said Fritz. "I'm going below again to see if I can trace any control sequence running up from below. I want you to go in there and see if you can find anything similar running down. We'll meet at the end of the shift and com-pare notes. You know what to look for—cable groupings or anything which suggests that it might have a control or power function."

"You're really set on this, aren't you?" Jacko said. "About using it, I mean."

"Certainly," said Fritz. "Let's face it, if Fritz Van Noon can't restart an alien subway then who in the universe would you expect to be able to do it?"

"I was afraid you'd ask that," said Jacko.

An hour later they met again at the portals of the building.

"There's a sort of power and control complex which ap-pears to come down somewhere near the further end here," said Fritz.

Jacko nodded. "I picked up the end of that," he said. "There's a channel running through the basement of the building, and the complex rises into that, and is then split into sections which are fed to the floors above."

"What's it like in there?" asked Fritz.

"Weird," said Jacko. "There's no other word to describe it. It's like the epitaph to an insane, overgrown spider with a compulsive spite against inverted single-head broaching presses."

"Thank you," said Fritz. "I can imagine it all too clearly."

Jacko's description of the basement of the building was, if anything, an understatement. The ground floor proved in-conceivably worse, and the situation deteriorated rapidly as they ascended to the higher floors. The subway had pos-sessed the crude simplicity of a functional unit, but the de-tail and complexity of the levels in the building above defied analysis or description. For a long time no object which they examined provided any sort of clue as to its function, and they traversed the cluttered levels with an increasing sense of dismay and frustration. As with most of the larger build-ings only the top storeys had suffered any considerable de-cay, and the sand and damp had not penetrated into the interiors to any great extent, so that the state of preservation on the levels in which they were interested was excellent.

Fritz's spirits were nearing their lowest ebb as he battled with an ocean of incomprehensibilities, until he entered the final gallery. Here he stopped, groping for form in the alien pattern, then seized a glimpse of illuminated understanding and fanned it into a flame.

"Jacko! Do you know what this is? Don't you see—elec-trical control gear."

Jacko was unimpressed. "If this is their idea of electrical control gear I should hate to see their version of a collection of crazy, twisted maypoles."

"It doesn't matter," said Fritz. "The approach may be alien, but the underlying logic is inescapable. Unless I miss my guess this is an automatic switching system, and from its complexity I should think it's pretty comprehensive. It may even be the only switching system for the whole of the Tazoon subways. You realize what that means?"

"About fifteen years' circuit analysis," said Jacko morosely.

"No. Look at the condition of this stuff. The preservation is as good here as it is in the subway itself. The chances are it's still functional. We'd only have to re-connect the power to get the whole thing back into operation."

"Perish the thought!" said Jacko. "I may be a bit naive, but assuming—just for the sake of argument—that what we've found is a subway, where would you get the energy to power it? Subways need a lot of power, and if the Tazoons ran out of it how are you going to find it?"

"We'll worry about that later. It may not be easy, but I have one advantage the Tazoons didn't have—access to the complete technologies and resources of a scientific culture which was completely alien to the Tazoons. I don't doubt that Colonel Nash could be persuaded to bring an MHD oscillating-plasma generator out from Terra, but that's a last resort. As an unorthodox engineer I'd prefer to locate the original Tazoon power source and see if a completely fresh engineering approach could start it producing again."

"So what's the plan?" asked Jacko.

"Get Harris and a couple of the electrical boys to join me here to try and analyse the circuit logic.

Meanwhile you take the rest of the squad below and start dismantling the train. Between us we should discover enough about the way the Tazoons handled electricity and mechanisms to have a fan-idea of how to make these pieces work."

"You think so?" asked Jacko. "I still haven't forgotten what you did to that ruddy harp."

Fritz's team did indeed manage to establish a certain amount of circuit logic, and once a few principles were known the work progressed rapidly. They concentrated mainly on the huge switching columns, swiftly realizing that what at first sight could be mistaken for relative crudity was in fact an ingenious and sophisticated short-cut technique to solve a highly complex sequence-switching problem. Among other things they discovered that the assembly was probably built to handle alternating current with an efficiency peaking at about ten kilocycles a second, although such periodicity seemed unlikely in practice. The current handling capacity of the assembly was staggeringly high. Breakdown voltages too were high, but afforded no real clues as to the normal operating potentials. Safety precautions against unshielded conductors were non-existent, and they were forced to the conclusion that either the equipment was designed to operate unattended or else the physiology of the Tazoons had rendered them immune to electric shocks which would be lethal to their Terran counterparts. The apparatus which logically should have been metering equipment, however, made no sense at all.

Somebody was soon at work rigging up a communicator to connect the switching gallery with the subway below. When the line was functional Jacko was the first to make a call.

"Fritz, we've run into a snag on this train dismantling project. We can't get the blasted thing apart. Tell me I'm crazy if you like, but I'd swear the train was cast as a whole and not fabricated—moving parts included."

"Cast in a pattern of that complexity in steel?" asked Fritz incredulously.

"Not steel," said Jacko. "Titanium, unless I judge my metals wrong."

"That only makes it worse," said Fritz. "Come to think of it, we were being a bit naive expecting a two-million-year extinct culture to leave something which could be dismantled with a hammer and a pair of Stillsons. Is there no hope at all?"

"We could take an atomic-hydrogen torch or a cutting laser and chop it into two-inch slices, but I doubt if Nevill would react favourably to the idea."

"Come to think of it," said Fritz, "neither would I. Better abandon the project, Jacko, and come back up here. I think I've got a better idea anyway."

"What are you planning now, Fritz?"

"I'm looking at it this way: there are two ways of making a piece of equipment yield the secret of its function—you can dismantle it and worry the principle out of its components, or you can simply set it operating."

"I hope I'm misunderstanding you," said Jacko. "For one ghastly moment I had the idea you were proposing to re-start the Tazoon subway without knowing how it worked."

"I was proposing just that. Can you think of a faster way of finding out how it works than by seeing it in action?"

"Is one allowed to resign from the project?" asked Jacko. "Or is suicide the only logical form of escape?"

"You can also be beaten to death by your superior officer, if you're really smitten with an escapist death-wish. We think we've unscrambled the power lines in the gallery here and we've made a guess at what should prove to be the main input lines."

"So?"

"So I want to trace them back to source. Then we can start investigating whether or not we can re-start the native power producing plant. I want every man I can get employed on tracing those lines, Jacko, and I want you to supervise personally. Remember, we have to get the whole thing operational inside three months if we're to beat Nash's deadline."

"I still think it's a waste of time," said Jacko. "If we're right that the Tazoon civilization collapsed because of lack of power, what chance have we of finding it some two million years later?"

"I suspect the answer is quantitative," said Fritz. "They were trying to run a civilization, we're trying only to run a subway. I'd estimate our requirements at perhaps one ten-millionth of theirs or less. Viewed in that light it doesn't seem too difficult a task, now does it?"

six

Nevill's team had concentrated on clearing only the tops of the taller buildings. Generally the sand penetration into the interiors was not total, and thus they had access to large modules of Tazoon architectural environment without having to wait for the total clearance which ultimately would follow as resources became available. Once gaining the interior of a building they were relatively free to explore the entire contents of the lower levels. Archaeologically the finds were so incredibly lush that complete classification and analysis would take many decades, and the method therefore used was to set up specialist study groups to make a complete analysis of certain typical areas as a guide to rapidly separating the unique from the mundane when new areas were opened up. Representative samples were carefully crated for transport to Terra, where a more exhaustive examination would be undertaken.

For the next two weeks Fritz himself was kept fully employed in his role as authority on alien science and technology, and the sheer mass of work confronting him could have kept him comfortably occupied for several lifetimes at least. It was now painfully obvious that the staff of the Tazoon enterprise could have been increased a hundredfold and still the finds would have been more numerous than the

researchers. Fritz's own work in the field was hampered by the fact that he was working without assistance, the entire complement of the U.E. squad being devoted to locating the elusive power source from which the Tazoons had derived their supply.

On this latter point even Nevill had been unable to offer any help. Although detailed maps of the sectors of the buried city were beginning to be built up there was nothing in them which suggested any power generation or distribution facilities. This was not conclusive, because in very few areas had it yet been possible to excavate below the level of the basic terrain on which the city had been built, and what lay underneath was still a subject for conjecture, but the pattern of conductors disappearing into the depths was sufficient to convince Fritz that whatever the source it was probably not located within the city confines. Jacko's report did not appear to illuminate the situation.

"I tell you, Fritz, that main power input cable you gave us was nothing of the sort. For fifteen blasted days we've traced that thing. A cable it may be, but it's a distribution circuit if it's anything at all."

Fritz scowled. "Are you sure you didn't lose it and pick up another cable in error?"

"Do me a favour!" said Jacko. "We were feeding a signal into the thing at the switching house and picking it up all the way down the cable. I tell you that thing is a distribution complex originating, not terminating, at the subway building."

Fritz sat up sharply. "Distributing power where?"

"I hate to tell you this, but it covers a fair proportion of the Southern plain. The cable divides and sub-divides *ad-infinitum* as far as we can tell. We counted divisions into roughly forty thousand pairs and that still left a fair majority—but we gave up when we found what was at the end of a dozen or so of the minor pairs. I'll give you three guesses ..."

"Don't tell me," said Fritz. "I can imagine . . . ruddy great Tazoon harps."

"Harps, harps and nothing but harps, and never a string between them. Listening to music I could understand, but can you seriously maintain that they installed five thousand million loudspeakers across the plain just so that they could listen to the trains? Nobody could be *that* alien!"

Fritz thumped the table. "Jacko, you're a ruddy genius I"

"Am I?" Jacko blinked.

"Yes. You've given me the clue I needed. Get the squad together, Jacko, we're going to re-start the subways of Tazoo."

Ten weeks of the precious three months of Colonel Nash's ultimatum had elapsed before they were in a position to make the preliminary tests. The intervening period had been one of furious activity for the U.E. personnel, and one over which Fritz had draped a veil of secrecy such that nobody outside of his group had any idea of the direction of his slowly unfolding plans. But on the final evening everything was ready. Fresh cables of Terran newness threaded their way out of the subway entrance; and on the

platform two dozen floodlights illuminated the mechanical achievements of a culture which had passed two million years before, and shone into the tunnel to light a vehicle which had stopped in that position at the same time that on Terra elephants were native to the Sussex Downs and the evolving ancestors of man had yet to distinguish themselves from their animal counterparts.

Shortly before sunset Fritz and his team assembled at the subway building. Already the calm stasis of the day was beginning to tremble with unease as the riding cloudrace over-head broke lower, heralding the nightly windy torment of the land. This was no lull before the storm but an increasing tension, a tight coil being further tightened to the inevitable breaking point which was the lash of the sand-filled gale. As the storm broke they hastened inside.

Fritz found himself more than slightly in awe of the thing he contemplated doing. Immaculate as was the preservation of these Tazoon artifacts he could not help remembering, as an engineer, the patterns of low temperature creep, the grain growth, the diffusion—all the degradation of properties which fabricated metals might be heir to after two million years of rest. Fortunately the Tazoons had understood their materials and their atmosphere well, and apparently had built to last, with a success which was phenomenal.

In any case, Fritz was now committed. Sentiment and curiosity apart, the very continuance of the U.E. depended on his ability to re-activate the subway. He could not draw back now even though the whole place threaten to crumble about his head in a welter of dust and thunder.

As was his custom when there were unavoidable risks to be taken, Fritz alone attended the array of instruments set up in the subway proper. Jacko was in the switching gallery on the other end of the communicator, in a hastily conceived control set-up which included the rest of the relevant monitoring instruments they had been able to piece together from the inadequate supplies brought to Tazoo. Jacko, uncomfortably aware of the danger of Fritz's position, had sought to dissuade his superior from being present for the actual test run, but Fritz, foreseeing the cataclysmic damage to the installation which might result from the experiment, had decided to be present to gain first-hand experience of the principles of operation which might by their own employment become hopelessly obscured.

Five minutes to zero hour, and Fritz took a last check on his instruments. He had already signalled Jacko to begin preliminary switching when he heard footsteps and voices echoing in the corridors leading to the platform. He snatched up the communicator.

"Hold it, Jacko. I think I've got company. Do nothing until you hear from me."

"Right," said Jacko. "But it's none of our boys down there, I promise you."

"No," said Fritz, "but unless I mistake the gruff under-tones it's Colonel Nash and his aides. I'll have to get rid of them, of course. We'd get ourselves a bad name if we knocked off all of the top brass in one go." He slammed down the handset and marched up the platform just as Nash and his retinue

arrived.

"Lieutenant Van Noon," said Nash icily, "I have just been informed of your intention of trying to re-start the Tazoon subway this evening. As this is a project of the first magnitude I think I should have been more directly informed."

"You will be, sir, as soon as we have anything to report."

"I don't think you quite appreciate my point," said Nash. "If you succeed in this it will be the very first Tazoon me-chanical artifact of any moment to have been re-started. As such it is a rather—er—historical occasion. Naturally I'd have liked to have been asked to be present."

"And I don't think you quite appreciate my point," said Fritz. "There comes a point in the progress of any project which is usually obscured by a notice reading: *Danger, Engi-neers Testing*. As far as we know the Tazoon subway is in-tact and perfectly preserved. From an engineering point of view there is no reason why we can't switch on the current and have it back in operation as it last was two million years ago."

"Well?" asked Nash ominously. "What's the problem then?"

"Just this," said Fritz. "How do we know that what was normal for the Tazoons is even remotely tolerable for us? The power input for this one sector of the line is quite fantastic by Terran standards. The Tazoons don't appear to have been fools about the efficiency of power conversion, so I can only conclude that Tazoon subway operation was a pretty hectic procedure. When they throw the master switch upstairs we shall have a sample of Tazoon mechanical en-vironment in the raw. I don't want anybody down here at that moment who isn't absolutely essential to the success of the operation."

Colonel Nash snorted with irritation. "The best available information to date indicates that the Tazoons were small-boned, avian and somewhat fragile creatures. I am perfectly certain that officers of the Terran Exploratory task force are able to tolerate the conditions in a deserted subway every bit as well as its former occupants. But if you happen to be so unsure of your mechanical aptitude why don't you switch things on a piece at a time?"

"Because," said Fritz, "as far as we can tell the whole system is interlocked back to a master computing house of such complexity that it will take all of ten years to unravel the individual controls. For reasons best known to them-selves the Tazoons did not appear to have been in favour of local circuit isolators, so we have to accept the whole or nothing at all. I'm making a formal request, sir, for you to leave. If you remain I can't be responsible for the conse-quences."

"Are you staying, Lieutenant?"

"Yes, sir."

"Then we stay too. I appreciate it's your show, but I think you're over-stressing the danger angle."

"Very well," said Fritz. "But remember it was your de-cision." He returned wearily to his

communication point. "Jacko, prepare to switch on."

"Have they gone?"

"No, they insist on staying to see the fireworks."

"Ouch! I hope you know what you're doing."

"If I did," said Fritz, "the chances are that there's nothing on Tazoo which could persuade me to stay on this platform while you throw that switch. Bring the current up to a maximum over thirty seconds and hold it there for three minutes. If you can't contact me on the communicator immediately you've switched off again then get down here fast with all the emergency equipment you've got."

"Right," said Jacko. "And good luck! I'm giving you a count-down of ten ..."

SEVEN

If Fritz Van Noon was prepared for the worst experience of his life he was still unprepared for the sheer intensity and quality of the impressions which assaulted him. The whole tunnel cavity lit up in a kaleidoscope of lights of unbelievable colour-range and brilliance. The air grew rapidly and uncomfortably hot and choking with acrid vapours which his lungs could not accept and which burned his skin like the breath of a playful blowlamp.

But it was the noise that dug furrows in his soul. A series of rising screams from a dozen mechanical throats passed up through the audible range and into the low ultrasonic, causing dust fires to break out at intervals along the platform. Devices hammered and clattered and chattered in a cacophony which clawed at his eardrums with red-hot needles. Literally every fragment of the installation vibrated or resonated or contributed in some way to the atmosphere of screaming, explosive thunder. Ominously, the train which Fritz had stationed himself to watch, held motionless for a full minute then discharged itself in a rumbling, grinding ricochet into the station and down the further tunnel, accompanied by a cataclysmic roar which contained all the acoustic qualities of a continuous collision with an unending series of cheap tin tea-trays.

Scarcely had the first train disappeared from view than another skeleton juggernaut hurled itself upon the station and drove a hectic and furious path straight down the line and was gone before his senses could properly interpret its arrival. Fritz cringed before the shock-wave of its passing and watched his precious monitoring instruments scatter in all directions. He ground his teeth in mental pain at the sound of the mechanical anguish of tortured metal biting into tortured metal. Sparks and white-hot fragments showered the platform and peppered his coverall with a pattern of small singed holes.

Colonel Nash and his entourage were now crouched against the wall further down the platform, white-faced and with their hands over their ears, while some noise-making instrument above

aimed horrific noises at their heads. Under their feet the dust smouldered with a repulsive miasmatic odour, reminiscent of kakodyle and mercaptan, which had to be smelled to be believed.

Before Fritz had time to realize the smile that blossomed in his bosom yet another train entered the station, this one fighting to halt itself with a spine-chilling screech of unseen brakes which fought valiantly to kill the horrible momentum. Fritz gritted his teeth and watched its progress right to the last shuddering halt. With his monitoring equipment out of action he was forced to estimate the vehicle's speed mentally and make a rough guess at the forces which would act on the passengers of a vehicle involved in such a drastic reduction of speed. The answer told him more about the physiology of the Tazoons than Nevill had deduced in the previous twelve months.

Abruptly the power died and his eyes were forced to adapt to the relative dimness of the Terran floodlights. His ears still whistled and ached from their recent battering, and the intolerable heat and humidity made him feel like the occupant of some outlandish Turkish bath. Colonel Nash climbed unsteadily to his feet, a perfectly unreadable expression on his face, and picked his way carefully around the heaps of smouldering dust on the platform. His aides, lacking his aplomb, openly betrayed their relief at the end of the ordeal and hastened to the exit.

Nash made straight for Fritz.

"Van Noon."

"Sir?" Fritz saluted briefly while trying to balance a previous audio-frequency spectrum analyser which was in danger of falling off the platform into the channel.

"I owe you an apology," said Nash. "Lord, that was ruddy awful! But you've given me grounds for thought. I'm not saying you didn't warn me—but where in hell did you get all that power?"

"I'll be reporting on that, sir, as soon as I've tidied a few details."

"Very well," said Nash. "There'll be a Staff conference at three o'clock tomorrow in my office. I'd appreciate your answer then."

He turned and strode off, while Fritz became aware of the communicator buzzing urgently.

"Fritz, are you all right?"

"Only just," said Fritz. "It was grim. Everything was at least five times as fast as its Terran counterpart and about twenty times as noisy, to say nothing of the heat. If that's a sample of a deserted Tazoon subway in operation I hope I never have to suffer one during the rush hour."

"I've got news for you," said Jacko. "We had switching trouble up here on the temporary lines we rigged. According to our calculations we were only able to supply forty-three per cent of the total estimated loading. If you'll hang on for a moment I'll give you a test run at a hundred per cent loading."

"Don't bother," said Fritz hastily. "For that I'd need some repeaters and telemetry equipment plus a few unattended TV cameras. I'm not staying here for a hundred per cent loading run."

"Did you discover anything?"

"Enough. Initially the potential weakness of this system will be confined mainly to its passengers. The Tazoons were apparently using an adaptation of an A.C. linear motor for traction, with the bottom of the channel as the reactive element. On the same principle they use A.C. magnetic flux repulsion to lift the train clear of the ground so that they're virtually hovering on a magnetic flux field. I suspect the same principle should be operating on each side to centre the train with respect to the tunnel walls, only we didn't have enough current to make it fully effective. Come to think of it, it's a damn clever idea, with the train held in a mechanically frictionless supporting field with only inertia, air-resistance and eddy-current losses to be overcome by the traction system. I can't yet see how the current pickup is arranged, but that's probably inductive too. Suffice it to say we can soon adapt it to our own purposes."

"Good," said Jacko, "only I can't see that by so doing we're going to produce what we set out to achieve. They asked for a transport system and we're offering a subway with all that connotes in the way of limited routes and limited points of access. How long do you think that is going to satisfy Nevill?"

"For at least a lifetime, I should think," said Fritz. "The building of a subway is a climactic achievement in the history of any culture, requiring, as it does, the co-ordination of a considerable quantity of technological resources. Ergo: you only build subways to connect points which are sufficiently important to warrant such endeavour. Give Nevill a functional subway under this city and he will have immediate and convenient access to all those points of the city which the Tazoons themselves thought worth while making accessible. You not only have a transport system but a considerable pointer to the psychology and cultural habits of the Tazoons themselves."

When Fritz arrived at the Staff conference he had the feeling that the rest of the meeting must have been convened about an hour earlier, for the assembly was already engaged in earnest discussion at the time of his arrival. Nevill was leafing forlornly through a formidable pile of notes, reading abstracts, and Colonel Nash was in the chair.

"Ah, Lieutenant, take a seat. We hope you are going to tell us how you came by that impressive source of energy which enabled you to put on that display last evening in the subway."

"I can do more than that," said Fritz. "I think I can add considerably to our knowledge of the Tazoons themselves. But let us start with the harps—Tazoon harps. I suddenly realized what they were."

"And what was that?"

"Mechanoelectric energy converters—piezo-electric generators, if you like. The harps are merely assemblies of high-efficiency piezo-electric crystals operated by the vibrating strings of the harp. The strings are made to vibrate by the passage of the Tazoon night winds."

"I'm no scientist," said Nash, "but I would have thought that piezo-electric effects were scarcely of sufficient magnitude to be useful for energy conversion on that scale."

"A common misconception," said Fritz. "Even our relatively undeveloped Terran ferroelectric

ceramics are capable of something better than a power generating density of six-teen watts per square centimetre, which has solar cells beaten hollow. The Tazoon crystals are capable of an output of eighty watts per square centimetre and a conversion efficiency of better than ninety-five per cent, an efficiency markedly better than even the most advanced Terran M.H.D. oscillating-plasma reactors, Mechanoelectric conversion has always been a highly promising line of development, but hampered by the fact that on Terra there was a scarcity of large-scale sources of mechanical energy of useful frequency. The Tazoons made ultra large scale use of medium-level energy by utilizing the winds to activate the harp strings. A Tazoon harp in a typical night wind is capable of an output approaching two kilowatt. This comes out to around a megawatt of power for each square kilometre of plain equipped with harps."

"Are you sure of this, Fritz?" asked Nevill.

"Perfectly sure. We powered the subway by re-stringing some of the harps out on the plains there."

"But doesn't the output vary with the force of the wind?"

"Yes, but with the harps ranged over a wide area the variations average out fairly well."

"But how did they obtain their power when there was no wind?"

"They didn't," said Fritz. "We've found nothing which would indicate any attempt to store the power nor any suggestion of an alternative supply. When the wind stopped, everything stopped. Thus by habit if not by nature the Tazoons were probably nocturnal."

"But this is ridiculous," said Nevill. "I still can't conceive that they would fill whole plains with electrical generating transducers."

"Why not? They had no particular use for the great out-doors. By and large their native environment was intolerable to them."

Nevill sat up sharply. "That's a highly speculative statement to make. How do you arrive at that conclusion?"

"Simple," said Fritz. "Firstly, they were nearly blind, hence the need for such inordinately intense lighting such as we found on the subway. If my calculation is correct even Tazoo at mid-day was a pretty dull affair to their eyes. Secondly, the temperature the subway reached was so far above ambient that it's a reasonable guess that they couldn't tolerate outside temperatures for very long. They had a very low body mass and presumably chilled rapidly."

"Incredible!" said Nevill. "I knew they were small-boned, but body mass . . ."

"If you'd seen the rates of acceleration and deceleration of a Tazoon subway train you'd soon see that only creatures of small body mass could survive it."

"All right," said Nash, "you seem to have all the answers. Perhaps you also know why the Tazoons become extinct?"

"I could make a good guess. Even more than ourselves the Tazoons were power dependent animals, for the afore-mentioned reasons. They had reached a point where they couldn't exist without power for light and heat, having pre-sumably reached an evolutionary dead-end which had put them out of phase, so to speak, with their native environ-ment. Now remember that they depended on power from the harps, not having any great resources of alternative fuels, either fossil or nuclear. Remember also that the harp frames were made of ironwood from the trees of the forests which used to adorn the plains. I suggest they increased their power generating areas at the expense of the trees until at some point they encountered soil erosion. Normally soil erosion is reversible if the right steps are taken to combat it, but . . ."

"Well?" said Nash.

"Soil erosion led to sand and the sand and wind conspired to form a sandblast which abraded and destroyed the strings of the harps. The failure of the harps meant loss of power—the very power essential to bring in the purified sea-water necessary to help combat the soil erosion. The process de-veloped into a vicious circle—more sand, less harps; less harps, more sand, and so on *ad-infinitum*, every day the situa-tion worsening as the sand robbed them of the power they needed to combat its formation. When the sand grew deep enough it even prevented ironwood seeds from rooting, so the rest of the forests gradually died also. The Tazoons, faced with a gradual but unalterable loss of power, took the only course open to them—they tried to migrate to the tropical regions where the climate was life-supporting with-out the need for power. History seems to record that very few of them ever got there, which is not surprising when you consider that the night-wind was certainly capable of blow-ing a Tazoon clean into the air."

There was several moments' silence. "And the harps?" asked Nash. "That was their sole means of power genera-tion?"

"We have found nothing which would indicate other-wise."

"What a pity! Philip Nevill had just succeeded in per-suading me to lend support for a rather ambitious project. Consequent upon your demonstration of both power produc-tion and a potential source of transport, Philip was pro-posing to re-establish the Tazoon city, initially to cater for archaeologists interested in extra-terrestrial work, but later as a permanent colony and as a supply base for ships moving out to the Rim."

"You mean to re-populate the place—turn it back into a living city?"

"Given time, yes. If possible also irrigate the deserts and reclaim some of the wasteland. It's a great pity you have such admirable reasons why it can't be done."

"But it can be done," said Fritz. "Given time and suffi-cient labour to repair the harps there's enough energy out there to power the whole city and a dozen others."

"But I thought the sandblast. . ."

". . . ruined the harp strings. Yes, it did . . . but that was before the advent of Fritz Van Noon. The Tazoons prob-ably used a plain metal wire, possibly titanium, which was susceptible to abrasion. Remember they had no organic chemistry to speak off hence no plastics. We're using a high tensile and extremely tough steel wire and a polysilicone elastomer coating over it, which is a highly abrasion-re-sistant combination and should give many years' service with-out trouble. Unfortunately it damps the vibrations consider-ably—but then, we don't need the degree of either heat or light which the Tazoons found necessary."

"And you really believe the Tazoons became extinct be-cause of the lack of a suitably coated wire?"

"Yes," said Fritz, "just that. And let it be a lesson to our-selves. We don't know what factors in our own technology may be lacking when it comes to meeting some new and unexpected crisis. Our development is probably as one-sided as the Tazoons, but in another direction. Therefore nothing but benefit can come from the complete assimilation of ev-ery phase of Tazoon science and technology into our own. If colonization can do that, then I'll see you have the power to colonize."

"For the want of a nail . . ." said Nevill speculatively.

"Fritz," said Nash. "I've been meaning to speak to you about the possibility of permanently establishing U.E. as a branch of the Terran Exploratory task force instead of merely a section of the Engineering Reserve. How would you react to that? Of course, it would mean promotion. . . ."

"I should personally welcome the idea, sir," said Fritz, "but I fear I've already accepted another assignment on Ti-berius Two. They're trying to establish a mono-rail system there."

"I see," said Nash. "And just what is there about a mono-rail system on Tiberius Two that requires your peculiar talents?"

Fritz coughed discreetly. "I understand it's something to do with their gravity. Apparently it changes direction by seventy degrees every Tuesday and Thursday morning," he said, reaching for his cap.