There are very few subjects that lend themselves to the type of erroneous information found in the usage of our epoxy rod finishes. Some of the mis-information can be attributed to mere ignorance and such ignorance being repeated over and over again until it becomes factual in the mind of the perpetrator. Once this ignorance becomes apparently factual, no amount of evidence or data disputing the outrageous claims will sway the perpetrator.

Myths, Mythologizing and Myth-Makers

Some of the most common and widespread beliefs in rod building are anything but correct. by Ralph O'Quinn

Mr. Webster defines myths as "a person or thing, having only an imaginary or unverifiable existence"—"and unfounded or false notion" and our little rod building world is full of them. They exist in almost every aspect of the trade. It seems to me that they are especially prevalent in the finishes and adhesives end of our craft, but it just may seem that way because the adhesives and finishes are so dear to my heart.

Recently I was made a fool of—I might even say I looked like a plain idiot, because I blindly followed instructions from one whom I supposed knew what he was doing. The end result could have been a disaster, except his mythical expertise became quite obvious and cooler heads prevailed. That evening while doing my thing in my rod shop, it dawned upon me that a similar set of conditions exists in our rod building world. We most certainly have our share of pseudo experts out there. I used to either read or listen to an obvious distortion of the facts by one of these experts and merely shrugged and snickered over his ignorance. But lately I began to realize just how much damage these tirades are doing to our craft. There are more and more new builders just starting to build a rod or two and finding it most intriguing. Usually they get hooked like the rest of us and begin to ask questions. Only trouble is, being new to the art, the answers they get from the Myth Builders can get them running around in circles until they don't know whom to believe..

Slow Cure Epoxies are Always Stronger than 5-Minute Epoxies Due to Better Cross Linking - *False*

Recently a new rod builder came by to see my shop and was dismayed to see me installing a butt cap with a fast cure, i.e. 5min epoxy. He was adamant that I should be using a slow cure epoxy. I asked him why. He answered "Epoxy finishes and adhesives that take longer to set will be more flexible and more resistant to cracking. This is because the molecule in slower setting finishes and adhesives have more time to cross-link and are therefore stronger and less brittle. This is one reason why 5-minute epoxies are not very strong." He spoke like an expert on the subject, however, his information was totally false.

Unfortunately this MYTH is quite prevalent out there. How and where it got started is anyone's guess, but it has no basis in fact. The length of time required for an epoxy to set or cross link has no bearing on how strong it will be when fully cured. It is perfectly possible to formulate a 5-minute epoxy, or a 2-minute epoxy, that is far stronger than any long cure epoxy that is on the market today. During periods of research, I will often mix a 2-minute or a 4 or 5-minute sample adhesive, just to test one of the amines I am blending for a production formula. One of the problems facing rod builders is that very few of the epoxy formulations used in rod building were originally intended—originally formulated—for rod building. They are using something that was concocted by a mass marketing firm for general usage on anything from golf clubs to down spouts. The 5-minute varieties are invariably crammed with fillers, which give them very poor wetting which translates into poor adhesion, which appears to be poor strength. Mass marketing is aimed at one thing and one thing only, PROFIT. Your needs as a rod-builder are not considered in the original formulating.

The 5-minute epoxies are generally aimed at a different market than their longer cure time cousins. Chances are that both products on the shelf contain the same epoxy resin, but different amine hardeners, for it is the hardener primarily that determines the final cure properties of the two part system. In most (but not all) cases you could take the resin from the long cure kit, mix it with the hardener from the short cure, and come up with the short cure time, possibly with different or even better characteristics. For it is not the length of cure time that determines these characteristics, but the properties of the amines and epoxides that make up the formulae.

Now it may be that a particular 5-minute epoxy is or is not as strong as a particular slow-cure epoxy, but it will have nothing to do with the time required for "cross-linking of molecules." While that sort of thing sounds impressive coming from the mouth of a self appointed expert, it is a myth, plain and simple.

Adjusting Epoxy Resin and Hardener Ratios Can Result In Better Curing and Hardening - *False*

In order to clarify what I was attempting to teach this young fellow, I began measuring out some portions of rod bond (long cure) and my newfound concoction, i.e. 5-min rod bond. I had them both measured out and ready to start the blending process when he interrupted and insisted that I add just a tad more resin to each mixture. We were eyeballing the mixture, and they looked equal to me. When I asked him why he thought more resin was necessary, he looked me straight in the eye and blurted out that "It is a well known fact that when mixing epoxies you must always use a bit more resin than hardener, as this will ensure that your mixture hardens properly." For a moment or two there, I thought I was going to come unglued. It is very difficult to keep one's compo-

sure in the proper perspective when confronted with such blasphemy.

So I pointed out to this budding young "myth maker" that the labels on these products explicitly tell you to mix equal parts of A and B. I rounded up several more two part kits of various and sundry manufacturers and showed him that ***all*** manufacturers of two part adhesives and finishes, state to mix ***equal*** parts of A and B. Not a single one of them recommend to mix a bit more resin than hardener. Then I obtained one of my reference manuals from a nearby bookshelf and introduced him to what makes an epoxy tick. Namely the Epoxides and the Amines. In order to simplify things, I told him to think of the epoxies as a white marble and the amines as black marbles. In order to obtain the correct cross linkage when mixing the two – one must have two black marbles for every white marble. The formulator, who concocted this kit, formulated the two mixtures so that exactly two black marbles and one white marble will be in the mixture when you mix together ***equal*** parts of each. In order to be assured this would happen, he called for the correct ratio of amine to epoxy. The formulator used his knowledge of Stoichiometry, which deals with the application of chemical laws of definite proportions.

Mixing Unequal Portions of Epoxy Resin and Hardener Will Still Work - *Maybe, Maybe Not*

Finally, after much haranguing, and considerable resistance, I could see him coming around to reality. He was really a bright young fellow and the first question he asked was, "Then how come when I mix more epoxy I always get a good finish". Good question, and one that puzzles a lot of people. The answer is ***tolerance***. Everything has a tolerance. A foot long ruler is a foot long, plus or minus a few thousandths of an inch. This few thousandths of an inch is the tolerance. You must mix exactly equal parts of your epoxy compound in order to get the proper mix. Exactly, plus or minus about 5% of your volume mixture. Almost all systems will withstand a 5% mismatch. As you approach 10%, you are getting into trouble. This 5% can be that much more epoxy, or 5% more hardener. If you must err, it is best to err on the hardener side. A slight surplus of hardener gives a better- finished product than a slight surplus of resin (epoxy). But don't take this as carte blanche to add more hardener! Do your level best to attain that exact 1 to 1 ratio of resin and hardener.

When using a syringe as the measuring instrument for mixing epoxies, the normal tolerance is 1/10th of 1%. If this mixture is subjected to qualification type testing, and compared to a mixture wherein there was an induced 5% tolerance, the 5% specimen will fail miserably. So even though we are using our epoxies merely to cover our threads, hardly ever in a structural situation, it is prudent to keep the tolerance to a minimum – read the label and don't listen to the "Myth Makers."

Heating Or Torching An Epoxy Thread Finish Will Tend To Make It More Flexible - *False*

Not all myths are propagated by newbies. A few months ago a fellow came into our plant where we mix and package all the U-40 and Trondak products, and asked for me. I wasn't around so our secretary gave him my phone number. When he called and introduced himself, he claimed to having been building rods for some fifty years. Then he asked me if I could sell him some epoxy that didn't have the retarder in it. I didn't know what the devil he was talking about and told him so. He then responded by telling me that he wanted to get some epoxy thread finish without all that "Stuff you put in it to keep it from

fully curing." My response was "Why in the world would we do that?' His answer was that "Everyone knows that you add it to keep the finish from fully curing so that it will remain flexible." He went on to state that when he flames his finishes, this component is destroyed and the finish becomes brittle. "Obviously this is what is causing the cracking at the edges of the guide feet on most all of my rods," he said. Well, it's not nearly so obvious to anyone who knows better than to believe this silly myth.

The key words to his problem are "everyone knows" and "Obviously this is ....." He became quite offended when I tried to explain to him that epoxy compounders have the very devil of a time getting their product to cure ***properly***. So why in the world would they add something that would prevent it from curing, assuming that such a thing existed, which I doubt. I tried to explain to him that cracking at the edges of the guide feet is caused by uneven flex between the rod and the guide foot. The rod wants to bend while the very stiff guide foot wants to stay put and the poor epoxy is caught in the middle, resulting in cracking or stretching.

When the epoxy finish is torched to excess, flamed to hot, the extra heat can cause even the most flexible finishes to become quite brittle. The more brittle the finish, the more it will tend to crack under flex. The finish becomes brittle, not because of any component that is added to keep the epoxy from fully curing is destroyed, but merely because it is considerably ***over cured***. Some finishes are merely brittle by nature and will crack under flex even if they are not heated during cure.

The more I tried to explain reality to this "experienced rod builder who has been building rods for fifty years," the more offended he became. He finally accused me of merely protecting trade secrets, and making excuses for something that is obviously (that key word again) trouble for all rod builders, and then hung up on me – saving me the opportunity of hanging up on him. All of the newbies that I have had the opportunity to counsel have been open to learning – it's the old timers that have the closed minds.

Gouging and Scratching of Surfaces Will Make The Adhesive Hold Better - *False*

It was also an old timer (I estimated this guy to be in his late 70s) that came into my shop one day to have me demonstrate the proper mixing of Rod Bond. He had seen me do this at one of the trade shows and wanted a more detailed demonstration, so he called me on the phone and I invited him over since he lived only about 20 miles from me. Since I had a couple of fly rod handles ready for assembly, I figured to kill two birds with one stone. I opened a jar of Rod Bond resin, scooped out a portion, closed the jar and opened the jar of hardener. After wiping off the spatula, I scooped out an equal portion of it by eyeballing - making a special point to my student that I was only eyeballing the portions. Then I showed him how to blend the two by spreading the mixture out across the piece of cardboard I was using until the mixture was uniform. This spreading, instead of stirring, assures one of complete bubble free blending.

Once mixed/blended, the next step was to bond my fly rod handles. I showed him how to gain a water-break-free surface on the rod blank with the judicious usage of Scotchbrite. The cork had been reamed to fit the blank so there was no mandrel involved. I applied some rod bond to a portion of the blank about one handles length forward of the area to be bonded, slid the handle down to that area and with a rolling/wiping motion – coating the entire inside of the handle. Then as I applied some rod bond to the final bond area my

very attentive student came to life with a loud "NO-NO-NO, you have to gouge and scratch that area before bonding." He became very excited, and explained to me that the glue might not hold on a smooth surface, but the gouges and scratches would give it more holding power

This is a myth that is as old as rod building itself, making it probably the oldest myth in all of rod building. While patiently correcting his erroneous beliefs it suddenly dawned upon me that I had written an article in RodMaker Magazine a few years ago on this same exact subject. Going to my nearby collection of the magazine I retrieved the copy with the article in question and asked my errant guest to read the article. At first he tended to skip hastily through it, but then seemed to gain more and more interest in the subject as he read more and more. To make a long story short, he wound up a believer. The following are excerpts from RodMaker Volume 5 issue 2, written for the purpose of putting to rest the myth that gouging and scratching are necessary to obtain a good bond with epoxy.

Any bonding agent, call it a glue, adhesive or whatever, is intended to be worked over a wide area. Bonds are never concentrated such as is a rivet or bolt, except when dealing with something like jewelry in which case it is not bonding, it is merely gluing. As an example, suppose we take two pieces of thin sheet metal about 4 inches square, super impose them one on the other, drill a few holes and rivet them together, leaving an inch or two on the sides for holding purposes. No matter how many rivets we install in the thin metal, when exhorted to a pulling force the rivets merely tear out at a very low load.

Now take the same setup, only bond the two together with a good metal bond system. There's no way you can separate the two without tearing the metal itself at a high load. The bond has distributed the load throughout the entire bonded area, while the rivets took only point load resulting in failure of the structure at each rivet. When you gouge through the surface of a fiberglass or graphite rod blank, then bond to that area, you have effectively punched a rivet or two in the structure, at the point where you gouged it, and the structure will fail at that point and under very low load.

When bonding to a rod blank, be it graphite or fiberglass, the surface resin must not be penetrated. The surface of the blank is composed first of a clear coating/paint, then under that coating is a layer of the resin that binds the blank together. You are not hurting the integrity of the blank by removing part or even all of the outer coating. Bonding directly to the underlying resin will still give optimum conditions. However if this outer layer of resin is removed by filing, grinding, judicious sanding, or whatever—you are now bonding directly to the glass or graphite fibers, and this is where you simulate punching a rivet. This is the condition that leads to catastrophic failures and in preventing this condition is where our knowledge of "Water Break Free" surfaces comes into play.

In Rod Building, If Most Everybody Says Or Believes It, Then It's Probably True - Not Hardly

Be wary of the myth makers - what they pretend to know is usually based on what they've heard or what they only suspect to be the case, rather than actual facts, science or sound knowledge. ✍

This issue's article on rod building myths will be followed by additional articles also intended to expose such myths, in the hopes of saving many rod builders from the mistakes and troubles caused by blindly following incorrect information. Some of which has been with the craft for many decades now.