

# The PROPAGATOR

March, 2005

The Monthly Newsletter of South Orange Amateur Radio Association

## Celestial Radio Circuits

Our March general meeting will feature SOARA member John Hoot, N6NHP. John will discuss the design of the communication system on the upcoming Mars Reconnaissance Orbiter mission (MRO). With its large-dish antenna, powerful amplifier, and fast computer, Mars Reconnaissance Orbiter can transmit data to earth at rates as high as 6 megabits per second, a rate ten times higher than previous Mars orbiters. This rate is quite high considering that Mars Reconnaissance Orbiter will achieve it while 100 million kilometers (62 million miles) from Earth.



The orbiter's radio operates in the X-band of the radio spectrum, at a frequency of around 8 Gigahertz. The orbiter will also be used as a telecommunications link for future missions.

This spacecraft is to be launched on August 10, 2005, and scheduled to arrive at Mars in March, 2006. During its intended science mission from March 2006 to July 2008, it is intended to study Mars from orbit, perform high-resolution measurements including images with a resolution of 20 to 30 cm, and possibly serve as communications relay for later Mars landers until about February 2010.

John is president of Software Systems Consulting. He has been an active amateur astronomer for more than 35 years. Among his professional accomplishments are the design and development of the Meade CCD cameras and the telescope pointing systems for the Magellan and AutoStar EC telescopes.

His interests include CCD imaging, spectroscopy, photometry and radio astronomy. He is presently completing construction of the first elements of the Hoot-Vega radio telescope at the Vega-Bray observatory, Benson, Arizona.

Jim, K6LIO

## T-hunt Report

Did it rain? *No*. Did we hunt like rabbit dogs of prey? *Yes*. Was the fox easy? *No*.

Tucked away in the foot hills deep among the alligator lizards and under the watchful eyes of high flying red tailed hawks, the fox started to sing at the stroke of 1 PM. From the far flung regions of Orange County the hunters started to stalk its musical signal.

Now here's how I wanted it to play out: I would use the first fox to make sure everyone got a good bearing. But, at the stroke of 2 PM the fox would become a blue jay moving every 15 minutes, a short distance to a new location. After the first ¾ of an hour the jay would move only on the ½ hour.

This would give the really good and lucky hunters a very nice challenge (on the flat lands). When they thought they had the jay they would ask this person, are you the blue jay? If they had "caught" him, he would answer yes. I asked Heiko to do it knowing that he had about 1,200 bikes at his disposal to choose from. Heiko agreed so I sent him a map and a 220 frequency. So the trap was set. I asked my Susan to flip burgers and dogs for the guys and she agreed, so the food was set.

As the time neared 2 PM, I still had not heard from Heiko. At 2:15 I had hunters in the park and heading my way. Oh no, I was getting close to having no Jay! Looking down the hill I could see Dale heading up the hill. Then I heard Heiko on Susan's FRS: "Where are you? High or low?" "I'm high," I explained and Heiko was on the fly to find me tearing from one side of the park to the other, passing hunter after hunter completely unrecognized due to the helmet and sun glasses.

But Dale, W8RRV, got to me first at 2:26 PM. He was teamed with Karl, KF6MDF. Second in was Tony, AE6QT at 2:27. Next in was Matt, KE6ALM, at 2:27½. Kareem, KG6USK, slipped in at 2:41.

## Longwave Well Received

Kriss Larson's presentation on longwave beacons held the SOARA meeting in rapt fascination as he narrated a slide show of various beacon stations. In his travels, both in this country and around the world, Kriss has visited and photographed beacon sites. His slide collection included many unique and interesting beacons. In the early days of aviation these beacons were the main navigation aids. Only a few are still in operation. Their frequencies are located below the AM broadcast band. Many general coverage short-wave receivers will tune as low as 100 or 150 KHz, and are suitable for listening for beacons.

If you missed this very interesting talk, you may want to visit Kriss' web site where you can see some of his photographs and read some of the fascinating history. The easiest path to the web site is to go to SOARA's site and click on the link to past meeting presentations. There you will find a link taking you to the site of Kriss Larson, KG6UOS. The time spent browsing this site will be well spent. Kriss has done a lot of research and compiled a collection of information and photographs that are very entertaining as well as informative.

Next in was Jeremy, KG6JAD, at 3:07. Followed by Howard, KG6GI, at 3:09. Then came Lou, KG6FCT, at 3:10. Ray, AE6H, showed up at 3:37 with an observant student.

I learned that Dale had out-run the pack by making a bee line on foot from the other side of the park, down a hill, crossed a 1 foot deep running stream, and trekked across the rest of the park and up the hill to my location to be first in. Now that is fox hunting.

Check the web site for current T-hunt Info.

73

Dave, KG6QCI



## The Way I See It:

Shedding light on some mysteries of

In this column we have carefully avoided math (as much as possible), but in your general reading on Amateur Radio you will run into some. There are a few math topics which seem to be shrouded in mystery. I have in mind “imaginary numbers” and “logarithms”.

If you took algebra, you were exposed to imaginary numbers — they are numbers involving the square root of minus one ( $\sqrt{-1}$ ). Recall that the square root of a number A is that number B ( $= \sqrt{A}$ ) such that when B is multiplied by itself the result is A. (A and B represent numbers here.) OK, the square root of 4 is 2 (i.e.  $2 \times 2 = 4$ ), but there is no number that you know of which if multiplied by itself, will produce -1 (or any other negative number). [Note that  $-1 \times -1 = +1$ .]

Well, there are cases in mathematics where it is necessary to deal with results which involve  $\sqrt{-1}$ . We call it an imaginary number (to give it a name, I suppose it is no more imaginary than a lot of other numbers) and use the symbol “i” in equations. Well, in electronics we use i as a symbol for current, and it would be confusing to have i standing for too many things, so we use “j” in equations and formulas for electronic circuits.

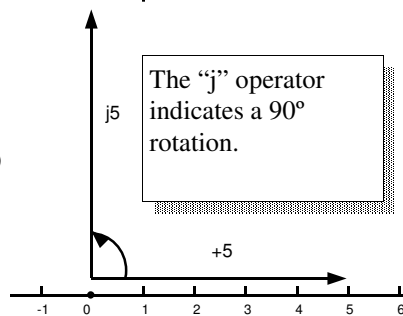
Now this may seem quite bazaar to put into an equation a symbol that represents a number that “isn’t a number”(?) — and what meaning could it have? Try to remember back to when you first ran into negative numbers. Negative numbers are fairly common. They are bad if our football team gains -6 yards on a play (lost 6 yards), or if they appear in our bank balance (accountants write them in red ink). But generally we are comfortable dealing with them. Well let me make you a little less comfortable with them. Here is a (dreaded) word problem: There are five people in a room. Six people leave. How many people are left in the room?

OK, negative numbers are not useful when we are counting people (or a lot of other things). Lets look at what seems to be the most obvious area of application of negative numbers: distance measured along a straight line. We draw a horizontal line and take distance toward the right as positive. At the left end we make a dot to indicate the zero point (the origin). Mark off equal distances from the origin, say each inch and number them. Clearly if we extend the line to the left we are in the “negative number” range.

We can represent a measurement as an arrow with its tail at the line’s

origin. We can easily picture a measurement with a negative result as an arrow in the opposite direction. In the drawing is a measurement with the result: 5. To make that value negative we rotate the line by  $180^\circ$ , and get “-5”. Thinking of that little minus sign as indicating a rotation of  $180^\circ$  seems reasonable.

Mathematicians call that minus sign “-” an operator — it takes a perfectly positive number, like 5, and makes it negative. The imaginary number “j” is also an operator, we can put it with an ordinary number to make that number imaginary. Remember that j is the square root of -1. That means that if we multiply j by j, if we square it, we get -1. Put another way, if we apply j twice we get minus one. That is just a rotation of  $180^\circ$ . That suggests that the operator j represents a rotation of  $90^\circ$ .



The “j” operator indicates a  $90^\circ$  rotation.

That is exactly the way it is used in electronics. If we pass an AC current through a resistor, we get a current that is in phase with the voltage. The value of the resistor, in ohms, is just the ratio of the voltage (volts) divided by the current (amperes). [An ohm is a volt per ampere.] But for an inductor or a capacitor, the current and voltage are  $90^\circ$  out of phase. So we say that it has a reactance and write its value with a j (inductance) or -j (capacitance) to indicate the phase difference. That takes care of the phase difference when

calculations are done.

Well that is what imaginary numbers are about in the field of electronics. If you are not already familiar with them, you probably won’t be doing calculations using imaginary numbers, but they should be a lot less mysterious now.

What about logarithms? The place you are most likely to run into them is in the use of the units “dB” in gain calculations.

Expressing gain in terms of dB is useful because we simply add gains and subtract losses. If we use gain numbers, we would have to be multiplying and dividing. And if we switch between power and voltage and back, we will be squaring and taking square roots. Well it isn’t a trick if we are using a computer or calculator, but without them, it would be a major nuisance.

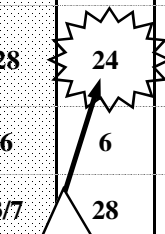
I introduced the topic in terms of the difficulty of doing the calculations by hand because in the 15<sup>th</sup> century they didn’t have computers or calculators. John Napier, born about 1550 near Edinburgh, Scotland, got the idea that one could devise a table of numbers and, well, lets call them logarithms, such that to multiply two numbers you merely add the logarithms and look up the number whose logarithm is the resulting sum.

John set out to devise such a set of logarithms. He spent 20 years working on it before publishing his first book of logarithm tables. His invention was immediately accepted, and he received widespread acclaim. Such immediate acceptance of a new concept in mathematics (or any other field) is rare. When you consider the work and time that was saved due to Napier’s invention, its value becomes obvious.

It turns out that any number of schemes for logarithms can be devised. We use  $\text{Log}_{10}$  (log base 10) to calculate dB values from the gain numbers. How do you obtain the log values? Easy, today we use a calculator with a log function!

Incidentally, the reason for the strange capitalization of “dB” is that the “d” is for “deci” — the prefix for 1/10, and the “B” is for “bel” — a unit of gain named after Alexander G. Bell. □

Year 2005	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.
General Meeting 7:00 PM	24	28	21	18	16	20	18	15	19	17	21	No meeting
Program	WU6D (Org. SM)	KG6UOS "Long Waves"	N6NHP "Ham Radio & Astro."	AA6MH Calif. ACS	Spring Auction	Field Day Prep.	Show & Tell	K3AW Video on Antennas	K6RIX Radio KFI	TBD	Fall Auction	—
VEC Testing	24	28	24	18	16	20	18	15	19	17	21	—
SOARA T-Hunt	9	6	6	3	1	5	10	7	11	9	6	4
Board Meeting	31	3/7	28	25	23	27	25	22	26	24	28	
ARRL Field Day						25/26						
SOARA picnic								7				
SOARA Holiday Party												4



VE testing will be held on Thursday, March 24, rather than on Monday before the meeting. Walk-ins are welcome. Time is 7:00 PM. Location is Meeting Room at the Community Center.

==== Notice =====

It is election time again at SOARA. Since 2005 is an odd numbered year, the constitution dictates that we elect the Directors. There will be a call for nominations from the floor at the next regular meeting on March 21st. If you, or someone you know is interested in running for one of the Directors positions, please be prepared to nominate them at the meeting. One request: In fairness to all, if you plan to nominate someone other than yourself, please get the concurrence of that candidate first.

Thanks, and best 73,  
Ray, AE6H,  
SOARA President



Class Notes

The current SOARA technician licensing class will soon be completed. Testing for the students will be held on Thursday, March 24. Testing will be at the regular class time of 7:00 PM. There will not be testing before the regular meeting on Monday. Anyone wishing to take a test should show up at the class test session.



All students appear to be progressing very well. The interest level has been very high. It is encouraging to see so many people showing this much interest in the hobby. Were anxiously looking forward to welcoming 26 new hams.



SOARA needs a volunteer to coordinate field day this year. This an important job, yet, as formidable as it sounds, it really isn't that difficult. We already have a number of volunteers to handle various parts of the task, and invariably others jump in as the event approaches.

doesn't get missed. To help the coordinator accomplish this, previous coordinators have put together a comprehensive note book with all the steps that need to be taken. Many steps are already done, as the club has a fair number of antennas "prestaged" and ready to go. We also have the site arranged and the City of Mission Viejo Permit in hand.

SOARA has always been extremely fortunate in that we have lots of participation, especially for set-up and take-down. We just need someone willing to keep the team working together, and to be sure something

If you'd like to accept the fun and rewarding challenge of coordinating field day, let us know. You won't be sorry, I guarantee!



Manuals Mailed

The new 2005 Repeater User's Guide & Membership Manual has been mailed to all current members. Most of the credit for producing the material goes to Howard, KG6GI. In addition to his other duties in maintaining and upgrading the six repeaters that SOARA operates, Howard generated the technical content and user instructions for this manual.

Enclosed in this issue of the newsletter you will find a page with a cutout to fit into the manual. It contains a list of members who were missed in the book or who joined after the publication. Cut out this page and add it to the membership roster in the back of the Manual.



# The PROPAGATOR



## South Orange Amateur Radio Association

P.O. Box 2545  
Mission Viejo, CA 92690

**Meeting: March 21, 2005 at 7:00 PM**  
**Speaker: John Hoot, N6NHP**

☛ **SOARA** meets at the Mission Viejo Community Center, 26932 Veterans Way, Mission Viejo, the third Monday of every month at 7:00 PM. Changes to the meeting time or place are announced in this newsletter and on the 147.645 two-meter repeater.

☛ **License Exams:** Amateur License Exams are given prior to SOARA meetings. Exams are from 5:00 to 7:00 PM. Walk-in applicants are welcome. For information call Paul Levey, NZ1M, at 949-481-5454.

☛ **Contacting SOARA:** Questions about SOARA? Send e-mail to: [info@soara.org](mailto:info@soara.org), or leave a message at 949-249-1373.

☛ **Web Site:** SOARA maintains a web site with current club information. The URL is: <http://www.soara.org>.

☛ **Repeaters:** The Laguna Beach, San Clemente, and Trabuco repeaters are open. The Santiago Peak repeaters are closed. For details or questions on the repeaters contact the Repeater director, KG6GI.

2m — 147.645 - (110.9) Laguna Beach  
2m — 146.025 + (110.9) San Clemente  
2m — 145.240 - (110.9) Trabuco  
220 — 224.100 - (110.9) Laguna Beach  
220 — 224.640 - (123.0) Santiago Pk. (C) 440 —  
445.660 - (110.9) Laguna Beach  
440 — 447.180 - (131.8) Santiago Pk. (C)

☛ **Nets:** SOARA 2 m repeater open net is held Tuesday 8:00 PM  
40 meter HF net (7.250 MHz +/- for QRM), Sunday 7:30 AM.

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