JOHNSON COUNTY RADIO AMATEURS CLUB, INC.

P.O. Box 93 Shawnee Mission, KS 66201

RBBDBACK

OCTOBER 2020

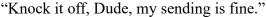
Hambone and the Huckster

A Hambone Story by Jaimie Charlton, ADØAB

"Boy Hammy, I've never seen a hamfest like this. This place is full of neat stuff."

"Yeah, I'm glad the school donated the use of their enormous parking lot for this. It's the biggest outdoor 'fest I've ever seen. It's also the only outdoor hamfest I've ever seen."

Look at those cool keys, I bet your sending would improve with one of those shiny chrome ones."



"Sure, it is. That's why you get asked for so many repeats, just sayin'." "Dude, Look! Solid state amp kits, just what I need to run a kilowatt. And they are so cheap! I'm tired of running my puny hundred watts, I'm always last in a pileup. The instructions say that they are fun and easy to build."

"Get a grip, Hammy. Look at the instruction manual, it's almost a hundred pages long and the title is misspelled. Maybe they're too cheap."

"Well, maybe. Hey Dude, look, there's that new software defined transceiver everyone's been looking for."

"Wow! That's a really cool 3-D waterfall display. I've heard that receiver is great for hearing tiny little DX signals."

"Yes indeed, boys, that is one hot transceiver," came a bull horn voice from what appeared to be a handlebar mustache situated above a green and yellow plaid sport coat and below a ten-gallon cowboy hat. "Come on over, I've got something even hotter to show ya."

Their prurient interests spiked by the word 'hot', the boys followed the voice to a small booth where they discovered that there was actually a man behind the mustache and he was standing behind a littered display counter.

The man continued, "I couldn't help but hear your comments about how hot that snazzy little rig is at grabbing that ole DX, but I've got something even hotter here."

"What's that?" asked Dude, showing his disappointment that the pictures he thought were 'hot' were just antennas.

see HAMBONE on page 5

JULY MEETINGS

Oct 9 –TBA via Zoom.
Oct 23 – TBA via Zoom..

The Johnson County Radio Amateurs Club normally meets on the 2nd and 4th Fridays of each month at 7:00 PM at the Overland Park Christian Church (north entrance), 7600 West 75th Street (75th and Conser), west of the Fire Station.

Much of the membership travels to the Pizza Shoppe at 8915 Santa Fe Drive for pizza buffet and an informal continuation/criticism/clarification of the topics raised at the meeting ... or anything else.

Leave the church, turn right (west) on 75th. Turn left (south) on Antioch. Turn right (west) on Santa Fe. Pizza Shoppe is just past the Soic on your left.

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A publication of the
Johnson County Radio Amateur Club, Inc.
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The Amateur in Amateur Radio - Chip Buckner ACØYF

If I Can Ever Do Anything For You

As club members gathered on Zoom for the September 25 JCRAC meeting,, Vince, KEØCGR, was

promoting the JCRAC raffle, but dropped hints about the uses to which he could put the funds. Club members who had moved to Kansas City joked about the Vinny's, Guido's and other tough guys reputed to live in

their towns and speculated as to how they might go about retrieving the club treasury. Vince, by the way, "gave" at least as good as he "got".

I mentioned that I had my own "Guido" story, but that it would have to wait for an Annex Meeting. A couple of club members protested that they were unlikely to remember to ask about it, so that I should find an earlier opportunity to recount my story.

Thus challenged, here goes ...

Long ago, I was an assistant attorney general for the state of Missouri, I did legal work for the state agency that regulated "proprietary schools" Most such schools did precisely what they were supposed to do.

From time to time, however, one would do or fail to do something that required the agency to make threatening noises about taking action against a license.

One day I got a phone call from the agency's

executive director who said that he wanted me to attend a session with a licensee. Because he had never before asked me to be there for such a meeting, I asked why.

"The licensee's name is 'Civella'", he said.

"I'll be right there."

I have no personal knowledge of such things, of course, but the Civella family was reputed to run organized crime in Kansas City.

Mr. Civella--I no longer remember his first name--was a personable

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PRESIDENT'S CORNER

Our inability to have in-person meetings is turning all of us into Zoom "experts". When we can



have meetings at the church we may still use Zoom as a way to open it up to member that can not attend due to distance or other issues. We should be

able to do this as there is WiFi available.

We are beginning to receive items for the Ensor auction, We are not, however, sure of the format for this year. How to have the auction an maintain distancing and permitting the items to be reviewed are two on the issues.

The club's raffle is underway because on the auction uncertainty. Vince (KE0CGR) Is heading up the raffle again this year. You can contact him for tickets or go to the club's web site (w0erh.org) select the "store" tab. We already had one surprised winner. Me! Get your tickets for the August drawing and add to your chances. All tickets, except the wining ticket stays in the pot. I was saving up for a new HT and by luck found myself in possession of a gift certificate from Associated Radio. So I'm

You, too, can be a winner of the raffle too.

the owner of a new Yaesu FT-

3DR.

- Bill Gery - WA2FNK

Johnson County Radio Amateurs Club - September 11, 2020

Meeting Date: Friday September 11, 2020. The meeting Started at 7:00 PM.

Attendance: Due to COVID-19 restrictions, this Meeting took place online using Zoom Video Conferencing. 33 were present.

The Minutes from the August 28, 2020 were read and accepted unanimously.

The Treasurer's report was read and accepted unanimously.

Old Business:

- We welcomed all 1st time visitors to the meeting.
- Repeater Update Bill Brinker, WA0CBW reported all working well. The 145.290 MHz Repeater antenna U bolts have not been replaced yet.
- Ensor Auction Raffle tickets are available to purchase off the website or from Vince Sabia, KE0CGR. The next drawing will be on September 25 for \$200. Final drawing in Oct for \$400.

New Business:

- Ensor Museum Volunteers October is the month that the JCRAC provides volunteers to staff the Museum on Saturdays and Sundays from 1pm to 5pm. Please sign up for a slot by accessing the link on the Club's website. Like previous years, all volunteers that sign up will be entered into a drawing for a \$50 Gift Certificate to Associated Radio. Volunteer multiple times and you will be entered multiple times.
- Al Rawitch, K0IMP has updated the Silent Key Plaque which hangs inside Associated Radio with 2 names. Those names are Danny R. Rayfield KE0FVO and Terry L. Constant W0TLC.

Reports:

- 6 m NR.
- 10 m SSB Roundtable 4 participated on September 10.
- 40m SSB Roundtable 2 participated on September 9.
- Fusion Digital 440 net 15 Check-ins on September 9 and 22 Check-ins on September 2.
- 2m Wheat Shocker net 17 Check-ins on September 10 and 16 Check-ins on September 3.
- HF Activity Chilean Island 0n 20m. Kansas QSO Party.

Announcements:

- Campfire Saturday September 12.
- Virtual Technician Class in January conducted by he Santa Fe Trail Amateur Radio Club.
- See Larry's List for upcoming Events.

Business meeting adjourned at 7:43 PM.

Program:

The Program was a presentation on the NanoVNA-F Portable Handheld Vector Network Analyzer SWR Meter by Tom Wheeler, N0GSG.

Submitted by Ted Knapp, N0TEK, Secretary.

Johnson County Radio Amateurs Club - September 25, 2020

Meeting Date: Friday September 25, 2020. The meeting Started at 7:00 PM.

Attendance: Due to COVID-19 restrictions, this Meeting took place online using Zoom Video Conferencing. 38 were present.

The Minutes from the September 11, 2020 were read and accepted unanimously.

The Treasurer's report was read and accepted unanimously.

Old Business:

- We welcomed all 1st time visitors to the meeting.
- Repeater Update Bill Brinker, WA0CBW reported all working well. The 145.290 MHz Repeater antenna U bolts still have not been replaced yet.
- Bill Brinker, WA0CBW was surprised at his house with authentic NanoVNA-F.
- Al Rawitch, K0IMP has updated the Silent Key Plaque which hangs inside Associated Radio with 2 names. Al also reported that there is only 1 name plate space left on the current wooden Plaque section. He relayed that a new wooden Plaque section would cost about \$100. A motion was made and seconded to purchase another Plaque section for no more than \$200. The motion passed unanimously.
- Ensor Auction Raffle tickets are available to purchase off the website or from Vince Sabia, KE0CGR. The next drawing will be on September 25 for \$200. Final drawing in Oct for \$400.
- Ensor Museum Volunteers October is the month that the JCRAC provides volunteers to staff the Museum on Saturdays and Sundays from 1pm to 5pm. Please sign up for a slot by accessing the link on the Club's website. Like previous years, all volunteers that sign up will be entered into a drawing for a \$50 Gift Certificate to Associated Radio. Volunteer multiple times and you will be entered multiple times.

New Business:

- Ensor Auction Raffle The Third \$200 Gift Certificate drawing to Associated Radio was conducted. Barb McKinney, KE0EGG was the winner.
- The Breakfast Club has found a new indoor home. It is the IHOP at 91st and Metcalf.

Reports:

- 6 m NR.
- 10 m SSB Roundtable 3 participated on September 24.
- 40m SSB Roundtable 3 participated on September 23.
- Fusion Digital 440 net 15 Check-ins on September 23 and 15 Check-ins on September 16.
- 2m Wheat Shocker net 18 Check-ins on September 24 and 19 Check-ins on September 17.
- HF Activity NR.

Announcements:

- WW1USA Remote Special Event October 31st.
- Virtual Technician Class in January conducted by the Santa Fe Trail Amateur Radio Club.
- See Larry's List for upcoming Events.

Business meeting adjourned at 7:40 PM.

Program:

The Program was a presentation on the "Morserino-32 Morse Code Trainer Kit and Demonstration" by Jay Greenough, WJ0X.

Submitted by Ted Knapp, N0TEK, Secretary.

Lowering his Texas drawl to a more confidential timbre, the man continued, "This is a super antenna. It is a totally new design by my company, Congruent Electromagnetics or CE for short," continued the man gesturing to his company's logo emblazoned on, well, pretty much everything. "This hamfest is the first time it has been shown to the ham radio community. It has been available for some time to governments, though."

"It looks like a lumpy wire dipole to me," said Hambone eager to move on to the food tent where pork chop sandwiches and ice cream awaited.

"Yes, son, that it does. But let me show ya a couple of things that make this antenna a super receiver. These features are so state-of-theart that back at the factory we call it a 'Super Signal Sucker' 'cause it seems to suck weak signals right out of the noise."

"That sounds great, but we gotta get going," said Hambone.

"That's right, it does, but it isn't," continued the mustache stepping out from behind the counter revealing the that the whole ensemble was being held up by a pair of lime green trousers. "If you don't mind, I'd like to ask you a personal question, are you boys hams?"

"He is," replied Dude pointing at his brother. "I'm still studying."

"Yes, I'm a General," added Hambone, standing just a bit taller.

"Well, then, you have passed tough tests which means you'll understand when I talk technical to you. You boys are familiar with gyroquadratic geometry braiding, aren't you?"

The boys glanced at each other and nodded, vaguely.

"Well then, you know how its self-shielding properties vastly reduce noise pickup which hugely increases your signal to noise ratio. But that's not all. The counter-opposed helix design makes this antenna an unbelievable radiator. That means even low power signals get out as good or even better than the big guns. Are you with me?"

"That's what I need," Hambone responded. "I gotta improve my receiving signal to noise ratio! Are you selling these things, or what?"

"Yes, we are selling these here today at a discounted price of \$200, but I sold my last one just before you came by," bemoaned the man.

Thinking he sensed a deal, Hambone responded, "Well, how about this one?"

"Oh, this is my forty-meter demo, you don't want it. I've been carrying it around hamfests all month. It's a bit worn and its box is a mess."

"I don't care," said Hambone. "I'll give you a hundred bucks for it just as it stands."

"Well, maybe," mused the salesman. "I guess I don't need the demo since I don't have any to sell and I'm headed home after this 'fest. Okay, it's a deal. Because I like you boys. I'll throw in the coax, too. It's a special design that makes your SWR on any antenna very low."

Hambone quickly handed over a Benjamin and scooped up the

antenna, coax and all. "Thank you, sir, we really appreciate it."

"Have fun, boys."

"Wow Dude, can you believe it? It took all my money, but we got a Super Signal Sucker antenna for only a hundred bucks!"

"Yeah, and I can believe we aren't going to get any pork chop sandwiches."

A week later, back home, Hambone and Dude have already strung up their new antenna, but are concerned over its performance. Dude, with binoculars, is checking their installation while Hambone measures SWR with his antenna analyzer.

Just next door, on his deck, sits their uncle Elmer enjoying the cool late summer day with his ubiquitous cup of coffee. Elmer has been watching the boys for a while, but his curiosity finally gets the best of him and he walks across their yards to where Hambone is standing, "What are you guys working on?"

"Hi Unck. I bought this new hightech forty-meter super signal sucker antenna at the hamfest a week ago. The guy said it was a super receiver on forty meters and could suck DX signals right out of the noise. He also said that it was an unbelievable radiator that would make low power signals sound as strong as the big guns. But so far, it seems to be worse than my plain old half-wave dipole."

"I don't see anything wrong with our installation," reported Dude, putting down his binocs and joining the group.

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"Well," commented Elmer, "It seems to be pretty short for forty meters. Are you sure that's what the specs say?"

"The box says that the antenna's ten-foot length seems short by ordinary standards, but it is not. The special gyroquadratic braiding and the new fluorocarbon insulation slow down the radio waves passing over it so they spend more time on the wire and leave more signal. It also says that the counter-opposed helix design makes this antenna almost noise-free and an unbelievable radiator." explained Hambone.

"Yeah, and since the radio waves are going slower, their wavelengths are shorter so the antenna can be shorter," explained Dude. "It makes sense to me."

"It makes nonsense to me," replied Elmer. "Why didn't you guys ask the salesman what *gyroquadratic* means?"

"Gee, Unck, he said we were smart because I have a ham license. After that, we didn't want to seem stupid so, we pretended to understand," confessed Hambone. "Besides, he was nice enough to sell us the antenna for half price."

"How much was that?"

"A hundred bucks. And he threw in this special coax, too."

"Bring the antenna over to my shack. Let's see what you actually bought."

With that Elmer headed back to his shack while the boys gathered in their antenna and followed. In their uncle's shack, they spread the antenna out on the workbench and proceeded to examine it. Elmer

began by cutting into the wire and one of the bulges.

"Well, boys, it looks like you bought yourselves ten feet of antenna wire and pieces of plastic all covered in shrink-wrap tubing. See, the gyro-whatever copper is just ordinary antenna wire and the bulges are pieces of plastic tubing."

"But Unck, the man said the bulges were tiny slot antennas to capture more of the radio waves."

"If that were true, Hammy, where is the slot? You see, there is none. I think it's time we reviewed how antennas receive. Everyone likes to talk about transmitting antennas. You know, SWR and tuners and all, but receiving is just as important."

Uncle Elmer settled into his professorial mode and the boys knew this would not be a short visit. Sketching on his yellow pad, Elmer began, "The transmitter generates RF power that is transferred via coax to its antenna which converts it into an electromagnetic wave, or radio wave, and launches it into the air. You might like to think about that as if the antenna were blowing a giant bubble. A bubble that is expanding outward from the antenna at essentially the speed of light."

The boys nodded in agreement.

"Now this is the tricky part, so stick with me here. The surface of the bubble represents the transmitter's power. As the bubble expands, the transmitter's power is spread thinner and thinner because it has to cover the ever-larger bubble surface. Since the transmitter's power stays the same, say 100 watts, the strength of the electromagnetic field, measured in watts per square meter of bubble

surface, gets lower and lower as the bubble expands."

"I think I get it," said Hambone. "If we are real close to the transmitter, the bubble is small so the transmitter's power is spread over a relatively small surface. That means the watts per square meter of bubble surface is high so the signal is strong. But as we move away, the bubble must get bigger before its surface reaches us. That means the same 100 watts of power is spread over a larger surface – more square meters - which means fewer watts per square meter or, a weaker signal."

"And because the surface area of the bubble goes up as the square of its radius, doubling our distance from the transmitter means our bubble will have four times more surface area. That's why the signal will be four times weaker!" Chimed Dude. "I always wondered why the signals got so weak so fast, now I know!"

"So," continued Elmer, "The job of the receiving antenna is to capture as much of the transmitted power as it can by intercepting as much of the surface area of the bubble as possible."

"Is that why microwave and radio astronomy dishes are so big?" asked Hambone.

"Yes, their capture area, or aperture, is largely determined by their gain or directivity which, in their case means size. They are designed to intercept as much of the bubble's surface as possible and focus it on a receiver. All antennas have apertures, even wire antennas like dipoles."

see HAMBONE on page 7

"So, that means the bigger the antenna the more signal it will grab?" asked Dude.

"Not exactly," said Elmer. "An antenna's capture area is derived from its gain/directivity and wavelength and only slightly affected by its size. For one of those big dish antennas, the capture area is around fifty to seventy-five percent of the actual area. That's due to the extremely high gain of those antennas.

The capture area of wire dipoles, though smaller, is actually much larger than the area of the wire itself and also depends on directivity and wavelength. One calculation I recall showed that for a half-wave wire dipole, the capture area was about $0.13\lambda^2$ which is much more area than just the physical wire. There is a lot more to how an antenna receives, but suffice it to say that making the antenna using exotic materials or special construction techniques will not affect its gain and how well it receives."

well it receives." "But Unck, I get why this antenna doesn't receive all that well, but it doesn't seem to get out either. It's SWR was only 1.1:1, but it seemed like no one could hear us." "Let's take a look at that 'special' coax. It'll give me a chance to try out my new Nano Vector Network Analyzer or NanoVNA for short," said Elmer as he removed a small device from his instrument shelf. "We'll just connect one end of your coax to this S11 port and we'll put this shorted connector on the other end. Its impedance is essentially zero-ohms. Let's look

at the return loss and SWR over a frequency range of, say 3.5 to 30 MHz."

"Look at that, Dude!" exclaimed Hambone. "The SWR is only about 1.2 across the bands. The guy was right about this being really good coax!"

"Wrong, Hammy!" countered Elmer. "The *return loss* is the important measurement here. That RL of about 20dB says this coax is more like a dummy load than a feedline. The low SWR is simply a consequence of that."

"Unck, I don't understand?"

"It's simple. The far end of the coax is shorted. That is like having it connected to an impedance of zero-ohms which means a really big mismatch to the fifty-ohm cable. Such a big mismatch should cause a really high SWR, or low return loss. But it isn't which means the coax is lossy."

"I still don't get it," said Hambone. Elmer took a deep breath and went on. "Return Loss or, RL, is the characteristic of this cable we're interested in and that's what the VNA is measuring. Another name for it is S₁₁. To measure return loss, the VNA sends out a signal into the coax and measures how much of it comes back. The extreme mismatch, due to the short circuit at the far end, means that all of the signal should be reflected back.

The more signal that comes back, the better because that means it didn't get lost in the cable. The VNA compares the returned signal level with the outgoing signal level and expresses the ratio in dB. Since I know you boys really like math, let's see what's happening with actual numbers."

"Oh, no," moaned Hambone and Dude in unison.

"Oh yes," enthused Elmer pulling his yellow pad and marker pen from a workbench drawer.

Let's call the outgoing signal voltage, Vi, or incident voltage, and the returning voltage, Vr, or reflected voltage. If the coax had no loss, all of the signal sent out would return. There would be no return loss. But all coax has loss, the only question is how much and that's what we want to measure."

Vi = Incident voltage

Vr = Reflected voltage

"But Unck, your nifty toy is showing SWR, that's for antennas not coax, isn't it?"

"Actually Hammy, SWR or VSWR which stands for Voltage Standing Wave Ratio, refers to transmission lines, not antennas. The advertising that says an antenna has a low SWR is misleading. SWR is an indication of how closely the input impedance of antenna matches the intrinsic resistance (usually 50 ohms) of the feedline. It says nothing about how well an antenna will transmit or receive. After all, a dummy load shows an SWR very close to 1:1. But I digress.

As I said, for this coax test, RL is what we're interested in.

To start with, even though it refers to loss, RL is a positive number and is normally expressed in dB. The basic formula for return loss is:

 $RL = -20\log(Vr/Vi)$

Look at this formula, if the cable has very little loss, Vr should almost equal Vi making the

see HAMBONE on page 8

quotient, Vr/Vi nearly equal to 1. Do either of you remember what the log of 1 is?"

Both boys reached for the calculator app on their phones, but before they could answer, Elmer responded, "I'm ashamed of you two, It's zero, you should know that.

But your cable has so much loss that only about 10% of the signal sent out by the VNA made it back. Putting in those numbers:

If only 10% of the outgoing signal, Vi comes back. We can say:

Vr = 0.1Vi

0.1 = 0.1 Vi/Vi

 $RL = -20\log(0.1)$ Remember, the $\log(0.1) = -1$

RL = 20dB.

Even though we're talking about loss, RL is a positive number. Still, that's a lot of loss."

"Okay, Unck, but everybody uses SWR when talking about antennas. What's the difference between it and RL?" asked Hambone.

"They are really two sides of the same coin. To see how they are related let's start by defining a *reflection coefficient*. We'll call it, K, and say that it is the reflected or returning voltage divided by the outgoing voltage.

Reflection coefficient = K = Vr/Vi

In the interest of completeness, Vr, Vi and K can all be complex numbers, that is they can contain both real and imaginary parts. But for our discussion, we will stick with simple numbers."

"Thank Goodness," muttered Hambone.

Since SWR is the maximum voltage on a transmission line divided by the minimum voltage, we can write it:

SWR = Vmax/Vmin = (1+Vr/Vi)/(1-Vr/Vi) = (1+K)/(1-K)

See, a small Vr gives a low SWR. Normally, you accept that as proof your antenna is well matched to your cable and you are getting most of your power transferred to the antenna. But it could also mean you have lossy coax and little of your power ever gets to your antenna. That's why you want to test the return loss of your coax.

Dude, you look puzzled?"

"Yeah Unck, I don't see how RL and SWR are two sides of the same coin."

"That's easy, using the formula for RL, you can find k:

 $RL = -20\log(Vr/Vi)$

Get the logarithm alone on one side of the equal sign by dividing both sides by -20

 $-RL/20 = \log(vr/Vi)$

Remember that K=Vr/Vi

 $-RL/20 = \log(K)$

Antilog both sides gives

 $K = 10^{-RL/20}$

Now, SWR is simply related to K as follows

SWR = (1+K)/(1-K)

K = (SWR-1)/(SWR+1)

Finally,

 $K = (Z_1-Z_0)/(Z_1+Z_0)$ where Z_0 is the characteristic impedance of the cable and Z_1 is the impedance of the load which is usually the antenna.

I'll leave it you guys to do the algebra."

Looking longingly at the hamshack

exit and freedom, Hammy summed things up, "What you're saying, Unck, is I was screwed."

"Yeah, that's pretty much it.

You know, boys, that guy and his company was a fraud and playing a joke on you right from the start and you could've avoided all this just by asking questions. That huckster knew just how to suck you in by flattering you and then playing on your pride. In fact, you could've avoided the whole thing by looking closely at his company's emblem right here on the box."

"What do you mean, Unck? The guy said his company is Congruent Electromagnetics and its logo is CE, see?"

"Look, again, Hammy, the logo has a big CE on it and below that in fancy lettering it spells out 'Caveat Emptor'.

>>> FEEDBACK <<<

from AMATEUR on page 2

fellow. His associate, whom--for the purposes of this story--I shall call "Guido", was more the strong, silent type. They wore immense horseshoe-shaped platinum rings, studded with pea-sized diamonds. I had encountered people wearing such rings on several prior occasions.

It turns out that Mr. Civella wanted to transfer the license for his truck-driving school to someone else. The state would not permit him to do that because his license was not in good standing. His license was not in good standing because Mr. Civella had failed to renew it. The agency director explained, both to me and to Mr. Civella, that his hands were tied.

"What does Mr. Civella need to do to renew his license?", I asked.

"He needs to file a renewal application."

"Mr. Civella, would you be willing to fill out a renewal application?"

"Yes, I would."

"Dr. [Agency Director], if Mr. Civella filled out the renewal application, would you accept it?"

"Yes, I would."

"And would that solve Mr. Civella's licensing problem?"

"Yes, it would."

I looked at Mr. Civella and then at Dr. Agency Director. Dr. Agency Director invited Mr. Civella back to his office, where he had a license renewal form, leaving me alone with Mr. Guido.

"Hey. That was a nice thing you done there."

"Thank you, but I'm just doing my job."

"No, that was very nice."

"Really, it was nothing."

Mr. Guido reached into his pocket and pulled out a business card. "If I can ever do anything for you", he said, handing me the card, "you give me a call".

Mr. Guido was old enough, and this occurred sufficiently long ago, that I am pretty confident that Mr. Guido is no longer in a position to do me any favors. Nonetheless, when I am unable to convince a repeat-offender-colleague of the importance of following some minor company rule, I will trot out this story and suggest that perhaps Mr. Guido will be a more effective communicator than I had been.

>>> FEEDBACK <<<

And just what is "physics" anyway?

Professor Steve Gimbel of Gettysburg University lectures on "Philosophy and Physics" for "The Great Courses". Explaining the difference between "physics" and "philosophy", he quotes a colleague for the proposition that if you ask "why?" once, you're a scientist. If you ask "why?" a second time—why was that the answer—you're a philosopher. If, however, you ask "why?" a third time, you're a three-year old annoying your mother.