

W6OTX

W6ARA

PAARA NEWSLETTER

VOLUME 58, NUMBER 2, February 2008

K6OTA

K6YQT

PAARAgraphs



Celebrating 71 years as an *active* ham radio club—*Since 1937*
The Palo Alto Amateur Radio Association, Inc.



CALENDAR

- Feb..... 1, **PAARA Meeting**, 7:30
Menlo Park Recreation Center
700 Alma Street, Menlo Park
- Feb..... 6, **PAARA Board Meeting**, 7:30
Red Cross Bld., 400 Mitchell Ln., Palo Alto
- Jan..... 25, PAARA/FARS Winter Banquet
- Mar..... 7, **PAARA Meeting**, 7:30
- Mar..... 12, **PAARA Board Meeting**, 7:30
- Mar..... 7, **PAARA Meeting**, 7:30
- Mar..... 12, **PAARA Board Meeting**, 7:30



President's corner

~Kristen McIntyre, K6WX



February 08

It's the February issue of PAARA-Graphs already and it's almost time for the plum blossoms to appear on the trees. Before too long spring will be here and with that we can hope for better propagation around the equinox.

As many of you have probably heard, solar observers at NOAA (The National Oceanographic and Atmospheric Administration) and elsewhere have proclaimed the start of solar cycle 24. It was heralded with the appearance of a high latitude sunspot with a magnetic field polarity that was reversed from most cycle 23 sunspots. In addition, a dipole-like formation of the sun's corona has appeared. This is where the corona streams seem to be mostly confined to the sun's east / west axis. This formation is typically found at the start of the new solar cycle. While it will take many months yet for us to see the benefits of an upswing in the sun's 11 year activity cycle, there is now at least some hope for improved conditions on HF. As I write this the sunspot number is 0 and the Solar Flux Index is 73 indicating that we still have some waiting to do.

In case you missed it, we had a really great speaker for the January meeting, **Joel, KD6W**. Joel told us all about the past and potential future of Amateur Television. It seems as though we may have some digital video conversion on the bands in the not too distant future. I know that many of you may have missed this talk as we were in the midst of a fairly big (for California anyway) winter storm at the time. The morning before the meeting a large number of the stations who checked into the 9AM Talknet reported being without power, so I was not surprised to see many of you be unable to make it to Menlo Park. I believe I saw someone videotaping the talk so you might be able to view that if you weren't there.

I wanted to put out a special thanks to **Leigh, WA5ZNU**, for showing us his new LiFePO4 (Lithium Iron Nanophosphate) battery at the January PAARA meeting. Leigh has written a column for PAARAGraphs about this exciting technology which has the potential to revolutionize portable Amateur Radio operating. Thank you Leigh.

(Continued on page 16) president's corner

NEXT MEETING

February 1, 2008

**SPEAKER
and
PROGRAM:**



Program not confirmed at press time,

WEB's

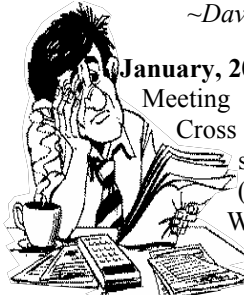
Recommended by PAARA Members

?

(Do you have one or more?)

BOARD OF DIRECTORS MEETING.

~David Ungar W6DH, PAARA Secretary



January, 2008 PAARA Board Meeting

Meeting was convened at the Palo Alto Red Cross on 1/9/08 at 1925 hours (Juliet). Present were Kristen McIntyre K6WX (Pres.), Ron Chester W6AZ (Treas.), Wally Porter K6URO (Ed.), Dennis Wilson KA6LSW (Webmeister), Byron Beck KG6UOB (Dir.), Vic Black AB6SO, David Ungar W6DH (Sec.) and Christopher McIntyre KG6SVI (Future Pres.). Although we had no quorum at that time, we soon had one with the arrivals of Gerry Tucker N6NV (Dir.) and Rick Melrose K6RDM (Membership).

The President reported on the last meeting and mentioned that the raffle did well despite the weather keeping some folks home. We discussed upcoming speakers and formed a speaker committee, chaired by Joel Wilhite KD6W (VP). We do not yet have a speaker lined up for March, and all suggestions are welcome.

PAARA continues to be the very grateful recipient of equipment donations. Warren Weinstock KF6QGF is donating his antenna system to us. (Thank you, Warren!).

Ron W6AZ reported on the raffle and stated that after two good years the club's bank balance has now caught up to where it was five years ago. He also passed around the quarterly financial report.

The PAARA SLAC tour is coming up in March. Joel KD6W has the details. Attendance will be limited to 30 attendees and signups will be at the March meeting. PAARA members will have priority in filling the 30 slots. It is time for us to start devising ideas for a Summer tour.

We discussed the projector issue, and the upcoming Winter banquet. Thanks to Howard Califf W6HOC, the raffle at the banquet promises to be very exciting.

At last month's board meeting, we decided to donate the club's TV and VCR to Chuck Johnson N6VFH, who has an amateur radio use for them. At this meeting, Kristen read a nice message from Chuck thanking the club for the donation. Chuck has also sent us a Certificate of Appreciation.

The discussion about the board meeting minutes content was tabled because too many board members were absent.

Vic BAB6SO, Gerry N6NV, and David W6DH volunteered to serve on the speaker committee.

Ron W6AZ is working with David Cooper KE6PFF to get the proceeds from last year's Winter banquet deposited into PAARAs account.

We tossed around an offer that has been made to PAARA of the donation of a D-Star repeater.

Rick K6RDM reported on membership. Membership is increasing steadily; the club now has over 300 members. Although many folks have renewed for 2008, many have yet to do so. Remember, folks, that the dues are now \$20.

Kristen K6WX will be following up on the Menlo Park Recreation Center contract.

We then chatted about signature authority on the PAARA bank accounts with the goal of getting it for our Treasurer plus two other Board members for every account.

We next talked about getting a check out to Worldradio and Ron W6AZ is taking care of it.

Kristen K6WX will be setting up an email list so that we can get announcements out to the membership.

We discussed the pre-meeting dinner at Su Hong, which has been dwindling of late.

Finally we reminded ourselves that PAARAgaphs needs material. If anyone out there has anything they would like to say—polished or not— please send it in to Wally K6URO at k6uro@arrl.net.

Meeting adjourned at 20:32.

-- AR es 73 de W6DH

HOWARD CALIFF, W6HOC, WINS PRESTIGIOUS AWARD.

Active PAARA member and well known amateur radio operator Howard Califf, W6HOC was recently presented with the rather coveted and prestigious award known as the "Mick McDonald Award" by the Santa Clara County Emergency Managers' Association. This award is entitled "2007 Volunteer of the Year". It is a joint effort by both the City of Santa Clara and the County of Santa Clara. As some of you may be aware, Howard is the emergency communications radio officer for the City of Santa Clara and spends much of his free time providing guidance and technical assistance to that Government agency and many of the other volunteers who offer their services in case of an emergency. It should be noted that Howard is also well known in ham radio circles as the Manager of the Candy Store (HRO) in Sunnyvale. (Ham Radio Outlet) remains active as an excellent source of not only amateur radio equipment (hardware & software) but important guidance in assisting hams with purchase choices.

PAARA joins the Emergency Managers' Association in recognizing this significant effort on the part of Howard Califf and complimenting him for his contributions to our amateur radio community here in the greater Bay Area.

Submitted by:

Terry Finn AA6T, Photos by Dan Noriega, K6DN.



photo K6DN



Miscellaneous Info

By Vic Black AB6SO

A Major Breakthrough in Solar Power

Imagine photovoltaic solar panels so light weight and inexpensive that you could roll them out just like roofing tar paper and cut them to size using scissors or hang them on the side of your home like wall paper. Think about putting them on top of RV's, big rig trucking trailers or railroad box cars and shipping containers to operate the refrigeration units. This isn't just pie in the sky thinking anymore. The sun radiates to earth more watts in one hour than the world can use in a whole year. The energy is accessible, inexhaustible and reliable. The key to harnessing that power economically is just now being realized.

Palo Alto-based Nanosolar has just announced a major breakthrough that could revolutionize solar photovoltaic panel production. As predicted in PAARAgaphs several years ago, the emphasis has changed from stating efficiency of solar conversion to electrical energy from maximum watts per square meter of panel to maximum watts per dollar. This results in bringing the cost down to less than one dollar per watt, which is competitive with centralized, large-scale fossil fuel-generated electricity. Imagine a slightly larger 10 watt panel for \$8 - \$10 as compared to a currently marketed comparable silicon panel for \$50 to \$150. Costs could drop dramatically to as low as 30 cents per watt in 12 to 18 months. In addition, the energy payback period has been reduced to less than one month. Anything that sounds too good to be true often is. So how can they do it?

First, they don't use silicon, which is in short supply worldwide. Secondly, they have perfected new proprietary processes for coating their substrates to allow producing panels 100x thinner and 100x faster than silicon based panels.

The new material, CIGS or copper indium gallium selenide, has been under development since the 1970s and can achieve up to 19.5% light-to-electric conversion to produce thin film solar cells. Besides being less expensive per watt than silicon, CIGS panels are light weight and flexible enough to conform to tight radius curves. They work better than silicon in low light and low angle conditions. They can also be made to be self healing if scratched. The first uses for these panels will be for commercial power generating plants and for powering Internet server locations.

We are currently witnessing the maturity of the third wave of solar panel development. The first wave started in the 1970s with the commercial introduction of mono- and polycrystalline silicon wafer-based solar cells. Silicon cells must be very thick in order to convert electricity efficiently since they don't absorb light very well. Also, they are usually mounted on glass, which is heavy, fragile, dangerous, expensive to ship and install and require depositing a conductive surface on the rear of the panels. Up to 70% of the silicon is wasted during manufacture. This complicates handling of the

panels throughout the entire production process, uses a lot of energy, wastes a lot of material and leads to lower yields.

Second wave panels appeared during the 1990's as the processes migrated toward production of thin film amorphous silicon solar cells. Some are sputter coated in a vacuum, or even more expensive epitaxial growth chambers depositing silicon one molecule at a time. Most are manufactured by plasma enhanced chemical vapor deposition of a thin layer of silicon on a substrate as opposed to monocrystalline and polycrystalline cells, which are sliced off silicon crystals and use more material and more expensive material. The substrates used are quite often thin stainless steel. This allows for flexible, robust panels, but stainless is a very poor electrical conductor. Key to Nanosolar's success is their proprietary semiconductor CIGS ink which helps to set a new standard for cost-efficient solar panels. The sample I saw looked similar to a colloidal suspension of graphite, a common lubricant. The ink allows for high speed printing presses to print the panels on a highly conductive thin foil a mile at a time. By using a highly conductive, low-cost foil as a substrate they avoid the cost of separately depositing an expensive bottom electrode as required for a non-conductive substrate such as glass. The new technology allows Nanosolar to produce high-power solar panels with 5-10 times higher current than other thin film solar panels on today's market. Extensive HALT, or Highly Accelerated Life Testing, indicates that the panels will be very robust allowing the company to issue 25 year warranties for their products.

At least four other companies are experimenting with the CIGS chemistry. They don't indicate how they will apply it to a substrate and most aren't expected to be in production any time soon. A Santa Clara based company, Innovalight, is developing printable silicon based ink. Their 30,000 square foot Sunnyvale plant isn't expected to have shippable panels until at least 2009.

Nanosolar has a new 200,000 square foot production plant in San Jose on the Cisco campus and over 450,000 square feet in Germany. Nanosolar's factories are capable of producing 430 megawatts of panels per year. Major coal-burning power plants produce about 500 megawatts per year. This will make Nanosolar one of the largest solar panel manufacturers in the world. (The current leader, Sharp, specializes in silicon panels). Nanosolar has received more than \$100 million in venture capital funding. Their production managers are some of the best in Silicon Valley. Don't rush out just yet to look for your new PV panel, though. Distribution is currently production limited. Although panels are now being shipped as of December, 2007 the first 100,000 panels (the entire 2008 volume) have already been sold to a German electric utility company.

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Rick Melrose K6RDM, 408-732-2247, k6rdm@arrl.net

New technology Lithium batteries

~Leigh L Klotz, Jr. WA5ZNU <Leigh@WA5ZNU.org>

There's a new battery technology in town, and it promises to revolutionize portable ham radio operating. Lithium Nano Phosphate and Lithium Iron Phosphate batteries are lightweight and provide the right mix of power, voltage, and current for ham radio applications. The price point is now low enough that individuals can buy a pack and charger to try out for under \$100 and be on the air with a field-operated SSB radio in 45 minutes!

Existing lithium batteries (Lithium Ion and Lithium Polymer) have excellent energy density (volts * amps * hours / weight), and great power delivery (instantaneous volts * amps). Lithium technology shares with lead-acid batteries and excellent self-discharge rate, so you can charge up a pack and know it's ready to go, without having run itself down the way Nickel Metal Hydride cells do.

In the weight and power delivery department, Lithium technology wins hands-down over lead acid, as the heavy SLA batteries are specified in discharge rates of 1/10th of their capacity: a 20 amp-hour SLA battery can deliver 20 amp hours only if used at a 2 amp rate!

These new-technology Lithium cells are exciting for two reasons: existing Lithium cells have safety problems, and are poorly matched to 12v radio equipment because the fully-charged voltage is often above 16v, making most of the energy unavailable to radios which have a maximum DC input of 14.4v.

The new technology Lithium Nano-Phosphate cells from [A123 Systems](#) and similar Lithium Iron Phosphate cells from other vendors break the mold for Lithium chemistry, and offer a maximum voltage of 14.4v, appear to have excellent safety features, and offer self-discharge and charge lifetime rates that are on par with existing Lithium batteries.

What's more, these new batteries (especially the A123) cells can source incredible amounts of current and still retain their energy amp-hour ratings. Let's taken example: the 20AH SLA mentioned may go down to 5 or so amp-hours when used at 20A, meaning you'd get only 15 minutes of 20-amp transmitter operation. Discharging an SLA 100% considerably weakens its cells and reduces it lifetime drastically, so a 30%-50% discharge is recommended for good lifetime. And the SLA weighs 15 pounds to boot!

By contrast, a 4.6 amp-hour A123 pack would provide the same service, and weighs only 2 pounds! And it can be discharged 100% and still retain its charge cycle lifetime.

We've had reports from one ham who used his A123 pack to run a 500W amplifier for half an hour SSB on field day, and then jump-started his truck with the same pack!

Tests by Ken WB6MLC and Oliver KB6BA presented at the Pacificon HFPack forum also showed that these battery packs are usable with today's 100W field radios, and provide excellent "talk time" and quick recharging.

For more information, including recommendations on what to do now, keep reading:

Choices Now

For now, If you want to power a 100W rig or a similar (or larger) amplifier, go for genuine A123 cells from one of the sources below. But be prepared to spend about \$300 for batteries and charger. If you can limit yourself to 50W SSB or so, try one of the smaller A123 packs from K5OOR, or one of the Batteryspace packs, and get away with an under-\$100 purchase.

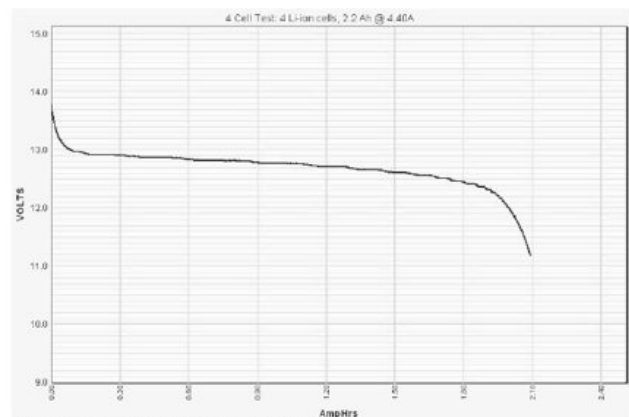
The Future

These batteries truly raise the bar for 12v applications: they feature max voltage 14.4v, flat discharge curve for excellent use of available energy, safety from over/under charge and impact fires (especially as compared to traditional Lithium packs, low self-discharge, high energy density, and high power density.

Not to be outdone by MIT's spinoff A123, Stanford now has its own technology using nano-silicon cell, though they will have a hard time catching up to A123's manufacturing base and reported \$350 million capitalization. A123 has some major marketing coups under its belt already, including DeWalt and Black and Decker tools now, and the Chevy Volt hybrid vehicle planned.

The recently released "one laptop per child"> uses Lithium Iron Phosphate cells as well.

The financial interest in this area is considerable, and either this (or another breakthrough spurred by it) will likely obsolete SLA and NiMH the way that NiCd and Carbon batteries are now limited to special applications.



Source: Virgil Stamps K5OOR HFPProjects.com

(Continued on page 16) Lithium

(Continued from page 15) *Lithium*

HFProjects A123 Lithium Nanophosphate packs

Virgil K5OOR offers two 12v packs with these new technology batteries.

- 10 amp discharge / 2.2 amp hour
- 20 amp discharge / 4.4 amp hour
- K5OOR Lithium Nanophosphate Power Packs Spec Sheets

Other A123 Lithium Nanophosphate



These packs are unfused and are usable up to almost 70 amps continuous, 138A peak, and can power an amplifier or a 100W SSB/CW radio.

A123 Racing 6.6v power packs (use two in series)

Dissecting a DeWalt 36v pack to obtain the A123 cells to make your own.

Batteryspace Lithium Iron Phosphate



These packs are usable up to 14A continuous, and can run a 50W SSB/CW radio or a similar-sized amplifier. They are less expensive than the genuine A123 cells but can source less current.

Product Specs

Batteryspace 2300mAh (about \$50)

Charger (about \$30) Note: the alligator clips contain diodes and clips are their heat sinks; do not remove.

Other Resource

HFProjects battery technology page

(Continued from page 11) *president's corner*

Before we get to our next PAARA general meeting, we have a very special annual event: The PAARA/FARS FARS/PAARA Winter Banquet on 25 January. It's a really special banquet this year as we have an extra special speaker. We will be welcoming **Martin Knutson, W0BBV**, who was a member of the initial group of six U.S. Air Force pilots hired by the CIA in 1955 for the covert U-2 program. He will be relating his experiences as a pilot during the cold war. It's a talk that you don't want to miss. In addition to this we have over \$1500 in raffle prizes that include a Yaesu FT-857D as the grand prize. Of course, there is the great food at Michael's at Shoreline at Shoreline Park in Mountain View and the fellowship of our ham friends. What more could you ask for. By the time you read this it may be almost too late to sign up if you haven't already, but check the FARS website at <http://www.fars.k6ya.org> to see if you can still sign up. I hope to see you all there.

Before closing I wanted to let everyone know that the PAARA officers and board for 2008 had their first meeting on 9 January and kicked off the new year. We had a chance to introduce our newest board member, **Byron, KG6UOB**, and start the year off with a rich set of discussions about the future of your radio club. We have an exciting year coming up and we'll be putting out the call for you to give us a hand whenever and wherever you can. Thank you in advance for any help you can contribute.

Take care ES GUD DX into the new solar cycle.

Note from Handiham

Wally,

We'll be running our Handiham Radio Camp session for people with disabilities Feb. 16 - 22, and I thought you might know of a PAARA member who would benefit from the camp experience. We serve people with physical disabilities and blindness/low-vision.

Since we'll be literally next door (rural Cupertino), it would be pretty easy for folks from the area to attend. We will be teaching Technician, General, Extra, and we'll have an Operating Skills class.

We have campers come in from far & wide, but there is room at camp for more locals! This would be a good opportunity for a blind or low vision PAARA member to upgrade a license or get a first ticket. Cost is what they can afford on a sliding scale, so anyone can afford Radio Camp and we don't turn away anyone for inability to pay.

I have attached a KMZ file, which pinpoints the location in Google Earth. It's on Stevens Canyon Road outside Cupertino.

73, Pat

Regards,

Patrick Tice, WA0TDA Manager, Courage Handiham System
 3915 Golden Valley Road Golden Valley, MN 55422
patt@courage.org 763-520-0511 Toll-free donations: 1-866-426-3442 1-866-HANDIHAM

Visit Handi-Hams on the web at <http://handiham.org> for our online audio news, information about our program, and much more. While you're there, link to www.courage.org and learn how abilities and disabilities can become possibilities.



photo K6VWO

PAARA 2008



photo K6VWO

photo K6VWO



**PAARA Radio NET every Monday evening at 8:30 P.M. local time on the
 145.230 –600 MHz repeater, PL tone off**

Congratulations: January 4th 2008 PAARA Raffle Prize Winners

- 1st Prize:** Pat / (not available) / Yaesu FT-2800M / 2m / 65W / Mobile Transceiver
- 2nd Prize:** Peter Sheerin / K6WEB / Yaesu VX-150/64B / 5W / 144 MHZ HT / with 2 Ni-Cd Battery Packs
- 3rd Prize:** Clark Murphy / KE6KXO / Red Cross / FR-250 / AM/FM/SW Emergency Radio / with Flashlight
- 4th Prize:** Dennis Wilson / KA6LSW / ARRL HF Digital Handbook
- 5th Prize:** Leigh Klotz / WA5ZNU / Power Pole Connector / PS-4
- 6th Prize** Jim Volstad / WA0TRY / CQ 2008-2009 Amateur Radio Calendar
- 7th Prize:** Doug Teter / KG6LWE / World Radio 1 Year Subscription
- 8th Prize:** Vick Black / AB6SO / ARRL Desktop Repeater Directory 2006-2007
- 9th Prize:** David Ungar / W6DH / Sterling Deluxe Wire Stripper

PAARA Members and Visitors: THANK YOU FOR YOUR SUPPORT of the exciting monthly raffles! Since Feb. 03, 114 Radios, including an Elecraft K3, a Yaesu FT-847, an Icom 706 MK IIG, a Yaesu FT-897D, and TWO Elecraft KX1's have gone to Fellow Hams, THANKS TO YOU!

PAARA had a remarkable year in 2007! If you aren't a member, please join PAARA now, and experience fun 2008 events with the "friendliest club around."

~K6AK Jim



PAARA February 1st 2008 Meeting

PAARA “The Friendliest Club Around”

Palo Alto Amateur Radio Association, Inc. www.paara.org

Date and Time: Friday, February 1st at 7 p.m.

Menlo Park Rec. Center, 700 Alma St., Menlo Park, CA.

Welcome Members and Visitors / Raffle Prizes:

FIRST PRIZE: Garmin® Nuvi 200 GPS



Navigator / “From Car to Your Pocket”

- Touchscreen GPS Shows Detailed Maps / 3.5" Vivid Color Display / SD Slot
- Automatic Routing with Turn-by-Turn Directions
- Comes Preloaded with Street Level Detail
- 6 Million Points of Interest (Hotels, Restaurants, ATMs, with phone #s)
- Rechargeable Lithium Ion Battery for 5 hour Pocket Use / Photo Viewer

SECOND PRIZE: Heil “The Traveler” Headset



- Heil ‘iC’ Boom Mic Element
- Pendant Switch / PTT & Up/Down Frequency Control
- Interface Cable NOT Included

THIRD PRIZE: Red Cross / FR-250 / AM/FM/SW Emergency Radio / with Flashlight

FOURTH PRIZE: Kill-A-Watt / AC Electricity Usage Monitor

FIFTH PRIZE: World Radio 1 Year Subscription

SIXTH PRIZE: ARRL Desktop Repeater Directory 2006-2007

SEVENTH PRIZE: Gordon West 0-5 wpm CW / Two CD Set

EIGHT PRIZE: FCC Part 97 Rules and Regulations

NINTH PRIZE: Sterling Deluxe Wire Stripper

Since Feb. 03, 114 Radios, including an Elecraft K3, a Yaesu FT-847, an Icom 706 MK IIG, a Yaesu FT-897D, and TWO Elecraft KX1's have gone to Fellow Hams.

Special Thanks to Bob, Howard, Rick, Mark, and everyone at HRO for their continued SUPPORT!


~K6AK Jim

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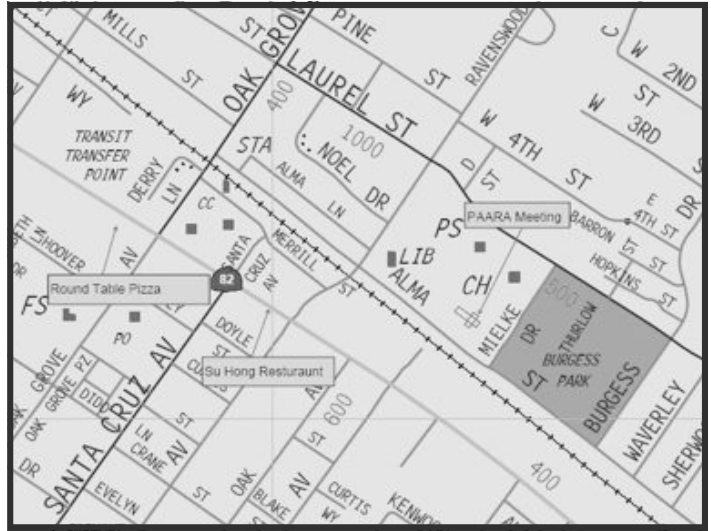


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PAARA Radio NET
 and Swap Session
 every Monday evening
 8:30pm local time
 on the
145.230 –600 MHz repeater
PL tone off

control operators:

Week	Operator
1 st Mon.	Pink Foster, KG6ILA
2 nd Mon.	Peter Sheerin, K6WEB
3 rd Mon.	Doug Teter, KG6LWE
4 th Mon.	Terry Ridgeway, N6ZAG
5 th Mon.	Doña Kerns, KI6DAR



Directions to PAARA meeting:
<http://paara.org/meetings/>

Palo Alto Amateur Radio Association
P.O. Box 911, Menlo Park, California 94026-0911
 Club meetings are on the first Friday of each month, 7:00pm at the Menlo Park Rec Center, 700 Alma Street, Menlo Park, CA.


Radio NET & Swap Session every Monday evening, at 8:30pm, on the 145.230 –600 MHz repeater, PL tone off.

Membership in PAARA is \$20.00 per calendar year, which includes one subscription to PAARAgaphs \$6 for each additional family member (no newsletter). Make payment to the Palo Alto Amateur Radio Association, P.O. Box 911, Menlo Park, CA 94026-0911

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Join us for pre-meeting eyeball

QSO
February 1st
gab & gobble



Food will be served at 6:00 sharp, so guests will be on time for the PAARA meeting. Those arriving late will be responsible for their own food order.

5:30 pm—at Su Hong Restaurant
1039 El Camino Real
Menlo Park

across from Kepler's Book Store
on El Camino Real
Walking distance from Caltrain!

ADVERTISERS WANTED.

PAARA members are encouraged to purchase an annual advertising space in the PAARA newsletter, commonly known as PAARAgaphs. This space is the size of a regular business card and only costs \$60.. annually. The money really assists our Association in producing and mailing the finest printed radio club newsletter in the western United States.

If you or your employer have a service to offer or a product to sell, please consider running an ad or an infomercial in PAARAgaphs. Remember that this little publication is distributed to many hams and ham radio supporters who will read it cover to cover. Simply contact the PAARAgaphs representative, Terry Finn, AA6T, at:

aa6t@arrl.net or 650-366-9111 to submit an ad.

W6AZ



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Vladimir Vladimirovich

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1. Not-for-profit ads by association members for ham-related items and wants. No cost for business card-size ads (additional space at \$2.50 per business card size).
 2. For Profit organizations and/or individuals: \$5-business card size, \$25-half page, \$50 full page or back cover.
- These fees may be reduced or waived in exchange for a valuable consideration that is given to the Association or its general membership. Such consideration must be in addition to any existing arrangements with the association. The PAARAgaphs editors reserve the right to reject any ad deemed to be not in the best interest of the Association.
 All fees payable in advance by the year with "scanner-ready" copy or text-only ads. Give payment and copy to Terry Finn, AF6TF

