

# AQUARIUM FILTRATION

By Dennis Heltzel

A lot has been written over the years about filtering aquariums. I don't want to just replay the same information that has been written before; rather I plan to discuss my view of the five different types of filtration commonly used in the hobby. That's right, five types. I know all the books say there are three types and those are certainly valid, but there are two more that I will discuss later. But first, let's look at the "big three". Ever notice that they are normally discussed in the same order—mechanical, biological, and chemical. Maybe that's because every author copies the ones before, but I think there's more to it than that. This order represents, roughly, the order in which each method intercepts the "bad stuff" as it passes through its various stages.

Before we start talking about the different types, let's look at what filtration is. I would define filtration as any process that improves the environment qualities of your aquarium. That is, after all, what we are trying to do when we put a filter in or on our tank. We can never filter our tanks to perfection, there will always be some level of pollution and the goal is not total elimination, but the management of the levels to be as low as practical. So, let's briefly go over the basic types of filtration that most of us know well.

First, we have mechanical filtration. This is the physical removal of waste and debris and it's vital for most aquaria because we want our tanks to look clean. Murky water with piles of detritus lying on the bottom is not appealing and most consumer grade filtration is heavily biased to keeping the tank visually clean. Not to discount the importance of appearance, but this does relatively little to actually keep the fish healthier and happier. If you are diligent to clean out the accumulated waste often, before it decomposes, then this does become a significant way to increase water quality, but let's face it, it's easy to let this slide.

Next we have the type of filtration that is the most talked about and generally the most hyped by equipment vendors, biological. The use of biological filtration has been heralded as the greatest breakthrough of all time for our hobby. It's almost as if the equipment vendors invented the process. Biological processes of all sorts are happening in your aquarium, no matter whose equipment you are using, or even if you have nothing at all. The basic idea here is that certain bacteria can change really bad toxins (ammonia and nitrites mostly) into less toxic toxins (nitrates). There are other bacteria that are supposed to convert the nitrates into nitrogen gas, but aquarists just let the nitrates accumulate until removed by the next water change. The biological filtration processes are the mainstay of modern filtration technologies and have a proven track record. There are of course thousands of types of bacteria in your aquarium, some are floating in the water, some are actively decomposing the organic matter, and some are growing on the surfaces of all

the objects in the tank. Those last ones include the beneficial bacteria that are capable of converting bad nitrogen into nitrates. So, this means that you don't need to worry about removing the main population of good bacteria by changing water or removing debris, since the bacteria in those areas are not the ones you need. Rather, be careful when disturbing areas in your tank that have objects with a high surface area. This would be mostly filter media and the substrate. It's ok to rinse those off, but don't use anything that will attack the bacteria, like chlorinated tap water. Instead use you discarded water change water to rinse your sponge filters, floss, or those expensive carbon filled pads in your outside filter. Also, be careful of when you replace those items as that removes all of the bacteria at one time. Replacing filter pads can be very disruptive, not to mention expensive, even if the manufacturer recommends it (gee, why would they want you to do that?). Just rinse the dirt off the pad and replace it as long as it's still in reasonably good shape. When you finally do need to replace the pad, don't just discard the old one, it still has a lot of bacteria still on it, instead, try to remove the floss part, rinse it gently and stick it somewhere in your filter where water flows over it. It will then "seed" your new cartridge with bacteria.

The final type of filtration commonly mentioned is chemical. The most common example of this is carbon filtration. Good carbon can be very good at removing even minute quantities of certain toxins. It does this by essentially grabbing the molecules from the water and holding them on its surface. This sounds like a great idea, and it works really well for things like removing chlorine and pesticides from tap water. That's why those carbon-bases water filters work so well in our kitchens. However, in the environment of an aquarium, they are not nearly as effective for a number of reasons. The biggest reason is that there is a much higher concentration of toxins in an aquarium than there is in tap water (if that's not true, you should not be drinking your tap water!). Also, carbon quickly becomes saturated in an aquarium. At that point, it just trades one molecule for another and it might not always favor picking up the toxins you care most about removing.

Other chemical filtration methods would include the use of various compounds that react with toxins and render them harmless in some way. There are specialized media that targets a particular toxin, like copper. These can be very effective, but have a narrow purpose for our aquariums. Chemical filtration is usually listed last on the list of filtration types, I think because it sort of "mops up" the final toxins that can't be removed effectively by the first two types.

Each of these types of filtration has purpose and it's good to understand the usefulness and limitations. In the next part of this series, I will talk about another type of filtration that is even more useful in certain circumstances.