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It's a Learning Moment in a Maker's World

“Making things is enormously therapeutic. And it's also fun.”

There are few activities in life so completely satisfying as making something. When it works, we progress from beginning through middle and reach the end, and we feel the sense of accomplishment it engenders. Stand back and admire: it glows, it beeps, it strains voices out of thin air. In life, too often our ordinary activities possess a beginning, a middle, yet only a small percent culminate in completion. But the very act of making something satisfies deeply because it nourishes our inner, creative force. Perhaps, the ultimate compliment to the Creator. It engages us fully, sharpens our skills, enlarges our understanding, and in many cases, helps forge the self-reliant spirit for which our community is renowned. This January 2017 issue of *QST* hopes to reenergize some of your inner creative force.

Today there are more opportunities than ever for Amateur Radio DIY enthusiasts. Purists can design and scratch-build their own inventions, or construct the designs of others; kit builders have a growing number of offerings from simple passive devices to full-size transceivers. A third approach involves the repurposing (hacking) of existing devices like 802.11 wireless routers, transformed into mesh network transceivers, enabling hands-on knowledge of frequencies and propagation styles that many amateurs never experience. Microprocessors like Arduino and Raspberry Pi have become building blocks of things, which their original architects could never have imagined. One appears in this issue.

Even though it feels good to make something useful out of a pile of parts, DIY is not merely a feel-good exercise. Learning moments abound. At a very basic level, every project builder eventually acquires solid construction techniques. One needs only to pick up the wrong end of a soldering gun for the learning curve to become very steep. The builder quickly learns to recognize the dull appearance of cold solder joints compared with their shinier versions. Most common components in a project are forgiving of rough handling. But microchip devices prove fragile and vulnerable to invisible forces like static charges. At the next level up: the physical placement of components, especially in a breadboard project, informs their function in the circuit design. For visual learners, the physical layout reinforces the circuit's overall functionality. Several years ago, I asked the dean of a leading electrical engineering program what skills were least prominent in his incoming class of EE freshmen. Without hesitation he said, “As a group they lack an appreciation for, and understanding of, componentry — how each individual component performs its unique function and how they all interrelate.” Viewing the widespread use of com-

puter assisted design tools combined with multifunction integrated devices, I observe a certain dissociation occurring between pixels on a screen and their real-world counterparts. Too few actually touch carbon, Mylar, or silicon. We ought to deconstruct a capacitor once in a while. Carefully.

Not wishing to emphasize smaller-scale construction at the expense of larger mechanical tasks, I note radio amateurs often confront elaborate mechanical construction, and large-scale at that, when creating antennas and supporting structures. If you plan to tackle this month's motorized mast project, you will need to be as agile with a wrench as you are with tweezers. While concrete and potting compound share certain fluid characteristics, they have vastly different curing features. Be warned.

Of course, the real learning occurs when the project fails to work on the first try. Or the second. Or the third. Failure is a double challenge when working your own, yet unproven, original because you are uncertain whether the fault lies in design or execution — or both. And among all the builders, tinkerers, makers, and designers, I most admire those who build and modify, over and over again, a single project. They are constantly refining, cutting, and trying, seeking at every turn a continuous process of improvement. From these visions and revisions emerge an Edison, an Armstrong, a Grove, and a Wozniak.

For my part, troubleshooting a problem provides the best learning moments of DIY. My colleagues will probably tell you that this naturally follows from my own vast and diversified experience with failure and mistakes. However, learning from mistakes and solving problems, especially trouble-shooting circuits, develops and refines one of life's most valuable skills — problem solving. In this issue you will read the words of Jeri Ellsworth, A16TK, a self-educated engineer whose secret to learning electronics is fail and fail often.

Give DIY a try in 2017. Above all, have fun. Making things is enormously therapeutic. And it's also fun.

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