

# **Calling The Empress**

**By George O. Smith**

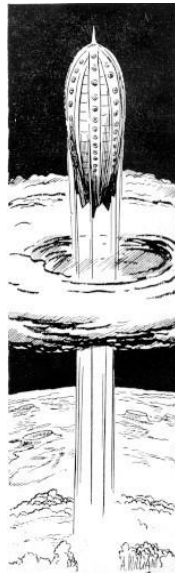
# Calling The Empress

The chart in the terminal building at Canalopsis Spaceport, Mars, was a huge thing that was the focus of all eyes. It occupied a thirty-by-thirty space in the center of one wall, and it had a far-flung iron railing about it to keep the people from crowding it too close, thus shutting off the view. It was a popular display, for it helped to drive home the fact that space travel was different from anything else. People were aware that their lives had been built upon going from one fixed place to another place, equally immobile. But in Interplanet travel one left a moving planet for another planet, moving at a different velocity. You found that the shortest distance was not a straight line but a space curve involving higher mathematics.

The courses being traveled at the time were marked, and those that would be traversed in the very near future were drawn upon the chart, too, all appropriately labeled. At a glance, one could see that in fifty minutes and seventeen seconds, the *Empress of Kolain* would take off from Mars, which was the red disk on the right; and she would travel along the curve so marked to Venus, which was almost one hundred and sixty degrees clockwise around the Sun. People were glad of the chance to go on this trip because the famous Relay Station would come within a telescope's sight on the way.

The *Empress of Kolain* would slide into Venus on the day side and a few hours later she would lift again to head for Terra, a few degrees ahead of Venus and about thirty million miles away.

Precisely on the zero-zero, the *Empress of Kolain* lifted upward on four tenuous pillars of dull-red glow and drove a hole in the sky. The glow was almost lost in the bright sunshine, and soon it died. The *Empress of Kolain* was a little world in itself, and would so remain until it dropped onto the ground at Venus, almost two hundred million miles away.



Driving upward, the *Empress of Kolain* could not have been out of the thin Martian atmosphere when a warning bell rang in the telephone and telespace office at the terminal. The bell caught official ears, and all work was stopped as the personnel of the communications office ran to the machine to see what was so important that the "immediate attention" signal was rung.

Impatiently the operator waited for the tape to come clicking from the machine. It came, letter by letter, click by click, at fifty words

per minute. The operator tore the strip from the machine and read aloud: "Hold *Empress of Kolain*. Reroute to Terra direct. Will be quarantined at Venus. Whole planet in epidemic of Venusian Fever."

"Snap answer," growled Keg Johnson. "Tell 'em: 'Too little and too late. *Empress of Kolain* left thirty seconds before warning bell. What do we do now?'"

The operator's fingers clicked madly over the keyboard. Across space went the reply, across the void to the Relay Station. It ran through the Station's mechanism and went darting to Terra. It clicked out as sent in the offices of Interplanet Transport. A vice president read the message and swore roundly. He swore in three Terran languages, in the language of the Venusians, and even managed to visualize a few choice remarks from the Martian Pictographs that were engraved on the Temples of Canalopsis.

"Miss Deane," he yelled at the top of his voice. "Take a message! Shoot a line to Channing on Venus Equilateral. Tell him: '*Empress of Kolain* on way to Venus. Must be contacted and rerouted to Terra direct. Has million dollars' worth of Martian Line Moss aboard; will perish under quarantine. Spare no expense.' Sign that 'Williams, Interplanet.'"

"Yes, Mr. Williams," said the secretary. "Right away."

More minutes of light-fast communication. Out of Terra to Luna, across space to Venus Equilateral Relay Station, the nerve center of Interplanetary Communications. The machines clicked and tape cleared from the slot. It was pasted neatly on a sheet of official paper, stamped *rush* and put in a pneumatic tube.

As Don Channing began to read the message, Keg Johnson on Mars was chewing worriedly on his fourth fingernail, and Vice President Williams was working on his second. But Johnson had a head start and therefore would finish first. Both men knew that nothing more could be done. If Channing couldn't do it, nobody could.

Channing finished the 'gram and swore. It was a good-natured swear word, far from downright vilification, though it did consign certain items to the Nether Regions. He punched a button with some relish, and a rather good-looking woman entered. She smiled at him with more intimacy than a secretary should, and sat down.

"Arden, call Walt in, will you?"

Arden Wastphal smiled. "You might have done that yourself," she told him. She reached for the call button with her left hand, and the diamond on her fourth finger glinted like a pilot light.

"I know it," he answered, "but that wouldn't give me a chance to see you."

"Baloney," said Arden. "You just wait until next October. I'll be in your hair all the time then."

"By then I may be tired of you," said Channing with a smile. "But until then, take it or leave it." His face grew serious, and he tossed the message across the table to her. "What do you think of that?"

Arden read, and then remarked: "That's a huge order, Don. Think you can do it?"

"It'll cost plenty. I don't know whether we can contact a ship in space. It hasn't been done to date, you know, except for short distances."

The door opened without a knock and Walt Franks entered. "Billing and cooing?" he asked. "Why do you two need an audience?"

"We don't," answered Don. "This was business."

"For want of evidence, I'll believe that. What's the dope?"

"Walt, what are the chances of hooking up with the *Empress of Kolain*, which is en route from Mars to Venus?"

"About equal to a celluloid snowball—you know where," said Franks, looking slyly at Arden.

"Take off your coat, Walt. We've got a job."

"You mean—Hey! Remind me to quit Saturday."

"This is dead in earnest, Walt." Don told the electronics engineer all he knew.

"Boy, this is a job that I wouldn't want my life to depend on. In the first place, we can't beam a transmitter at them if we can't see 'em. And in the second place, if we did, they couldn't receive us."

"We can get a good idea of where they are and how they're going," said Channing. "That is common knowledge."

"Astronomy is an exact science," chanted Franks. "But by the time we figure out just where the *Empress of Kolain* is with respect to us at any given instant we'll all be old men with gray beards. She's

crossing toward us on a skew curve—and we'll have to beam it past Sol. It won't be easy, Don. And then if we do find them, what do we do about it?"

"Let's find them first and then work out a means of contacting them afterward."

"Don," interrupted Arden, "what's so difficult?"

Franks fell backward into a chair. Don turned to the girl and asked: "Are you kidding?"

"No. I'm just ignorant. What is so hard about it. We shoot beams across a couple of hundred million miles like nothing and maintain communications at any cost. What should be so hard about contacting a ship?"

"In the first place, we can see a planet, and they can see us, so they can hold their beams. A spaceship might be able to see us, but they couldn't hold a beam on us because of the side sway. We couldn't see them until they are right upon us and so we could not hope to hold a beam on them. Spaceships *might* broadcast, but you have no idea what the square law of radiated power will do to a broadcast signal when millions upon millions of miles are counted in. A half million watts on any planet will not quite cover the planet as a service area on broadcast frequencies. On short waves it will because of the skip distance. But for square-law dissipation, you can't count skip distances—and in space it would be a case of the signal losing in strength according to the inverse square of the distance. So they don't try it. A spaceship may as well be on Rigel as far as contacting her in space goes.

"We might beam a wide-dispersion affair at them," continued Channing. "But it would be pretty thin by the time it got there. And, having no equipment, they couldn't hear us."

"May we amend that?" asked Franks. "They are equipped with radio. But the things are used only in landing operations where the distance is measured in miles, not Astronomical Units."

"O.K.," smiled Channing. "It's turned off during flight and we may consider the equipment as being nonexistent."

"And, according to the chart, we've got to contact them before the turn-about," offered Arden. "They must have time to deflect their course to Terra."

"You think of the nicest complications," said Channing. "I was just about to hope that we could flash them or grab at 'em with a skeeter. But we can't wait until they pass us."

"That will be the last hope," admitted Franks. "But say! Did any bright soul think of shooting a fast ship after them from Canalopsis?"

"Sure. The answer is the same as Simple Simon's answer to the Pieman: Alas, they haven't any!"

"No use asking why," growled Franks. "O.K., Don, we'll go after 'em. I'll have the crew set up a couple of mass detectors at either end of the station. We'll triangulate, and calculate, and hope to hit the right correction factor. We'll find them and keep them in line. You figure out a means of contacting them, huh?"

"I'll set up the detectors and *you* find the means," suggested Don.

"No go. You're the director of communications."



Don sighed a false sigh. "Arden, hand me my electronics text," he said.

"And shall I wipe your fevered brow?" cooed Arden.

"Leave him alone," directed Franks. "You distract him."

"It seems to me that you two are taking this rather lightly," said Arden.

"What do you want us to do? Get down on the floor and chew on the rug? You know us better than that. If we can find the answer to contacting a spaceship in flight, we'll add another flower to our flag. But we can't do it by clawing through the first edition of Henney's 'Handbook of Radio Engineering.' It will be done by the seat of our pants if at all; a pair of side-cutters and a spool of wire, a hunk of string and a lump of solder, a—"

"A rag, a bone, and a hank of hair?" asked Franks.

"Leave Kipling out of this. He didn't have to cover the whole Solar System. So let's get cooking."

Don and Walt left the office just a trifle on the fast side. Arden looked after them, out through the open door, shaking her head until she remembered something that she could do. She smiled and went to her typewriter and pounded out a message back to Williams at Interplanet. It read: "Channing and Franks at work on contacting the *Empress of Kolain*. Will do our best." And she signed it: "Venus Equilateral."

Unknowing of the storm, the *Empress of Kolain* sped silently through the void, accelerating constantly at one gee. Hour after hour she was adding to her velocity, building it up to a speed that

would make the trip in days, and not weeks. Her drivers flared dull red no more, for there was not atmosphere for the electronic stream to excite. Her few portholes sparkled with light, but they were nothing in comparison to the starry curtain of the background.

Her hull was of a neutral color, and though the sun glanced from her metal flanks, a reflection from a convex side is not productive of a beam of light. It spreads according to the degree of convexity and is soon lost.

What constitutes an apparent absence? The answer to that question is the example of a ship in space flight. The *Empress of Kolain* did not radiate anything detectable in the electromagnetic scale from ultralong waves to ultrahigh frequencies; nothing at all that could be detected at any distance beyond a few thousand miles. The sweep of her meteor-spotting equipment would pass a spot in micro-seconds at a hundred miles; at the distance from the Relay Station, the sweep of the beam would be curved like the stream of water from a swung hose and therefore useless for direction finding, even though the Station's excellent equipment could pick up the signal. And so fleeting would be the touch of the spotting beam that the best equipment ever known or made would have no time to react, thus marking the signal.

Theorists claim a thing nonexistent if it cannot be detected. The *Empress of Kolain* was invisible. It was undetectable to radio waves. It was in space, so no physical wave could be transmitted to be depicted as sound. Its mass was inconsiderable. Its size was comparatively sub-microscopic, and therefore it would occult few, if any, stars. Therefore, to all intents and purposes, the *Empress of Kolain* was nonexistent, and would remain in that state of material-non-being until it came to life again upon its landing at Venus.

Yet the *Empress of Kolain* existed in the minds of the men who were to find her. Like the shot unseen, fired from a distant cannon, the *Empress of Kolain* was coming at them with ever-mounting velocity, its unseen course a theoretical curve.

And the ship, like the projectile, would land if the men who knew of her failed in their purpose.

Don Channing and Walt Franks found their man in the combined dining room and bar—the only one in many million miles. They surrounded him, ordered a sandwich and beer, and began to tell him their troubles.

Charles Thomas listened for about three minutes. "Boy," he grinned, "being up in that shiny, plush-lined office has sure done plenty to your think-tank, Don."

Channing stopped talking. "Proceed," he said. "In what way has my perspective been warped?"

"You talk like Burbank," said Thomas, mentioning a sore spot of some months past. "You think a mass detector would work at this distance? Nuts, fellow. It might, if there were nothing else in the place to interfere. But you want to shoot out near Mars. Mars is on the other side of the Sun—an Evening Star to anyone on Terra. You want us to shoot a slap-happy beam like the mass detector out past Sol; and then a hundred and forty million miles beyond in the faint hope that you can triangulate upon a little mite of matter; a stinking six hundred-odd feet of aluminum hull mostly filled with air and some machinery and so on. Brother, what do you think all the rest of the planets will do to your little piddling beam? Retract, or perhaps abrogate the law of universal gravitation?"

"Crushed," said Franks with a sorry attempt at a smile.

"*Phew!*" agreed Channing. "Maybe I should know more about mass detectors."

"Forget it," said Charles. "The only thing that mass detectors are any good for is to conjure up beautiful bubble dreams, which anybody who knows about 'em can break with the cold point of icy logic."

"What would you do?" asked Channing.

"Darned if I know. We might flash 'em with a big mirror—if we had a big mirror and they weren't heading right into the Sun."

"Let's see," mused Franks, making tabulations on the tablecloth. "They're a couple of hundred million miles away. In order that your mirror present a recognizable disk, it should be about twice the diameter of Venus as seen from Terra. That's eight thousand miles in—at best visibility—say, eighty million or a thousand-to-one ratio. The *Empress of Kolain* is heading at us from some two hundred million, so at a thousand-to-one ratio our mirror would have to be twenty thousand miles across. Some mirror!"

Don tipped Walt's beer over the edge of the table, and while the other man was busy mopping up and muttering unprintables, Don said to Thomas: "This is serious and it isn't. Nobody's going to lose their skin if we don't, but a problem has been put to us and we're going to crack it if we have to skin our teeth to do it."

"You can't calculate their position?"

"Sure. Within a couple of thousand miles we can. That isn't close enough."

"No, it isn't," agreed Chuck.

Silence fell for a minute. It was broken by Arden, who came in waving a telegram. She sat down and appropriated Channing's glass, which had not been touched. Don opened the sheet and read: "Have received confirmation of your effort. I repeat, spare no expense!" It was signed: "Williams, Interplanet."

"Does that letter offer mean anything to you?" asked Arden.

"Sure," agreed Don. "But at the time we're stumped. Should we be doing something?"

"Anything, I should think, would be better than what you're doing at present. Or does that dinner-and-beer come under the term 'Expenses'?"

Arden stood up, tossed Channing's napkin at him, and started toward the door. Channing watched her go, his hand making motions on the tablecloth. His eyes fell to the table and he took Franks' pencil and drew a long curve from a spot of gravy on one side of the table to a touch of coffee stain on the other. The curve went through a bit of grape jelly near the first stain.

"Here goes the tablecloth strategist," said Franks. "What now, little man?"

"That spot of gravy," explained Don, "is Mars. The jelly is the *Empress of Kolain*. Coffee stain is Venus, and up here by this cigarette burn is Venus Equilateral. Get me?"

"Yop, that's clear enough."

"Now it would be the job for seventeen astronomers for nine weeks to predict the movement of the jelly spot with respect to the usual

astral standards. But, fellows, we know the acceleration of the *Empress of Kolain*, and we know her position with respect to the orbit of Mars at the instant of take-off. We can correct for Mars' advance along her—or his—orbit. We can figure the position of the *Empress of Kolain* from her angular distance from Mars! That's the only thing we need know. We don't give a ten-dollar damn about her true position."

Channing began to write equations on the tablecloth. "You see, they aren't moving so fast with respect to us. The course is foreshortened as they are coming almost in line with Venus Equilateral, curving outward and away from the Sun. Her course, as we see it from the Station here, will be a long radius upward curve, slightly on the parabolic side. Like all long-range cruises, the *Empress of Kolain* will heist herself slightly above the plane of the ecliptic to avoid the swarm of meteors that follow about the Sun in the same plane as the planets, lifting the highest at the point of greatest velocity."

"I get it," said Franks. "We get the best beam controller we have to keep the planet on the cross hairs. We apply a spiral cam to advance the beam along the orbit. Right?"

"Right." Don sketched a conical section on the tablecloth and added dimensions. He checked his dimensions against the long string of equations, and nodded. "We'll drive this cockeyed-looking cam with an isochronic clock, and then squirt a beam out there. Thank the Lord for the way our beam transmitters work."

"You mean the effect of reflected waves," asked Chuck.

"Sure. They're like light—only they ain't. We're going to use a glorified meteor detector. We'll control the spread and dispersion

so that we cover a healthy hundred miles or so, which will give us sufficient power, I believe. If not, we'll have to tighten the beam. At any rate, spreading from a point source to an object of a given dimension, the waves rebound as though the object were a plane mirror. That will give us a dispersion of twice the dimension of the *Empress of Kolain's* planar projection through this axis. Twelve hundred feet isn't much, but once we get her on the beam and have confirmation, we can forget the rebound. We'll have her pinned."

"And then?" asked Franks.

"Then we will have left the small end, which I'll give to you, Walt, so that you can have part of the credit."

Walt shook his head. "The easy part," he said uncheerfully. "By which you mean the manner in which we contact them and make them listen to us?"

"That's her," said Don with a cheerful smile.

"Fine!" said Thomas. "Now what do we do?"

"Clear up this mess so we can make the cam. This drawing will do, just grab the tablecloth."

Joe, the operator of Equilateral's one and only establishment for the benefit of the stomach, came up as the three men began to move their glasses and dishes over to an empty table. "What makes with the tablecloth?" he asked. "Don't you want a piece of carbon paper and another tablecloth?"

"No," said Don nonchalantly. "This single copy will do."

"We lose lots of tablecloths that way," said Joe. "It's tough, running a restaurant on Equilateral. I tried using paper ones once,

but that didn't work. I had 'em printed, but when the Solar System was on 'em, you fellows drew schematic diagrams for a new coupler circuit. I put all kinds of radio circuits on them, and the gang drew plans for antenna arrays. I gave up and put pads of paper on each table, and the boys used them to make folded paper airplanes and they shot them all over the place. Why don't you guys grow up?"

"Cheer up, Joe. But if this tablecloth won't run through the blueprint machine, we'll squawk!"

Joe looked downcast, and Franks hurried to explain: "It isn't that bad, Joe. We won't try it. We just want to have these figures so we won't have to run through the math again. We'll return the cloth."

"Yeah," said Joe at their retreating figures. "And for the rest of its usefulness it will be full of curves, drawings, and a complete set of astrogating equations." He shrugged his shoulders and went for a new tablecloth.

Don, Walt, and Charles took their improvised drawing to the machine shop, where they put it in the hands of the master mechanic.

"This thing has a top requirement," Don told him, "Make it as quick as you can."

Master Mechanic Walton took the cloth and said: "You forgot the note. You know, 'Work to dimensions shown, do not scale this drawing.' Lord, Don, this silly-looking cam will take a man about six hours to do. It'll have to be right on the button all over, no tolerance. I'll have to cut it to the 'T' and then lap it smooth with polishing compound. Then what'll you test it on?"



"Sodium light interferometer. Can you do it in four hours?"

"If nothing goes wrong. Brass all right?"

"Anything you say. It'll only be used once. Anything of sufficient hardness to withstand a single usage will do."

"I'll use brass then. Or free-cutting steel may be better. If you make it soft you have the chance of cutting too much off with your lapping compound. We'll take care of it, Don. The rest of this stuff isn't too hard. Your framework and so on can be whittled out and pasted together from standard girders, right?"

"Sure. Plaster them together any way you can. And we don't want them painted. As long as she works, phooey to the looks."

"Fine," said Walton. "I'll have the business installed in the Beam Control Room in nine hours. Complete and ready to work."

"That nine hours is a minimum?"

"Absolutely. After we cut and polish that screwball cam, we'll have to check it, and then you'll have to check it. Then the silly thing will have to be installed and it's concentricity must be checked to the last wave length of cadmium light. That'll take us a couple of hours, I bet. The rest of the works will be ready, checked, and waiting for the ding-busted cam."

"Yeah," agreed Franks. "Then we'll have to get up there with our works and put the electricals on the mechanicals. My guess, Don, is a good, healthy twelve hours before we can begin to squirt our signal."

Twelve hours is not much in the life of a man; it is less in the life of a planet. The Terrain standard of gravity is so small that it is

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