



PAARAGraphs

Celebrating 62 years as an *active* ham radio club—*Since 1937*
Newsletter for the Palo Alto Amateur Radio Association, Inc.



CALENDAR

- Mar.....5, PAARA Meeting, 7:30
Menlo Park Recreation Center
700 Alma Street, Menlo Park
- Mar.....10, PAARA Board Meeting, 7:30
Red Cross Bld., 400 Mitchell Ln., Palo Alto
- Apr.....2, PAARA Meeting, 7:30
- Apr.....7, PAARA Board Meeting, 7:30
- May....7, PAARA Meeting, 7:30
- May...12, PAARA Board Meeting, 7:30

PROGRAM



March 5, 1999
7:30 P.M.

Speaker:

Marty Knutson WØBBV

Marty was in the renound skunk works and was a U2 pilot.
He may tell us about how he used ham radio to get out of a
jam in a country far, far away.

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

WHAT IF DR. SUESS DID TECHNICAL WRITING

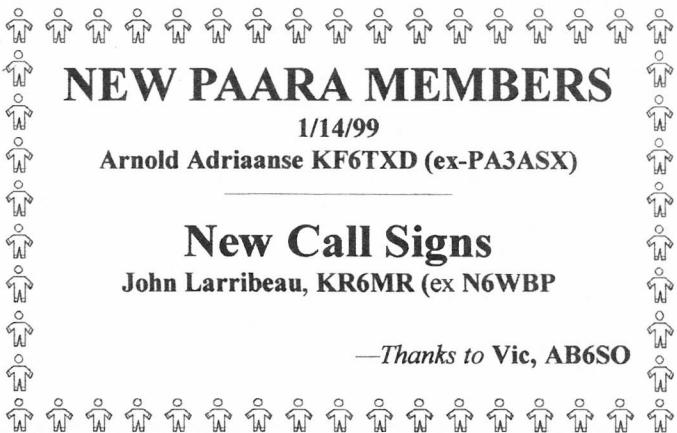
(from internet anonymous)

If a packet hits a pocket on a socket on a port,
and the bus is interrupted as a very last resort,
and the address of the memory makes your floppy disk abort,
then the socket packet pocket has an error to report.

If your cursor finds a menu item followed by a dash,
and the double-clicking icon puts your window in the trash,
and your data is corrupted 'cause the index doesn't hash,
then your situation's hopeless and your system's gonna crash!

If the label on the cable on the table at your house,
says the network is connected to the button on your mouse,
but your packets want to tunnel on another protocol,
that's repeatedly rejected by the printer down the hall,
and your screen is all distorted by the side effects of gauss,
so your icons in the window are as wavy as a souse,
then you may as well reboot and go out with a bang,
'cause as sure as I'm a poet, the sucker's gonna hang!

When the copy of your floppy's getting sloppy on the disk,
and the microcode instructions cause unnecessary risk,
then you have to flash your memory and you'll want to RAM your
ROM,
quickly turn off the computer and be sure to tell your mom!



NEW PAARA MEMBERS

1/14/99
Arnold Adriaanse KF6TXD (ex-PA3ASX)

New Call Signs

John Larribeau, KR6MR (ex N6WBP)

—Thanks to Vic, AB6SO

Miscellaneous Dates

Flea Market at Foothill (info at: <http://joslin.com/FleaMarket>)

- Mar 13 Foothill Amateur Radio Society (FARS)
 Apr 10 Silicon Valley Emergency Communications Society (SVECS)
 May 8 West Valley Amateur Radio Assoc., (WVARA)
 June 12 Palo Alto Chapter, American Red Cross
 July 10 Palo Alto Amateur Radio Assoc., (PAARA)
 Aug 14 San Jose Chapter, American Red Cross
 Sept 11 Santa Clara County Amateur Radio Assoc., (SCCARA)
 Oct 9 South Peninsula Emergency Communication System (SPECS)

PAARA Palo Alto Amateur Radio Association

meets 1st Friday 7:30 each month, Net 145.230 each Monday 8:30,
 contact: Andreas Junge N6NU.....(650) 233 0843

EMARC Electronics Museum Amateur Radio Club

meets 4th Friday 7:30 each month,
 contact: Sheldon Edelman 650-858-2176, Edelman@richochet.net

NCDXC Northern California DX Club

meets 2nd Friday 7:30 each month, repeater for member info 147.360, Thur
 8:00PM, contact: Bob Mammarella KB6FEC 408 729 1544.

NorCalQRP Northern California QRP Club

meets 1st Sunday each month,
 contact: Jim Cates 3241 Eastwood Rd., Sacramento, CA 95821.

Perham Foundation

contact: Jerry Tucker WA6LNV 650-961-3266

SPECS Southern Peninsula Emergency Communication System

meets each Monday 8:00PM on Net 145.27, 224.36, 440.80 MHz
 contact: Dennis Paul KC6PUN, 650-941-2666.

SCARES South County Amateur Radio Emergency Service

meets 3rd Thursday 7:30 each month, San Carlos City Hall.
 Net is on 144.45 & 444.50 (PL-100) 7:30 Monday evenings.
 contact: Dick Collins K6ANN 650-593-8952

SCCARA Santa Clara County Amateur Radio Association

Operates W6UU repeater 146.385+ Nets: 2m, W6UU, 7:30 Mon; 10m,
 28.385, 8:00 Thur. meets 2nd Mon each month.
 contact: Barbara Britton KD6QEI, 408-293-3847

SVECS Silicon Valley Emergency Communications

Operates WB6ADZ repeater (146.115 MHz+)
 contact: Lou Stierer WA6QYS 408 241 7999

WVARA West Valley Amateur Radio Association

operates W6PIY repeater 147.39+, 223.96, 441.875, 1286.2
 meets 3rd Wed every month.
 contact: Glen Lokke Jr. KE6NBO at 408 971 8626, or glokke@pacbell.net

Disaster Services

PALO ALTO CHAPTER, American Red Cross

Meets 3rd Wed. each month 7:30PM,
 HF, packet, BBS, ATV, OSCAR Gateway, NASA satellite,
 contact: Alan Ball 650-688-0423

SAN JOSE CHAPTER, American Red Cross

contact: Scott Hensley KB6UOO, 408 577-7924, fsh@richochet.net

VE Exams, 3rd Saturday each month, 11AM, 145.23- PL=100Hz

American Legion Hall, 651 El Camino Real, R.C.
 contact: Joe KB6OWG.

March Contests, 1999 Vic Black, AB6SO

(for rules and exchanges, see www.contesting.com)

- 6, 7 ARRL Int'l DX Contest, Phone 0000Z, Mar 6-2400Z, Mar 7.
 13 UBA Spring Contest, SSB 0700Z-1100Z, Mar 13.
 13, 14 RSGB Commonwealth Contest, CW 1200Z, Mar 13-1200Z, Mar 14.
 14, 15 Wisconsin QSO Party 1800Z, Mar 14-0100Z, Mar 15.
 20, 21 Alaska QSO Party 0000Z, Mar 20-2400Z, Mar 21.
 20, 21 Ohio Winter QSO Party 0001Z, Mar 20-2359Z, Mar 21.
 20, 21 Bermuda Contest 0001Z, Mar 20-2400Z, Mar 21.
 20, 22 BARTG WW RTTY Contest 0200Z, Mar 20-0200Z, Mar 22.
 20, 21 Russian DX Contest 1200Z, Mar 20-1200Z, Mar 21.
 20-22 Virginia QSO Party 1800Z, Mar 20-0500Z, Mar 21 & 1100Z, Mar 21-0200Z, Mar 22.
 27, 28 CQWW WPX Contest, Phone 0000Z, Mar 27-2400Z, Mar 28.

Palo Alto Amateur Radio Association, Inc. PO Box 911

Menlo Park, CA 94026

President	Andreas Junge N6NU.....	(650) 233 0843
Vice President	Jon Zweig, AD6FX	(650) 324 8751
Secretary	Dave Rice, W6NUC	
Treasurer	Doug Schliebus, K1DIT.....	(650) 851 0727
Membership*	Vic Black, AB6SO.....	(650) 366 0636
Trustee/Property/Badges	Fred Canham, K6YT	(650) 948 9238
ARES Officer	Lily Anne Hillis, N6PGM	(650) 325 5484
Club Historian	Steve Stuntz, K6FS.....	(650) 322 4952
Advertising	Bob Korte, KD6KYT	(650) 595 1842
Webmaster	/Andreas Junge AD6FQ.....	(650) 233 0843

*New Committee 12/98

Board of Directors

Charles Grandjean, WD6FAF	(408) 739 5185	'00
John Buonocore, KD6ZL	(650) 366 1658	'99
Terry Conboy, N6RY	(510) 944 5388	'99
Steve Stuntz, K6FS	(650) 322 4952	'99
Doug Schliebus, K1DIT	(650) 851 0727	'00

(see "Calendar" for Board meeting times, visitors welcome)

PAARAGraphs Staff

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VE	Ron Panton, W6VG.....	(650) 854 4814
The Way It Was	Charles Grandjean, WD6FAF....	(408) 739 5185

PAARAGraphs e-mail address:

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wmporter@aol.com

Submit material for PAARAGraphs by the 15th

PAARA Website <http://www.qsl.net/paara/>

1999 PAARA DUES

Some members still owe '97, 98 dues. See your PAARAGraphs mailing label.

\$12 for full membership

\$6 each for additional family member same address

One copy of newsletter

payable to PAARA and mail to:

PAARA, Box 911, Menlo Park, CA 94026

or to:

Treas. Doug K1DIT

(be sure to include names and calls of all members)

PLEASE include a completed copy of
MEMBERSHIP FORM

(The form was in Oct. PAARAGraphs and available at PAARA meetings)

Bring a Show & Tell

to the next

PAARA meeting

WEB WANDERINGS

de Vic Black, AB6SO



.Have you heard of the Fireball Phenomenon? Fireballs are low power transmitters made from computer clock oscillator modules which fit standard 14-pin IC DIP sockets and oscillate on one fixed frequency. Power output is tens of milliwatts. My first Fireball transmitter, made in 1992, consisted of the oscillator, a transmit/receive relay and a pot to control power output (usually 10 - 40 milliwatts). No side tone was needed since, at that power level, you simply listened to your own signal on your station receiver with the antenna switched between the transmitter and receiver while transmitting.

Components were mounted on a postage stamp sized PC board powered by a 9 volt transistor radio battery. There was no power switch. Current drain was so low that the battery lasted close to shelf life with 10 milliwatts output on 28.060 MHz. You just keyed the output. The oscillator generated a square wave, rich in harmonics. Even so, many hams ran them straight to the antenna because the harmonics were below legal power limits.

The New Jersey QRP Club has resurrected the Fireball in a newly refined kit available for the princely sum of \$10, or \$5 for the bare board. A custom 28.322 MHz oscillator module drives divide-by-2 ICs to provide jumper selectable outputs on 10, 20, 40 or 80 meters. An unused flip-flop can be connected to unused 5th band jumper pads for a 160m signal. However, this requires use of a higher oscillator frequency, above 28.800 MHz divided in half 4 times, in order to operate within the 160 meter amateur band.

A 5-element elliptical filter specific to each band magically turns the square wave into a sine wave. Standard kits have 40 meter filter parts, thus the name Fireball 40 or FB40. The basic kit requires about 15 minutes to build. Board traces are in place for adding an optional Embedded Research TiCK iambic memory keyer and 1.5 watt RF power amp (an amplifier briquette) to create a Fireball 40 Plus.

Each rig is a mono bander, but many Fireballs now sport rotary switches with filters and jumpers so the rigs work on one frequency in each of the four main bands. The latest artwork incorporates transmit/receive switching circuitry. Add a few optional parts and a transistor automatically shorts the receive side of the antenna path to ground during transmit to allow safely connecting your station receiver and FB40 to the same antenna.

Some builders switch in more oscillators to generate outputs on 2 or more frequencies per band. 28.060 MHz modules are readily available and one mail order company offers 14.1523 MHz oscillator cans for less than 25 cents. Many Fireballs become propagation beacons. **Paul Harden NA5N** scrounged a 28.000 MHz TTL oscillator can and runs his rig into a dummy load as a band edge marker generator for 3.5, 7.0, 14.0 and 28.0 MHz. It's minimal test equipment at its best!

A companion receiver, now in the design stages, will turn the little rigs into transceivers. We'll soon see 4-band transceivers complete with power supplies mounted in Altoid mint tins. Interstate QSO's are common and many hams are earning Thousand Miles per Watt awards with Fireballs. For info on these little RF wonders, go to the New Jersey QRP Club web site at <http://www.njqrp.org>. You'll find kit photos, finished rigs, schematics and parts lists as well as ordering information in case the milliwatt bug bites.

Last year I wrote about Coherent CW and Binary Phase Shift Keying, a form of radio teletype (RTTY). Suddenly "ritty" has become more attractive as a low power HF data mode with the introduction of PSK31, a new phase shift keying mode. This hot new mode uses a 30 Hz bandwidth. A data baud rate of 31 bps and tight software derived filters eliminate noise on either side of the signal thereby increasing the signal to noise ratio tremendously. The baud rate is intentionally low to match standard typing speeds rather than for exchanging large data files. However, this baud rate allows for previously unheard of HF weak signal work. This means you can communicate keyboard-to-keyboard on HF when you can't even hear the other station's signal by ear. Set up is extremely easy. All you need is a computer with Sound Blaster audio board and your HF transceiver.

Download free PSK31 software from the Official PSK31 WWW Home Page <http://bip106.bi.ehu.es/psk31.html> maintained by **Eduardo Taquet EA2BAJ** in Bilbao, Spain. Eduardo holds a CEPT Class 1 License but has never had an HF voice QSO since he specializes in digital modes.

Multi-page articles included here have just been released within the past month to major European ham magazines or are scheduled for publication within a month or so from now. This is the official PSK31 software distribution point for all popular computers and operating systems. The theory of operation is available in several languages, including English. The Windows/Sound Blaster version has help files to get you going in a jiffy.

Click on Eduardo's Home Page for even more digital modes. There are sound files to help you identify various digital modes along with downloadable files and info on TI and Motorola evaluation DSP boards used to generate various formats. There's even differential GPS available here. You can also find PSK31 software at the "All Things RTTY Website" maintained in Wilton, ME by retired IBM engineer **Dick Stevens N1RCT** at <http://www.megalink.net/~n1rct>.

Here's what **Bill Jones KD7S** said. "I got home from the office this evening and installed the Sound Blaster version of PSK31 on my PC. I made up a cable to go from my Icom IC-728 to the SB card, turned on the receiver and tuned to 7071.10 kHz. I heard a signal, tuned it in according to the 'help screens' I'd been reading and, would you believe it, I started seeing 'CQ CQ CQ de NB6Z NB6Z NB6Z' scroll across my screen. Just for the heck of it, I pushed the XMIT button and typed, 'de **KD7S K**'. I almost fell out of my chair when Griff came back to me. We chatted for about fifteen min-

(Continued on page 24) Wanderings

(Continued from page 23) *Wanderings*

utes. He was in Beaverton, OR (near Portland) and I am in Sanger, CA (near Fresno). I was running 15 watts output and Griff went from 70 watts down to 5 watts. He was still solid print. If you're looking for an exciting new experience, try PSK31. It couldn't be easier to get up and running (I'm living proof). It's free and it works extremely well."

Stew Whitehouse KE4YH worked Griff from Dunedin, Florida. "There is an interesting paper on PSK31 by **Peter Martinez, G3PLX** on NB6Z's web site <http://www.teleport.com/~nb6z>. Peter is the author of the PSK31 software that everyone is using. I worked **Griff Griffin NB6Z** on 15 meters. With 50-75 watts we were both about S3. After we both reduced power to 5 watts Griff was in the noise but by buttoning up the receiver he still printed 100% (I swear there were times when I couldn't hear him). If your xcvr doesn't allow you to use the narrow CW filters in SSB then use split VFOs and run the receiver in CW mode."

Dave Kreinberg, NR3E near Dallas, TX added, "I've been on this mode all of about 2 weeks using a Compaq 486/66, Sound Blaster card and Windows 3.1. It's been a blast experimenting with this, and you can't beat the price(!). The S/N ratio is such that you can copy (print) signals that are barely audible (or not audible to my hearing). Right now, it seems that popular calling frequencies are 14070.15 kHz, 7070.15 kHz and 7035 kHz (Europe). Weekends have a lot of DX activity on PSK. I called a VE3 and we had a nice QSO. The neat thing was that all around us, within a few Hz, were other QSOs going on, too. The extremely narrow bandwidth serves us well, and there can be many QSOs going on in a very narrow space with no QRM!"

Download the latest version because it will greatly aid you when tuning in signals. This version has a wide 'waterfall' indicator which shows you a real-time display of your proximity to the received signal. Since PSK has such a narrow bandwidth, it can be a real challenge tuning for proper decode. This waterfall indicator aids you to get the signal 'right on'. Another nice thing is that if you are tuned way far off, you can use the mouse to quickly grab and move the waterfall to its near center tuned position, and then use the computer cursor arrow keys to fine tune."

If you prefer CW, consider the coherent CW shareware available at <http://www.geocities.com/SiliconValley/Heights/4477/index.html#ccw>, the Web site of **Rob Glassey G0VTQ**. Rob says, "PCW is a Coherent CW program which uses the Sound Blaster, and has useful features like auto tuning, self synchronization, and auto threshold level. Coherent CW is normal Morse code with very good timing and frequency accuracy, so you can use 20Hz filters and integrators to get remarkable results from very weak signals. Precision CW, (PCW) V2.1 (Shareware Version) by **Ernst Schroeder, DJ7HS**, is available here".

Give these modes a try for a real thrill. Oh, by the way, why don't you hear about these wonderful new developments in CQ and QST? You will sooner or later. Just be patient. Remember, you can usually read about them first here in PAARAGraphs!!

ARRL Online

From ARRL Pacific Division: February 1999

ARRL E-mail Addresses

Are Available to Members:-

ARRL members can now announce their ARRL membership through their e-mail addresses! Starting February 1, 1999, a new membership service was available for those wishing to have an ARRL e-mail address, and you won't have to switch e-mail services to do it. Not only that, but it will be free-of-charge to League members!

The new, personalized League e-mail addresses will consist of the member's call sign @arrl.net. Electronic mail sent to the address automatically will be forwarded to any e-mail account you choose.

As long as you remain an ARRL member, you'll never have to notify people of an address change - even if you change Internet Service Providers.

Members are able to sign up quickly and easily through the ARRL Members Only Web Site. If you are not already registered for the Members Only Web Site, you can do so at <http://www.arrl.org/members/>.

Members who are not registered for the Members Only Web Site may also obtain their League addresses, but the procedure is a bit more time consuming. For instructions, send a blank message to subscribe@arrl.net.

Thanks, ARRL Letter

<http://www.arrl.org/members/>

Source for Emergency Supplies (mention in PAARAGraphs)

At last night's PAARA meeting, some folks wanted to know a source to buy the "dynaradio" Art demonstrated.

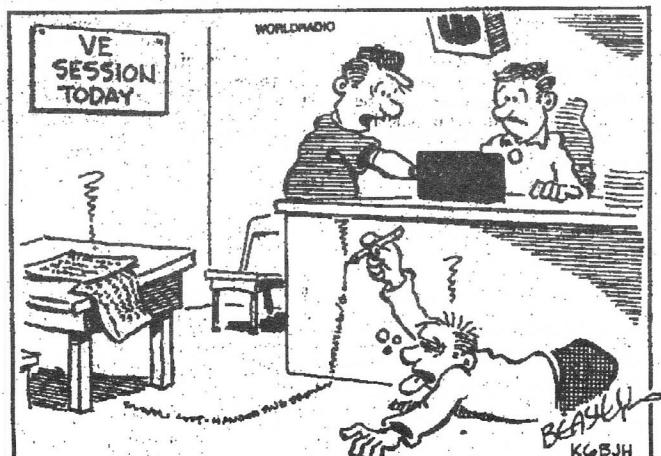
SOS Products

800-479-7998 [call to get their free catalog]

sos-info@sosproducts.com

They have a good selection of emergency supplies.

73! — Ken Dueker, KB6BPM



GOOD GRIEF, SAM---THIS THING'S BEEN RUNNING AT 40 WORDS PER MINUTE, NOT 20!

Northern California's Largest Electronics Flea Market

Continuing Under Perham Foundation Sponsorship in 1999

408/734-4453

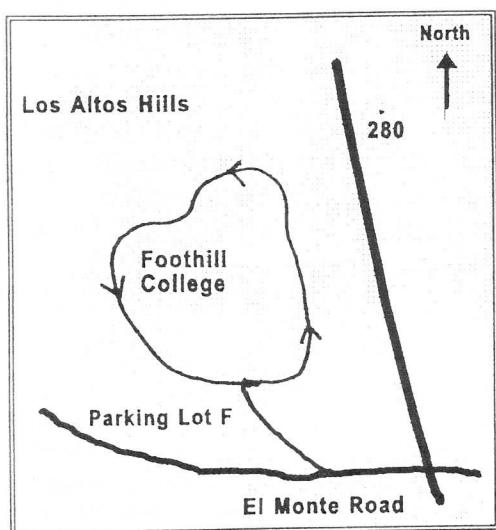
408/736-2685 (fax)



- Come to Parking Lot F(formerly parking lot A), Foothill College, Los Altos Hills
- Second Saturday of the Month, March-October, 6 am - 2 pm
- Sellers: \$15.00 per Vehicle (2 parking spaces)
- All appropriate taxes must be remitted to the State Board of Equalization.
- BUYERS FREE!!! (but bring 8 quarters for the College parking fee)
- Support your local non-profit electronics organization
- Refreshments provided by beneficiary organization
- ◆ Now extended into October.

NOTE: All Campus parking rules enforced. Please park legally, between marked lines only! Do not park where there are no lines.

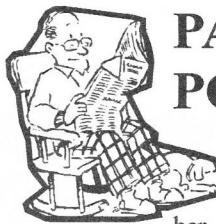
LOCATOR MAP:



Date	Beneficiary Organization
March 13	Foothill Amateur Radio Society (FARS)
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August 14	San Jose Chapter, American Red Cross
September 11	Santa Clara County Amateur Radio Association (SCCARA)
October 9	South Peninsula Emergency Communication System (SPECS)

NEED MORE INFORMATION?

Call on the SPECS repeater (145.27 MHZ -) or phone Perham Foundation at (408) 734-4453



PAARA PONDERINGS

de VIC BLACK, AB6SO

Congratulations to new PAARA member **Arnold Adriaanse KF6TXD (ex-PA3ASX)** who upgraded from Tech on Nov 25 to General Class Jan 27. Condolences to Arnold's son, **David KF6PGG**, who broke both arms simultaneously in a bicycle crash. Also congratulations to **John Larribeau**, formerly **N6WBP**, for his new callsign **KR6MR** as of Feb 3. PAARA member **Dave Meacham W6EMD** was a design consultant on the NorCal QRP Club Third World Project. This project is one of the most ambitious volunteer efforts undertaken by any club in history. Dave Fifield AD6A designed the 20 meter CW transceiver, the NorCal 20 (NC20) for the high RF environment of Europe. NorCal sold them at a price that would generate enough income to allow donating one FREE radio to a needy Third World ham for every unit sold, to a maximum of 500 rigs sold. All kits sold out in a few days, sight unseen. The project scope was massive. Total parts cost was over \$50,000. The club cleaned out a lot of RF parts suppliers for this project. **Doug Hendricks KI6DS** kitted more than 250,000 parts weighing more than one half ton. Incredibly, most of the design coordination was done by e-mail!! microprocessors.

Harmonics are 70dB or more below the fundamental. All other spurious emissions are 53dB or more below the carrier and easily meet FCC requirements. These figures were confirmed by a \$65,000 Hewlett Packard spectrum analyzer and each double sided bare board was pre-tested using a "bed of nails" tester to look for shorts, opens and other problems. Power out is user settable, conservatively rated from 0 to 5 Watts nominal (typically more like 7 W). The single conversion superheterodyne receiver uses a JFET pre-amp and high level double balanced mixer. Receive sensitivity is -135dB minimum discernible signal. A 4 crystal main filter and 1 crystal roofing filter provide a 300Hz receive bandwidth. Audio output from an LM380N is a LOUD 2W into a speaker or headphones. Powered by 10V to 14VDC, receive current is about 150mA making the radio better suited to base station or portable use rather than back packing as in previous club projects. The class C transmitter is about 60% efficient.

Rev. George Dobbs G3RJV of the British G-QRP Club will distribute the 500 donated rigs to third world hams. (Early rumors had the Pope delivering them). Besides **Dave Fifield** and **Dave Meacham**, project input came from **Dave Adams N9UXU**, **Bill Jones KD7S**, **Gary Surrency AB7MY**, **Mike Gipe K1MG**, **Jim Cates WA6GER**, **Doug Hendricks KI6DS**, **Gary Dianna N2JGU**, **Brad Mitchell WB8YGG**, **Jerry Parker WA6OWR**, **Paul Harden NA5N**, **Doug Hauff KE6RIE**, **Richard Fisher KI6SN** and St. Louis QRP Club members **Dave Gauding NF0R**, **Jim Smith N0OCT** and **Lee Johnson KE0MC**. Stand by for PAARA NC20 show and tell and be sure to thank these volunteers for a job well done. Because of them, at least 500 needy third world hams, some in

rare countries, will get on the air. Actually, more than 500 will get on. Some hams generously gave their purchased kits to the donation pool. You can be especially proud that a PAARA member was involved in this unique and truly worthwhile cause. On Saturday Feb 6 PAARA's Mobile Special Interest Group entered the 3rd Annual FYBO (Freeze Your B___ Off) QRP CW Field Day where point multipliers are awarded for low operating temperatures. Last year's low scorer was **Camilo Castillo HP1AC**. "Cam" had plenty of QSOs, but was handicapped by missing the multipliers since he operated from the hot, steamy forests of Panama.

Contestants met at the Canada College parking lot for the fun. Tech Pluses and Novices were encouraged to operate in the Novice bands. As is the custom with QRP contests, there are prizes with some of the participation prizes awarded by drawing entry logs from a hat. Techs and unlicensed people were invited to visit. High power (non-contest) SSB rigs were set up for them to use in order to get a feel for HF DX operating. During set up, team members worked Galapagos on SSB. The MN QRP Society challenged our multi op group. "If you beat us we will send everyone in your group a Minnesota delicacy...a can of Cream of Mushroom Soup. We'll even throw in a few good 'hotdish' recipes." Our gracious reply? "The PAARA FYBO team, **W6OTX**, will donate a box of California Sun Dried Raisins for every Member of the FYBO multi op team with the least points!"

Conditions were totally miserable with howling winds, torrential rain and temperatures plunging down to 50 degrees. Perfect for the FYBO contest. Results were very gratifying. The farthest 2 way QRP contacts in each direction were Alaska, New Hampshire, Florida and Panama where **HP1AC** reported a toasty 87 degrees F. A total of 16 states were worked. Not bad for two way QRP at 5 watts or less. Our 40 meter station was shut down when the tarp over the operating position gave way and dumped several gallons of water onto Andreas and his rig. He could only send strings of dits until the rig dried out! All of our contacts were made with vertical antennas on 40, 20 and 15 meters. Most were made on a 4 foot high mag mounted antenna on one of the cars.

Justin McAllister KD5AKO of Weatherford, TX reported running _ watt for a 459 report when we worked him. Then came the e-mail: "Vic, you might be interested in knowing that I read the wattmeter wrong on the QSOs on 15M. I thought I was running 750 mW, but it was really 75 mW! A friend was playing around yesterday and noticed that the switch was stuck on the wattmeter. So, how's that for a dipole!!!! That's by far the most miles per watt I've gotten. It looks like 17,333 as my computer shows you to be 1297 miles, about." PAARA team members included **Andreas Junge N6NU**, **Paul West KQ6WN**, **Vic Black AB6SO**, **Arne Luehrs KF6EDK**, **Jon Zweig AD6FX**, **Andy Korsak VE3FZK** with visitors **Dan Curry WB6STW**, **Andy Foo AC6GN**, **Sandra Dominguez**, **Ed Clement KF6TXB** and **Boots W0OOOF**, the hospital wonder dog. ☺☺☺

—Vic Black, AB6SO



PROGRAM NOTES:

PAARA Program, February 5, 1999

— Jon Zweig, AD6FX

Thanks to Jon for helping Steve Stuntz this month!

The meeting was well attended. We welcomed newhams

Andreas N6NU proudly showed his almost-completed Elecraft K2 transceiver. This is a beautifully designed all-band qrp rig. Sam Imai, KF6ML*, brought an unusual broadcast receiver which was powered by a hand crank which tightened a spring which drove a small generator. 30 seconds of cranking powered the radio for about 30 minutes.

Terry N6RY gave the evening's technical presentation on cellular telephony.

25% of the population now have cellular phones of which 40% are digital. Most of the original cell phones operated in UHF bands taken from television channels 73-83 in the 825-890 MHz range. Some of the older TV receivers, which cover this range, can receive cell calls! This service became very popular and it was not long before this frequency became over-crowded. The carriers requested additional allocation from the FCC. They received a somewhat complicated frequency spectrum.

In the 1990s, the FCC decided to take allocation away from point to point microwave carriers and auctioned off space for the Personal Communication Service. This was very lucrative for the FCC! They allocated 6 different licensees to each geographical area from 1850 to 1990 MHz. Some of the licenses went for billions of dollars!! Oddly enough, some of the licenses which were intended for less large companies sold for more than the licenses that were intended for larger large companies: some of the companies overextended themselves and are now bankrupt as a result.

The cellular telephone service, of course, began with analog system (AMPS). It was developed by Bell Labs. It consisted of 30 kHz wide FM channels with 45 MHz duplex spacing. There were "mobile transmitters" that ran at 3 watts and "portable transmitters" that ran at 300 mw. These signals carried supervisory audio tones at about 6 kHz to help sort out who was on which signal. Handoffs between cells were handled based on the receive signal level at that cell receiver. One difficulty with this system was its limited capacity. There are 416 channels available in each area of which 21 are control channels. All the 395 remaining channels are used in clusters of 7 cells, giving 19 channels of 3 clusters. Co-channel interference must be down 17 dB for good voice quality so there must be adequate spacing between occupied channels. The geographic distance between cells can vary widely according to terrain: it can be upward of 50 miles in flat rural areas and less than 1/4 mile in the city.

he receive antennas are arranged in sectors of 2, each group covering an angle of 180°. This is called a "Section Diversity System". The receiver listens to the antenna with the stronger signal. There is also, of course, a transmit antenna. Each sector can handle on an average, 12.3 users. This is why there are so many cells. The Airtouch Los Angeles section has 600 cells!

Because of the limited capacity of analog systems, engineers turned to digital cellular systems instead. The most popular systems now are the

- GSM (Group Special Mobile – from Europe – renamed Global System for Mobile Communications),
- USTDMA (a.k.a. US Digital Cellular or Digital Advanced Mobile Phone System – it is a Time Division Multiple Access System – see below).
- cdma One (code division multiple access) this is the newest system

Other similar systems in common use are

- iDEN – (Nextel) This is the digital version of Specialized Mobile Radio
- TETRA mostly European – operates in 12.5 kHz channel
- PDC – Japanese system like TDMA but uses 25 kHz channel instead of 30

The GSM System originated in Europe in the 1980s. Instead of 30 kHz wide channel, it uses a 200 kHz channel with a high bit rate modulation. This is split up so each user gets the channel for 1/8th of the time. Users keep their slot as long as they are on that channel. You can have up to 8 "simultaneous" channels with everyone taking a turn. The voice coders digitize the signal to 64 kbits/second. This data is then processed down with a linear predictive coder which models the vocal tract. This reduces the bit rate to 13 kbits/second. There is also forward error correction – this actually corrects transmission errors (as opposed to amateur packet which simply re-sends erroneous packets). This is important because these signals are prone to fading, multipath, etc. The net throughput is 270 kbits per sec / 8 = 33.75 kbits/second per channel. Actually only 13 kbits is signal – the rest is error checking. The mobile unit assists in handoffs in this system – it listens to adjacent cell sites and tells the cell site which one it hears the best. It is then switched to the best cell. In the US, these phones run 600 mw. GSM tolerates much higher interference than other signals so that you can pack channels closer and get much more capacity than the analog system.

The US TDMA system was designed for migration from the analog system. It runs on the same 30 kHz channels and uses quadrature phase shift keying (there are four different phase states for any given transition). There are six time slots per carrier with 4 kbits delivered data per slot. Since it is hard to transmit decent sounding voice on a 4 kbit channel, they com-

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bine every 3rd slot to make 8 kbit channels. The handoffs and power are similar to GSM but the interference tolerance is about the same as the analog system. Because of packing, this system has about four times the capacity of analog. There was an improvement of this system called IS-136 which improved the voice coder, added more forward error correction and added a digital control channel for better battery efficiency.

The iDEN was originally designed by Motorola. It was originally called Motorola Integrated Radio System but it sounded so bad that Motorola renamed it so their name would not be associated with it! It consists of 24 kHz carriers each containing 4 subcarriers each of which has a modulation system called M16-QAM. It varies the amplitude and the phase of the signal on each of the subcarriers. This system has a PTT mode and a cellular mode. The PTT (half duplex) mode is handled as packet while the cellular mode they use two aggregated time slots. This system is pretty intolerant of interference so it does not allow much close packing. Nextel uses this system around the US.

CdmaOne is a spread spectrum system developed by Qualcomm. It modulates in an arcane way. Everyone transmits on the same channel at the same time! The computer adds "orthogonal spreading codes" and other spreading codes to spread the channel out to 1.23 MHz (=41 analog channels!). This spreading is accomplished by quadrature phase shift keying. You can have up to 20 people talking at the same time on the same frequency on a sector of a cell site. There is enough logical code space to accommodate 61 people but the error rate starts to rise as that many voices are carried. This system uses a novel kind of coder: it runs at 8 kbit/second when it is carrying signal but then idles down to 1 kbit/second at rest! This increases capacity. You lower the power when you are not talking and still keep the same error rate. There is "soft handoff" in which the mobile unit is in communication with several cell sites simultaneously. If one fades, another will take over. The portables communicate with at most 200 mw but this is controlled so that all cell sites receive the same strength signal. This system can actually tolerate signal that is minus 14 dB below noise. Because they know the code you are on, they can reconstruct the signal from the "junk" with an acceptable error rate! (I wonder if we can adapt this to amateur cellular communication!) You can get up to 160 users per analog band = 10 times the capacity of an analog system.

In the Bay Area, the following carriers use the following system:

- Cellular One – AMPS/TDMA
- Sprint PCS – CDMA
- GTE – AMPS/CDMA
- Nextel - iDEN
- PacBell - GSM

Terry thinks that the new voice coder on GSM has the best voice quality as long as the signal is strong. The CDMA systems run a very close second as far as quality is concerned. These systems don't do so well when trying to encode other information than voice, though.

These systems will not have enough throughput to handle data (when lots of people want to use their cell phones to connect to the internet). A wideband CDMA is now being developed involving a spread spectrum technique into a 4 MHz channel – this should give 20x the capacity of AMPS in the same spectrum. It will tolerate high data rates easily tolerating the phone modems we use today

—Jon Zweig, AD6FX

*Sam's name and call: Sam Imai, KF6ML. The radio he had is a South African radio called Baygen made for use in the bush where there is no electricity. Contrast it to the Russian equivalent of about 25 years ago for use in North Africa in which camel dung was burned and a thermopile generated electricity for the radios. (And you probably thought there was no such thing as a kerosene radio!!).

—Vic Black, AB6SO

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—Donald L. Trask, KF6JMQ

King Hussein, JY1

From a web page put up by a Belgian in memory of the king.

<http://users.pandora.be/egbert.hertsen/index.htm>

The amateur radio community is mourning for the death of one of its most prominent members:

Holding the exclusive callsign JY1, King Hussein was an active amateur radio operator. Whenever his official duties allowed him, his voice could be heard on the HAM radio bands. Many of us could establish friendly on the air conversations with him. Even during his cancer treatment, he regularly got on the air from his hospital room. His voice will be sadly missed.

Thanks to Kit, W6ISO



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QSO March 5th

gab & gobble



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