Product Review & Short Takes Columns from *QST* Magazine

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Product Reviews

Yaesu VX-7R Handheld Tranceiver
Force 12 Sigma-5 Five-Band Vertical Dipole Antenna

Short Takes

The RIGrunner

The Yaesu VX-7R Handheld Tranceiver

Reviewed by Brennan Price, N4QX
Assistant Technical Editor

Yaesu's newest HT, the VX-7R, looks very much like its predecessor, the VX-5R, reviewed by Jay Mabey, NUØX, in the May 1999 *QST*. It is a shade taller and wider, but not so visibly different from the VX-5R that it raises eyebrows upon first inspection. Nevertheless, when I first unwrapped the new HT, there were enough subtle differences to prompt my exploration of this unit. It didn't take long to notice improvements that previous VX-5R users will like.

It *Feels* More Sturdy

When Yaesu unveiled the VX-7R at the 2002 Dayton Hamvention, a collection of the HTs were displayed in a water-filled case. In fact, both the front panel of the radio and its operating manual tout the VX-7R as "submersible." Handling the radio for the first time, I noticed a few structural enhancements from the VX-5R that would help the HT stand up to water.

The 18 front-panel keys resist just a little when pressed, finally registering with a satisfying click. The keys are larger and more resistive than those on the VX-5R, and these features make frequency entry and programming a snap on the new radio. Also, the microphone/speaker and dc power jacks are plugged by snug, form-fitting rubber caps, obviously resistive to anything on the outside. While these caps, particularly the dc power cap, were at first a little tougher to open than the easy-flip caps on many HTs, it doesn't take long to adapt.

"Sturdy and solid," I thought to myself. "Maybe I need to get with the ARRL Lab and develop a submersibility test." As tempting as it was to throw the thing in the sink and see how it worked when it came out, I held off until I played with the radio some more. It seemed wise to hold the potentially destructive tests off until last.

Turning it On and Tweaking the Settings

As with the VX-5R, the power on/off switch is controlled by a prominent key to the upper left of the front-panel speaker. Frequency entry is a snap; just enter six numbers on the keypad (with leading zero[es] if tuning below 100 MHz). When a frequency in the usual 2-meter or 70-centimeter repeater range is entered, the transmit offset is automatically entered. This Automatic Repeater Shift feature may be turned off or overridden for machines with nonstandard repeater frequencies or shifts.

Familiarity with the highly detailed (but easy to follow) user's manual soon becomes necessary. Out of the box, the VX-7R is set to dual-band receive mode, and the squelch controls on both VFOs are set very low. Users in high-noise areas may therefore be greeted with a blast of white noise. When this happened to me, I thought, "No problem, I'll change the squelch." But, like the VX-5R, there is no squelch knob. Squelch is controlled via a menu option, the first option that pops up when the menu is activated for the first time.

Working with the Menus

The extensive menu system is accessed fairly intuitively, by pressing the F and 0/SET keys. This is similar enough to the VX-5R. The user can cycle through menu options using the dial at the top of the radio, concentric with the volume knob. What is different—and not at all obvious to the user who has not read the manual—is the procedure for changing a menu setting that is displayed on the screen.

On all menu items, the user cycles through the options using the MAIN and SUB keys, the same buttons used to switch transmit VFOs and switch into and out of Dual Receive mode. MAIN steps up to the next setting on the list, and SUB steps down. It would have been a nice touch had this somehow been indicated on the case of the HT, but once you read about it in the manual, it becomes easy.

Some menu options, most notably the selection of a CTCSS tone, require the user to press the BAND key before changing the setting with the MAIN and SUB keys. Beyond setting the CTCSS tone (from the new industry standard list of 50) or DCS code (from 104 possibilities), the list of menu items that require this keystroke is beyond the scope of this review. If a user knows the above, he or she can get on the air for most uses.

How Does it Sound?

After everything was set, working through repeaters and on simplex frequencies was a pleasant experience with the VX-7R. Requested reports on the quality of transmitted audio were all positive, and the front-panel speaker was pleasant to listen to.

Users may cycle through four power settings on 6 meters, 2 meters and 70 cm, ranging from 5 W to 50 mW. The United States version of the VX-7R also has limited capability on the 222-225 MHz band, with two power settings of 300 and 50 mW. Yaesu is to be commended for incorporating the 1.25-meter band in this rig; the availability of more equipment should encourage use of this very good band. However, amateurs looking for more than nominal power may be disappointed. At the "high power" setting of 300 mW, I was only able to reliably activate the nearest repeaters. While the 222 MHz capability is nice, the documentation rightly identifies the VX-7R as a "triple-band" HT.

One really neat thing about this rig: it does AM! Not just when receiving broadcast and aircraft signals (which it does well), but when *transmitting* on the 50 MHz band! While any frequency on the band may be chosen for such operation, care should be taken to avoid interference with other modes. The band plan recommended by the ARRL Board of Directors sets 50.4 MHz as an AM calling frequency, with activity scattered about the "all modes" region of 50.3 to 50.6 MHz. The actual usage where you live may be vary; consult your local frequency coordi-

Bottom Line

Those who like the VX-5R will also like the VX-7R. Yaesu has improved the feel and friendliness of its top-of-the-line tri-band HT.

Brennan Price, N4QX ♦ Assistant Technical Editor ♦ n4qx@arrl.org

Table 1
Yaesu VX-7R, serial number 2G022193

Manufacturer's Claimed Specifications	Measured in the ARRL Lab
Frequency Coverage: Receive, 0.5-30 (AM), 30-59 MHz, 59-108 MHz (WFM), 108-137 MHz (AM), 137-174, 174-222 (WFM), 222-225, 225-420 MHz,[1] 420-470 MHz, 470-729 (WFM), 800-999 MHz (cell blocked); transmit, 50-54, 144-148, 222-225, 430-450 MHz.	Receive and transmit, as specified.
Power requirements: 10.0-16.0 V dc;[2] receive, 0.24 A; transmit, 1.9 A (max, high power).	Receive, 0.32 A (max volume, no signal); transmit, 1.6 A, tested at 13.8 V.
Size (height, width, depth): 3.5×2.4×1.1; weight, 9.2 ounces.	
Receiver	**Receiver Dynamic Testing**
Sensitivity: AM, 10 dB S/N, 0.5-30 MHz, 3.0 μV; 108-137 MHz, 1.5 μV; WFM, 12 dB SINAD, 76-108, 1.0 μV; 470-540 MHz, 0.35 μV; 540-800 MHz, 3.0 μV; NFM, 12 dB SINAD, 30-50 MHz, 0.5 μV; 50-54 MHZ, 0.16 μV; 57-76 MHz, 1.0 μV; 137-140 MHz, 0.2 μV; 140-150 MHz, 0.16 μV; 150-174 MHz, 0.2 μV; 174-225 MHz, 0.3 μV; 300-350 MHz, 0.5 μV; 350-400 MHz, 0.2 μV; 400-470 MHz, 0.18 μV; 800-999 MHz, 1.0 μV.	AM, 10 dB S+N/N, 1.0 MHz, 1.0 μV; 120 MHz, 0.56 μV; WFM, 12 dB SINAD, 100 MHz, 0.7 μV; NFM, 12 dB SINAD, 50 MHz, 0.15 μV; 144 MHz, 0.16 μV; 222 MHz, 0.36 μV; 430 MHz, 0.15 μV.
Two-tone, third-order IMD dynamic range: Not specified.	20 kHz offset from 52 MHz, 54 dB, 10 MHz offset from 52 MHz, 86 dB. 20 kHz offset from 146 MHz, 63 dB, 10 MHz offset from 146 MHz, 76 dB. 20 kHz offset from 222 MHz, 61 dB, 10 MHz offset from 222 MHz, 76 dB, 20 kHz offset from 440 MHz, 58 dB, 10 MHz offset from 440 MHz, 65 dB.
Adjacent-channel rejection: Not specified.	20 kHz offset from 52 MHz, 67 dB. 20 kHz offset from 146 MHz, 65 dB. 20 kHz offset from 222 MHz, 65 dB. 20 kHz offset from 440 MHz, 61 dB.
Spurious response: Not specified.	IF rejection, 13 dB;[3] image rejection, 44 dB.[4]
Squelch sensitivity: Not specified.	At threshold, VHF, 0.09 μV; 222 MHz, 0.3 μV; 430 MHz, 0.08 μV.
Audio output: 400 mW at 10% THD into 8 Ω (dc).	690 mW at 10% THD into 8 Ω.
Transmitter	**Transmitter Dynamic Testing**
Power Output: 50 MHz, 1.0 W high (AM only); 50, 144, 430 MHz, 5.0 W high; 222 MHz, 0.3 W high; 5.0/2.5/1.0/0.035	52 MHz, 4.8 / 2.4 / 0.84 / 0.1 W. 146 MHz, 5.1 / 2.6 / 1.1 / 0.02 W. 222 MHz. 0.33 / 0.03 W. 440 MHz, 4.5 / 1.9 / 0.8 / 0.02 W.
Spurious signal and harmonic suppression: 60 dB.	VHF, 54 dB; UHF, 70 dB. Meets FCC requirements for spectral purity.
Transmit-receive turnaround time (PTT release to 50% of full audio output): Not specified.	Squelch on, S9 signal, VHF and UHF, 70 ms.
Receive-transmit turnaround time ("tx delay"): Not specified.	VHF, 60 ms; UHF, 70 ms.

[1]"Action Band 1"—mode varies with frequency range within this segment.
[2]External dc. Battery is 7.2 V.
[3]For 52 MHz. IF rejection on 146, 222 and 440 MHz was 90, 72 and 91 dB, respectively.
[4]For 222 MHz. Image rejection on 52, 146 and 440 MHz was 88, 63 and 65 dB, respectively.

nation body to make sure, and listen before you transmit. Our tests were promising. Power in the AM mode is fixed at 1 W.

Like the VX-5R, the '7R has substantial expanded receive capability. With the exception of cellular frequencies, the radio will receive in AM, narrow FM and wide FM modes from 500 kHz to 999 MHz on the MAIN VFO. Reception and transmission on the SUB VFO is limited to the 6-meter band, 137-174 MHz, and 420-470 MHz. The included rubber-duck antenna, slightly longer than the one that came with the '5R, has a screw-off tip. A loading coil is included for operation on the 6-meter band and reception on lower frequencies. The loading coil works well, but keeping up with it can be challenging to a forgetful amateur like myself.

Memory fiends will not be disappointed. In addition to the 450 standard, programmable memory channels, there are 10 one-touch memory channels, which, when enables, can be handy for rapidly changing frequencies on the fly. Adding other types of memory (such as a "home" frequency for each band) brings the total number of programmable frequencies to over 500.

Bells, Lights and Features, Oh My!

Hams who come from the "simple is good" school of thought will be pleased

Figure 1—The front panel and front cover of user's manual for the Yaesu VX-7R says the radio is submersible. We put it to the test in the ARRL Lab.

with the performance of this radio. That doesn't mean that hams from the "give me lots of neat little features" school are left empty handed. To the contrary, the VX-7R enhances the considerable list of features found on its predecessor. Returning from the VX-5R are such oldies and goodies as the "Smart Search" feature, which will scan for 15 active signals and automatically store them in a memory bank. The graphical Spectrum Analyzer feature returns, and the enhanced LCD dot-matrix display allows for a relative signal strength to be displayed on each peak. The '7R can detect CTCSS tones or DCS codes of incoming signals, and the radio comes equipped with a1750-Hz tone generator for use with European repeater systems.

The first thing I noticed after the first charge of the battery was the front panel LED. "Oooh, what a lovely hue of blue," I thought to myself. The status LED to the top right of the keypad is called the "STROBE," and the various colors and intensities for the different statuses are programmable. If you prefer orange for transmit and chartreuse for receive, instead of the traditional red and green, you can arrange that.

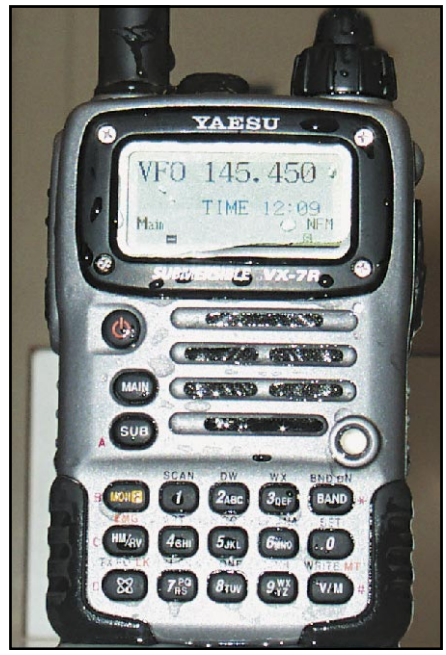

Figure 2—Thirty minutes after being placed in 8.5 quarts of water, the Yaesu VX-7R, water dripping off its chassis, works like new.

The option to install a barometric pressure/altimeter unit is also carried over from the VX-5R. Added is a built-in thermometer, which will not be accurate when the HT is held in a 98.6°F human hand, but works well when standing alone. A time-of-day clock can be set, as can an "alarm" feature. Someone who wants to use the VX-7R as a clock radio can do so; I did so on my July trip to Maine.

Speaking of that trip to Maine, it was a humdinger weather-wise. I made extensive use of the VX-7R's ability to scan NOAA weather channels. Keying F and 3/WX limits the radio to the 10 NOAA frequencies, and scanning can be turned on and off with the PTT switch. The radio can be set to sound an alarm when a 1050 Hz alert tone is detected on an active frequency. Thanks to this feature, I was alerted to severe thunderstorm warnings in four different counties on three different NOAA stations.

One thing not held over from the VX-5R is its compatibility with the same rapid charger. While the ac wall adapter sold with the VX-7R is the same as its predecessor, the accessory rapid charger is a different model. Users looking to upgrade will need to buy both items if the charging stand is important to them.

Going for a Swim

Now that I had played with the radio, it was time to put the submersibility claim to the test. Yaesu does not specify a depth and duration in the manual, but its advertisements have indicated that the VX-7R is submersible to 3 feet for 30 minutes

I did not have a 3-foot deep container in which to submerge the radio, but I did find a 10-quart mop bucket in the ARRL maintenance closet. I filled the bucket to the 8.5-qt level, just enough to submerge the VX-7R from base to tip of the non-extended antenna, as shown in Figure 1.

Thirty minutes later, I removed the radio from the water. It powered up immediately, even with water droplets clinging to the case, as shown in Figure 2. While I would not recommend that users of a VX-7R repeat this feat, it does indicate that Yaesu's efforts to fortify the radio have been effective.

A Worthy Successor

At first glance, the Yaesu VX-7R looks much like its predecessor. But within a few minutes, users will begin to discover and enjoy a unique feel and style that is easy to fall for. HT enthusiasts will appreciate the plethora of features, the solid performance on the three main bands, and the modest but welcome capabilities on 222 MHz and 6-meter AM.

Manufacturer: Vertex Standard, 10900 Walker St, Cypress, CA 90630; tel 714-827-7600; fax 714-827-9100; **www.vxstdusa.com**. $359.95.

Force 12 Sigma-5 Five-Band Vertical Dipole Antenna

Reviewed by ARRL Staff

The Force 12 Sigma-5 is a vertical dipole composed of a center element with two perpendicular bars, one at each end. The entire assembly is 11 feet tall. The upper and lower T bars are 48 inches wide (24 inches each side). In true dipole fashion, the feed point is located at the middle of the center element, where a printed circuit board receives the feed line. On the board are several relay controlled loading coils, facilitating a direct 50-Ω match. The board, relays, and loading coils are neatly enclosed in a covered styrene tube. A short piece of feed line (with connector) and the end of 50 feet of relay control line are soldered to the board and wire-tied to a feed point extension bar affixed to the center assembly.

No Tools Required

Our favorite part of the instruction manual says, "Tools required: NONE."

Bottom Line

The Force 12 Sigma-5 offers five HF bands in an easy-to-install package for the ham with limited space.

This happens so infrequently in building anything, including children's toys, that we still felt compelled to have a tool box nearby. We never used any tools, however.

The delivered antenna includes well-labeled parts. After aligning all the parts and matching them up by their letters, the joints are secured with machine screws, lock washers and finger-tightened wing nuts. Factory drilled holes align very well, and there wasn't a single metal burr on any piece of cut tubing. Welded parts and rivets were clean and solid. Assembly is fast. We were done in a couple of minutes.

From October 2002 QST © ARRL

Locating the Antenna

One person can easily raise and maneuver the assembly. To maximize its efficiency, the manufacturer advises against placing the antenna too high above the ground. Force 12 recommends installing the Sigma-5 using a 5-gallon bucket with cement for the base post, or sinking a slightly larger pipe in the ground for the base post to fit over. The antenna can also be placed on the ground and guyed with rope.

It's recommended that the antenna be installed away from any closely surrounding metal objects, and to run the coax feed line and relay control line at a 45-degree angle (or higher) away from the antenna for several feet to avoid coupling to the antenna. Dropping the lines too close to the Sigma-5 may have the effect of detuning the factory-set matching. The installation manual also suggests that persons using more than 100 to 200 W compute allowable RF exposure limits, citing possible strong energy exposure fields that may exceed FCC recommended limits.

We attached a coax feed line and ran it with the relay control line to our test station. Inside, the control wiring is accomplished using an included switch assembly. The relay control line and 12 V dc leads (it draws only 95 mA) were quickly screwed down to a wiring bus on the assembly. A rotary switch is pre-wired to the opposite side of the bus. As the switch is rotated, energized relays activate different sets of loading coils on each side of the feed point. The switch is rotated through five bands: 20, 17, 15, 12 and 10 meters. Without any power applied to the relays, the antenna is tuned for 20 meters. For convenience, the switch includes 20-meter positions at both ends of the rotation.

We settled on a relatively hidden location in a small yard that placed the antenna among some scrawny trees and within the dense ground cover of some pachysandra. The location ended up being slightly farther away than the included 50 feet of relay control line. We replaced the control line with 100 feet of common 5-conductor rotator cable and found it quite easy to disassemble the center tube to expose the relays and circuit board.

Figure 3—The delivered, disassembled Sigma-5. Components include the antenna sections, center feed point housing (with circuit board, relays and loading coils inside), 50 ft of relay control line and relay switch assembly. Gina is not included.

Figure 4—Each joint is clearly labeled. Assembly requires machine screws and finger-tightened wing nuts.

The Check-Out

We found that, regardless of the antenna's location, the VSWR at 14.2 MHz was higher than referenced by the manufacturer (greater than 2:1). Instead, the measurement flattened out to nearly 1:1 at around 14.0 MHz. Within the manual is a note explaining that the bandwidth on 20 meters will not quite cover the entire band. There are instructions for re-locating the tuned center of the band, which involves pulling back the housing on the center assembly, and slightly spreading the turns of the 20 meter coils at both ends of the circuit board. The clear instructions allowed us to successfully achieve a reasonable VSWR at 14.2 MHz. Similarly, we could have tuned the antenna higher or lower in the band.

Our efforts did not change the good VSWR measurements of the other four bands. In reassembling the center housing, we noticed that the 20-meter coils (the largest coils on the board) brushed against the inside of the plastic housing. Care should be taken when removing or reassembling the center housing to avoid contacting the coils. Such contact may compress or spread the coils, inadvertently changing the tuning.

On the Air

From our station in the Connecticut River Valley, we gave the Sigma-5 a workout during July's RSGB Islands on the Air event. Operating SSB with about 100 W, we contacted nearly all of the stations we could hear, often breaking pileups. Signal reports were good to excellent.

The antenna is very credible, particularly for those looking for a multi-band antenna solution that is easy to assemble and handle. The design of the Sigma-5 makes it easy to work on, with the understanding that you may have to adjust some of the factory tuning to suit your operating needs. Hams with limited space availability will find a good deal of capability in a small package.

Manufacturer: Force 12, Inc, PO Box 1349, Paso Robles, CA 93447; Order Line 800-248-1985, fax 805-227-1684, technical support 805-227-1680; **www.force12inc.com**. $349. QST

Table 2
Force 12 Sigma-5 Vertical Dipole

Manufacturer's Claimed Specifications	*Measured in the ARRL Lab*
Frequency Range: 20, 17, 15, 12 and 10-meter bands.	As specified.
Power rating: 1200 W PEP SSB, 700 W CW.	Tested only at 100 W SSB.
Dimensions: 9 ft tall, 18 in. base post.	As specified.
Weight: 7 lb.	As specified.
VSWR: < 2:1 at 17-10 m, <2.2:1 at 20 m	As specified.

SHORT TAKES

The RIGrunner

Let's say you have a single 12-V dc power supply and it features one, maybe two, output connectors. Looking around your station you see that you have a number of 12-V devices to connect. You can bundle the separate cables and bring them to the power supply, twisting and braiding until they all fit onto the available connectors. This may work, after a fashion, but you run the risk of a poor connection, or possibly even a short circuit. Worst of all, the convoluted mess is an unholy hassle to untangle when you need to remove a device or add a new one.

The West Mountain Radio solution to this unsightly and inconvenient situation is the RIGrunner power strip. A RIGrunner expands your power-connection options from one or two ports to as many as 12 depending on which model you buy.

Hook 'em Up

One cable connects the RIGrunner to the power source (battery, generator, power supply, etc). The RIGrunner, in turn, distributes power to your equipment using a bank of Anderson PowerPole sockets and their mating plugs.

The PowerPole plugs are easy to install on your dc power leads using some care and a common crimping tool. (Once I had the knack, it took about two minutes per plug.) West Mountain Radio has some very helpful information about this on their Web site. If you're an ARES or RACES member, you may see PowerPole connectors in frequent use. By standardizing on a single power connector, operators can rapidly switch different radios between many different power sources.

The PowerPole connectors simply push onto the RIGrunner jacks. The plugs are color-coded and "polarized," which is to say that you can't insert them the wrong way. Although they don't lock into place, the connectors fit quite firmly. If you wrap your foot in a wire and take a determined step, you will probably yank the cable out of the RIGrunner socket. On the other hand, if you are entangled in a power cord and about to kiss the carpet, you have more serious things to worry about.

Three Flavors

RIGrunners come in three models depending on how many outlets you need: 12, 8 or 5. Every model is rated at 40 A. The 12- and 8-outlet RIGrunners (models 4012 and 4008, respectively) feature LEDs that indicate the status of each socket and an audible over- or under-voltage alert system. The 5-socket model 4005 is primarily designed for mobile use and lacks the LED and audible indicators.

For this review I tested the model 4012. I found the LED indicators to be particularly convenient, but the audio alarm is a nice touch in applications where the power strip is out of sight. Each outlet is fused with ATC/ATO automobile fuses. Not only are they easy to replace, the blown-fuse LED indicator flags the location of the problem fuse instantly. Fuses are available in 10 values from 1 to 40 A, so you can choose the appropriate fuse for the hardware in question.

Impressions

The RIGrunner is a deluxe solution for a common problem. In my station I power five devices from one supply. By extending my power-supply ports with the RIGrunner, I could quickly remove and replace whatever happened to be attached to the 12-V bus—including my transceiver, digital wattmeter, sound card interface and more. When I want to move the radio from the house to the car, the process of detaching the power cable from the RIGrunner required about 5 seconds' worth of effort—a vast improvement.

I found the RIGrunner to be attractively designed and rugged. West Mountain took the extra step of incorporating RF suppression into each RIGrunner as well. With the RIGrunner in place I have no RF-induced problems (and my antenna is close to my operating position). RIGrunners are ideal station accessories for the sake of convenience and for public-service applications where time is precious and reliability is paramount.

Manufacturer: West Mountain Radio, 18 Sheehan Ave, Norwalk, CT 06854, tel 203-853-8080; **www.westmountainradio.com**. *Model 4012 with 12 PowerPole connector pairs and a 6-foot power supply cable; $109.95. Model 4012 without connectors or cable; $99.95. Model 4008 with 12 PowerPole connector pairs and a 6-foot power supply cable; $89.95. Model 4008 without connectors or cable; $79.95. Model 4005; $49.95.* QST

STRAYS

ATTENTION MARS OPERATORS AND USERS

◊ A project for the US Marine Corps Historical Division is seeking written and oral histories of service and civilian personnel who participated as operators in the MARS (Military Affiliated Radio System) program. Although the main focus is Navy/Marine Corps MARS during the Vietnam Era, contributions from all services and all eras are welcome and encouraged. In addition, if you used the MARS systems t communicate with your families or others, using either phone patches (Over!) or MARSGRAMS, please contact us. We are also seeking artifacts for the exhibit (at MCRD San Diego), MARSGRAMS, pictures of stations and personnel, orders (DNC-8), etc.

Please submit your MARS service dates, stories, etc, to: (e-mail) **MARS@borgmangroup.com**; or via postal mail to Borgman Group, Ltd, 3342 S Sandhill Rd, Ste 9-326, Las Vegas, NV 89121. *—Dr Daniel L. Borgman*

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