THE ORIGINAL MACQUARIUM

❀

VOLUME 4

❀

IN WHICH DORIS GETS HER OATS
AND THE HEAVENS RUMBLE WITH
OUR LORD'S KEEN DISPLEASURE

 version 1.3

THERE IS NOTHING ON THIS PAGE. NOTHING, I SAY! IF YOU KNOW WHAT'S GOOD FOR YOU YOU'LL FORGET ALL ABOUT THIS AND PROCEED TO THE NEXT PAGE. THAT'S RIGHT…JUST KEEP MOVING.

HEREIN WE HUMBLY RELATE FOR YOUR ILLUMINATION

THE DELINEAGE OF THIS SELFSAME DOCUMENT

1.0 Inital release. Girlfriend reads, says "*This* is what you've been working on for the past two months?!". Dumps author.

1.1 Deleted information on bypassing rotating steel knives at end of escalators at South Station MBTA terminal, Boston.

1.2 Deleted passage concerning TV weatherman Willard Scott, deemed by counsel to be "Too actionable for widespread publication, though 100% accurate in every conceivable detail"

1.3 Author breaks MacQuarium tank while making adjustment. Specifications modified to add extra half inch safety margin in depth of tank.

HEREIN WE HUMBLY DELINEATE FOR YOUR BENEFIT

THE CONTENTS OF THIS SELFSAME DOCUMENT

1 Legalese and Disclaimer

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2 Preface/Background

It all started innocently enough. Someone wrote in to MacUser's Help Folder column (written by yours truly and Bob Levitus truly) with a question regarding "The best way to upgrade a Mac 512." Seeing an opportunity to make a weak joke and eat up about 8% of my word count besides, I suggested that the only useful upgrade for a Mac 512 would be to turn it into an aquarium.

Had I been paying attention in my 10th grade social studies class, I would now be able to mention the assassination of someone at somewhere, a small event that nonetheless had monumental, grotesque repercussions, namely World Wars I and II and the Cold War, just for starters. In tenth grade, however, I had all of my elder sister's notes, term papers, and exams. Our teacher, remarkably, hadn't changed a single homework assignment or exam question in six years, so I managed to cop an A without bothering to learn so much as the teacher's name.

But I digress. The point is, an avalanche of mail resulted. All right, eleven letters. But clearly it was a mandate from the masses, eleven of them at any rate, and so I set forth to design and build The MacQuarium.

The MacQuarium is actually a custom-made glass fish tank (capacity: two gallons give or take a hectare) made to fit on top of a small platform inside any Macintosh shell with a Classic form factor. The MacQuarium is known to be compatible with the Mac 128, 512, Plus, and SE, and is assumed to work with a Classic or Classic II shell. No amount of begging or pleading could convince Apple to send me one for free, and frankly though I love my job, if I'm going to blow $799 it's going to be on a Laserdisk player or a subwoofer or a complete set of *Sandman* comics. I'm sorry, but there it is.

I set about my chosen task with four design imperatives firmly in mind:

- There must be no visible waterline. I've seen several half-hearted attemps at aquarium conversion where there's two inches of dead space in the monitor cutout. That's good enough for government work but dammit, this is America, or the little bits of it we've got left in working order, anyway, and since there was nothing good on TV for weeks on end, I worked around this crippling limitation.

- Nothing must obstruct the disk-drive slot. This is so you can see the little fishies poking their noses at the open slot, which is just so damn cute you'll want to hang yourself.

- There must be the ability to install one of those little divers with bubbles coming out of his head, or a treasure chest with the skeleton of a drunken pirate in it that waves a bottle of rum, or any other classic aquarium action toy that compensates for having to clean up fish doo doo.

- Oh, yes, the cost. This is all technically tax-deductible for me (and I technically got paid for it, too…Lord, I love this country) but a $150 MacQuarium would probably be a hard sell to your boss, spouse (or both, if applicable). Cost of a minimally configured MacQuarium must be under $30, not including the Mac shell.

Happily, the MacQuarium meets all four of these demanding criteria. The only drawbacks:

- May violate your Apple warrantee or AppleCare extended warrantee. If you bring your Mac in for repair, don't let on that you've made modifications to it and maybe they'll still honor the warrantee.

- Incompatible with A/UX 3.0 and Microsoft Word 5.0. Then again, so is everything else.

- Fish way too small to eat, can only be part of chowder.

On the plus side, the MacQuarium upgrade is the cheapest way to get color on a Classic-architecture Mac. *After Dark* is a neat screen saver, sure, but frankly it looks like a cartoon or something compared with the MacQuarium.

Next to finally, How Much You Are Expected To Pay For This Document. As disgustingly detailed in the Legalese and Disclaimer section, this package is free (though NOT public domain) and if you paid anything beyond a disk duplication fee or normal downloading charges for it, I'd very much like to know about it. However, if you think this MacQuarium package is worth something, then please go down to your local Red Cross chapter and donate a pint of blood. It doesn't hurt a bit (outside of a quick pinch), it quite literally might save a life, and they give you name-brand juice and cookies afterward.

Finally, your feedback is appreciated. Questions, comments, corrections, or whatever, contact me on the Internet (preferably) as andyi@world.std.com.

Really finally, and the most serious part of this document: do keep in mind that goldfish, dim as they are, and they are *plenty* dim, really, are living creatures. Please do not attempt this project if you are not willing to take good

care of your fish until they die of old age. If you don’t like the idea of feeding fish every day and cleaning a tank every month, you should either forget the idea entirely or resign yourself to stocking the MacQuarium with some sort of mock-fish. Carrots probably will work fine underwater.

3 What You'll Need

Shell
- Any Macintosh with a Classic form factor.
- Hacksaw blade, chisel and file, drill (optional)

Tank
- Five custom-cut panes of 1/8" window glass
- Masking tape
- One tube of silicone adhesive
- A 4' by 12" plank of 1/2" thick number two pine (or any other piece of wood suitable for building a small platform)

Aquarium
- Fish
- Air Pump, Air tubing
- Filter
- Gravel
- Light
- Thermometer
- pH test kit
- Tap water conditioner
- Food
- Check valve
- Gang valve
- Air stone
- Water
- Tchochkes for tank (little diver, fake plants, severed hand, castle, etc.) – Optional

4 Construction: The Shell

Preparing the shell is your first step on the journey towards MacQuarium ownership for a simple reason: it's a royal pain in the semprini. The idea is, if you give up here, you won't have already spent all that money on the glass and aquarium supplies.

(No matter what order you decide to perform these steps in, it's strongly advised that you buy the fish *last*. Fishy survival in one of those little plastic bags is estimated at something like four hours, rather less than the three days it'll take you to finish building the MacQuarium. Killing fish needlessly leads to unsightly buildup of bad karma and should be avoided if at all possible)

Anyway, it's not all that much work, really; it's just a serious a slow, tedious little details that must be attended to, and much time spent sawing off all the bits of the shell that only get in the way of the fish tank. OK, onward.

Securing a Shell

Certainly the shell itself is the only unusual component of the MacQuarium, but nonetheless it shouldn't be hard to find. The easiest way to secire a Mac shell for yourself is to contact one of the following companies and simply order one:

Pre-Owned Electronics
205 Burlington Road
Bedford, MA 01739

(800) 274-5343

Shreve Systems
3804 Karen Lane
Bossier City, LA 71112

(800) 227-3971

Both outfits specialize in Macintosh parts, components, etc. and have been around for a long time. The median price for a good Mac 512 shell is about $40 or so.

Credit Where Credit's Due / Revealing Possible Conflicts Of Interest Department: I hereby humbly thank Pre-Owned Electronics for their generous donation of Mac shells for this project. As soon as I mentioned that I was looking for something I could turn into an aquarium, they up and offered to send me the stuff for free if I'd just give 'em a list of instructions when I was done…this even before they found out I was a writer. If only support for projects like the Supercolliding Superconductor and the Orange Julius On Betelgeuse could've found such eager, Queen Isabella-like support so easily in the private sector…

The only way you can get a shell cheaper is to rummage through closets and the desktops of the less-popular people in your dorm or office for outdated Macs no one has any chance of using. You'll also have luck at electronics flea markets, where a D.O.A. Mac 512 can be picked up for $20 if it's in truly sorry shape. Also try hopping on a local BBS and try to scare up a rigormortified Mac someone's willing to sell for parts. As with many computer items, often you'll find that local system administrators are more than happy to trade an old 512 or Plus for a week's worth of beer money for the office.

Kids, be sure to get your parents' permission before turning Mom and Dad's computers into MacQuariums.

OK, now which Mac to aquarify? I'd suggest a Mac 128, 512, or Plus. They have all those great ventilation slots up at the top, so as aquariums they'll allow maximum ventilation into the tank; the 512 and 128 are far less useful, of course, so when you make the inspired joke "It was the only productive thing I could do with it!" you'll be rewarded with big atomic laffs and yucks instead of stony, confused silence; finally, this document provides modification instructions specifically for the Plus, 512, and 128. Those of you aquarifying an SE or Classic will have to wing it a bit at some point.

Preparing the Shell

The first step is easy. If you're converting an existing Macintosh, open the case and remove the logic board, analog board, CRT yoke and assembly, disk drive(s), hard drive, and frame. Discard.

Seriously, if you're converting an existing Mac and it's been powered up within recent memory, for Tarim's sake be careful of the CRT. Even if it was unplugged a long time ago, the CRT can still contain enough juice to electrocute you and eight friends besides. Buy any of Larry Pina's neato books and Macintosh repair and upgrades for instructions on how to discharge all that pent-up electricity safely.

Now then. If you bought a shell alone, it will almost definitely arrive empty. All you'll have to do is remove a single metal platform, which during life was used to support the logic board, CRT and drive cages, and pull out a loose bit of RF shielding. Discard all.

> Actually, because it's all steel and latticed, that rack makes a great solar toaster. Leave it in the sun for a while, then set some bread out on it, and in an hour or two, bang! You've got toast. Just another way of leaving the environment in that much better shape for our children.

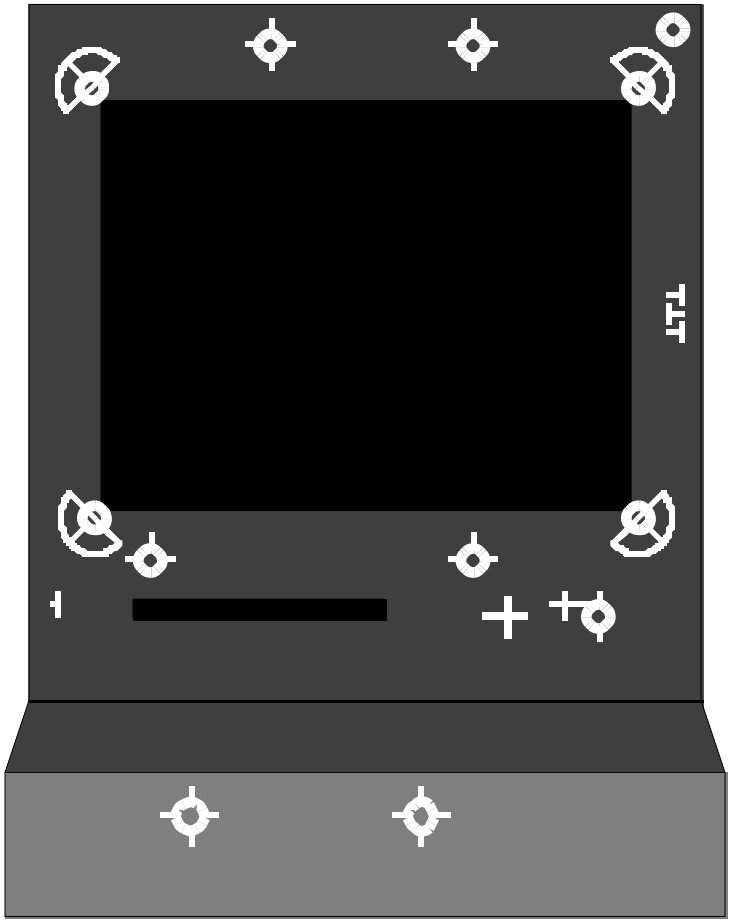
Once you've removed everything inside the shell that isn't (a) plastic and (b) a fundamental part of the shell itself, you're all set to start sawing away. This is that slow, dull, tedious part I mentioned earlier.

The implement of destruction here will be an unadorned hacksaw blade. You have to work the blade into a lot of tight spaces, you see, and you'll also have to take advantage of the bendiness of the naked blade to complete certain incisions, so the handle will only get in your way.

Unless you want to spend your remaining time on earth vaccuming up hateful piles of beige/platinum plastic sawdust, do your work in the garage or set down a bunch of newspapers in your work area. You might also guess that it'd probably be a bad idea to wear a shaggy sweater, too. When you're cutting, saw in short, manageable strokes and save all your strength for the pull stroke, which does all the actual cutting. Have a six-pack of something cold and refreshing on hand, and renting a movie or three wouldn't be a bad idea, because you're in for true wing-ding of an evening.

Deep breath now. Your first job is to work on the front plate. The tank's front is a flat piece of glass angled back to fit nice and kentucky against the entire top section of the front plate, right above the spot where the plate bends like an "L". To make sure that the front of the tank can snuggle as close to the monitor cutout as possible, we have to remove every bit of plastic that sticks up past the highest elevation of that cutout. Otherwise, the glass in the assembled tank will sit a centimeter or so away from the cutout and your MacQuarium will fool nobody.

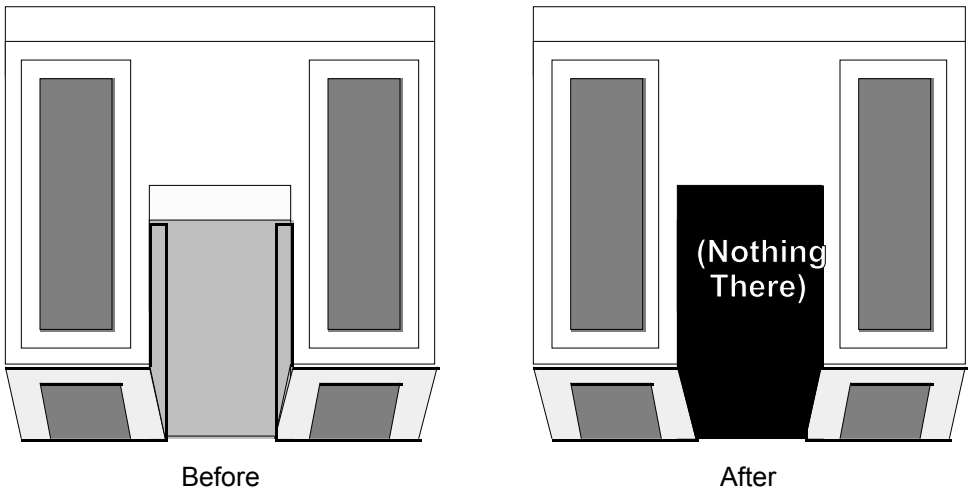
Those of you working on a Plus/512/128 shell, just diligently saw down all the the bits marked in white on this here sketch, down past the elevation of the monitor cutout (scale and relative positions has been jiggered around a bit for clarity):



Everyone else will have to wield their hacksaw blades as I did that very first time, getting a cutout-eye view of the front plate and hacking off anything that looks even remotely suspicious. The only bits that should certainly be spared the sting of your blade are the little tabs around the very outermost perimeter of the front plate. These will sit outside the edges of the tank and will help you align the tank properly inside the shell.

By the time you finish with the front bezel, you should have put away almost half of the six pack, made it all the way through Star Wars and are now at the bit in Empire Strikes Back where the Millenium Falcon is in the cave, only it isn't really a cave, it's a giant mutant space slug, and…ah but I'm getting away from myself again. On to the back portion of the shell.

The only thing we have to do to the back portion of the shell is completely remove the the handle-well at the top. The well dips down two whole inches into the case, thus making a nice high waterline impossible, plus with that thing gone we'll have a nice, neat hole through which we can feed the fishies and install a tank light. If you're still unclear on what needs to be done, this expensively-produced infographic shall make it plain:



Get the picture? Okey-doke. As you look into the back from the inside, you'll see two rod-like lengths of plastic running down the ceiling toward the well (this is where those two deeply-recessed Torx screws used to go). Starting by holding your hacksaw blade flush against the ceiling and sawing back and forth, cut all the way down until you make it to front edge of the "basket" itself – the box that makes up the handle's recess. Fortunately, the rods are molded to the ceiling on two narrow rails of plastic, so if you lay the shell down with the front facing up, you should find it pretty easy going.

Once you've cut all the way down to the basket, your next step will depend on how dainty your hands are. If you're good at maneuvering in tight spaces, you can cut right through the front edge of the basket and then continue through . By holding the blade flat against the ceiling you should be able to make it all the way through the basket, out between the two "lobes" of the top of the case, straight back to the first sharp downangle of the ceiling. But if such a feat of dexterity is beyond you, just cut off those those two long plastic posts where they meet the basket and get them out of the way. You should then have an unobstructed path through the basket and thence to that downangle.

No matter how you get to that turn, there's a little trouble awaiting you. You have to continue the cut about 120˚*down* to follow the contour of the handle well, so a little trickery is needed. You could saw out what you can of the basket, then use the extra space to maneuver the blade along as best as you could manage, but the easiest solution is to drill a hole at both corners, a

bit wider than the sawblade, then complete that angled cut from outside the shell. The rounded inside corners this technique leaves behind can be removed with a file or a good, sharp chisel.

Your almost-final cut is through those last four inches along the back of the basket. Again, superior swordsmanship can save the day, but the simplest way to make the cut is still to just drill a hole somewhere along the middle and then cut outwards from there. If you managed to cut out the basket in one solid piece, it should fall out in your hand. I will understand completely if you can't resist the temptation to fit it onto your hand and swoosh it through the air making WHOOP! WHOOP! noises…after all, it looks almost exactly like a fightership from Next Generation or something. Those of you who aren't in touch with your Inner Child may choose to reflect that it'd make a handly little planter or better yet a receptacle for your change in the car.

All that remains of the handle at this point is a ridged strip of plastic at the front edge, roughly an inch deep by four inches wide. The more adventurous types will want to remove that piece, too; you'll have another inch of access and you'll be able to mount your aquarium light another inch closer to the front, where it can do more good.

Whether you wimp out on that final piece of not, you're nearly done preparing the shell. As a final step, take a file or a piece of medium to fine sandpaper and take the burrs out of the edges of the cuts you made. Also use a file or a chisel to straighten out and Deviations From Perfectly Straight Lines you may have made, if you're a stickler for that sort of thing. And don't think you're so superior if you are because you're not.

5 Construction: The Tank

Ah, the Tank! Serendipity incarnate. While preparing the shell required loads of backbreaking labor, building the tank itself mostly involves sitting comfortably reading a good book, watching TV or engaging in any of dozens of other leisure activities while other bipeds and chemical processes do most of the actual work for you. It should be pointed out, in all fairness, that while working with the shell was dull and arduous, there was only a slim chance of accidentally slashing your wrists so badly that the arriving paramedics would be rushing to get your driver's license out of your pants before the bloodstains make it so unreadable that they have to identify you by dental records.

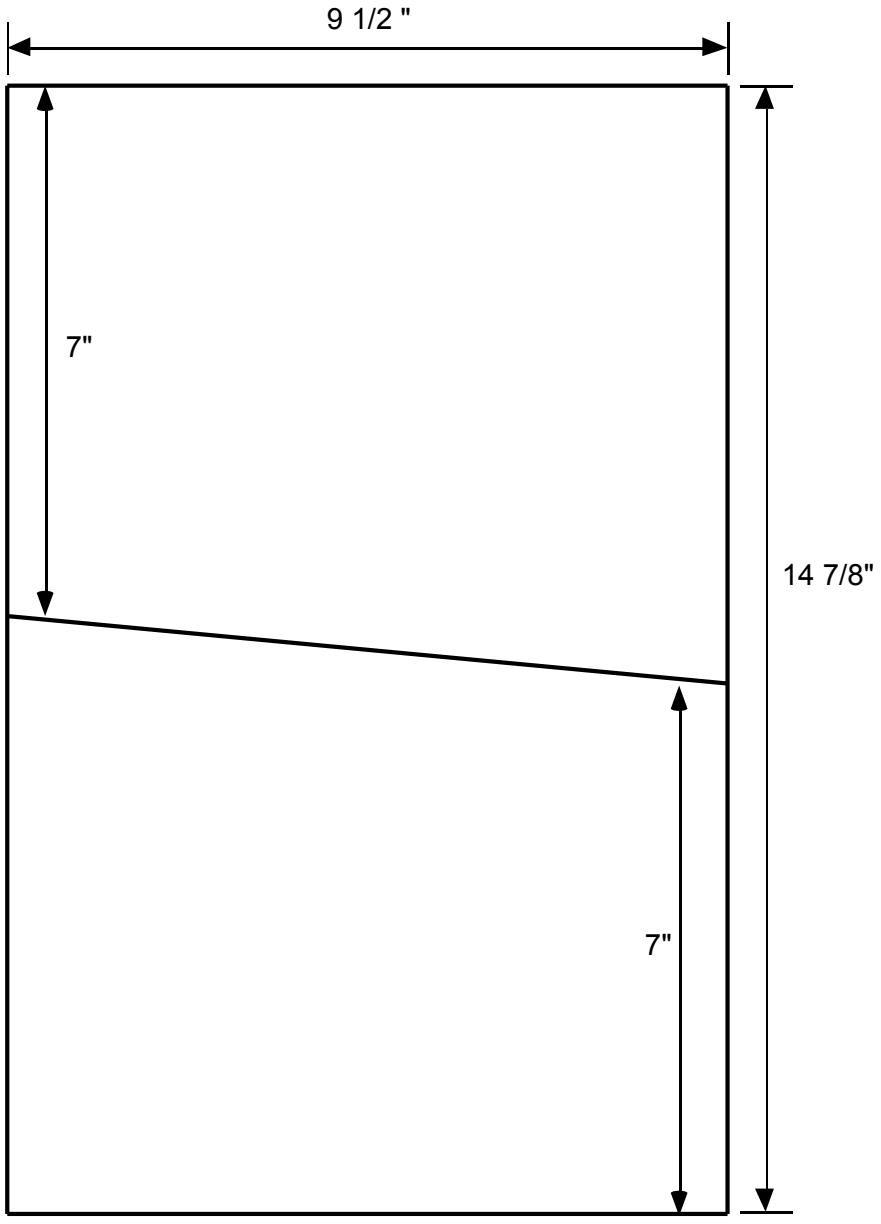
Section five and I'm talking about slashed wrists and dental records. I've been working on this project far too long.

Anyway, all you need to do is go to your local hardware store or home center and have some 1/8" window glass cut to the specifications I provide you, then assemble the actual tank with silicone adhesive. That's right…no frame, no support rods, nothing but glass and silicone.

First, the glass. On the next page you see a list of all the pieces you'll need. Hopefully, there'll be a shop somewhere nearby where you can just hand over those two pages and pick up your glass an hour later. Any store that cuts glass will have no problems with three of the five pieces that make up the tank; they're all nice, friendly rectangles, and most shops have a jig all set up for making perfect right angles of any size. No, it's the side pieces that might cause a panic or two among the less-studly glass franchisees; they're right trapezoids, with only two right angles, so cutting those two panes will take (gasp!) actual, intelligent thought on the part of the person cutting the glass. As such, many places will just turn you away. Be persistant and keep looking around. In my travels, the most foolproof sources of good glasscutters are shops that specialize in glass and could cut you a mirror in the sillhouette of Abraham Lincoln if you so desired. They tend to charge an arm and a leg. Instead, look for little hole-in-the-wall hardware stores, where the employees are typically related to the owner and (gasp! yet again) actually care about doing a job properly.

The thing is, though, none of the glasscutters really have anything to worry about. Hand over the template and they'll realize that making the two trapezoids requires nothing more than cutting a plain rectangle, drawing a diagonal line on it at a specific point, then pulling the cutting bar down that straight line. Trivial.

Side Panels: Cut from 9 $^{1}/_{2}$ " x 14 $^{7}/_{8}$ rectangle of glass, two pieces total. From drawing (drawing is to scale):



Front: One pane 8 $^{1}/_{4}$" x 9 $^{9}/_{16}$"

Back: One pane 8 $^{1}/_{4}$" x 9 $^{3}/_{8}$"

Bottom: One pane 8 $^{1}/_{4}$" x 7 $^{3}/_{4}$"

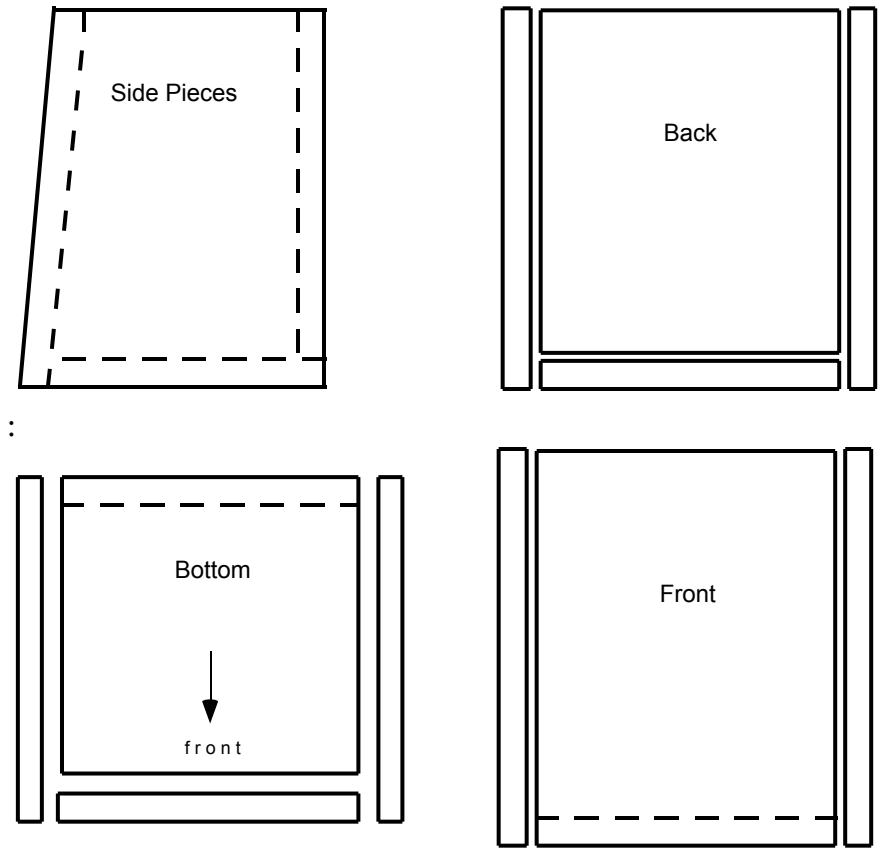
Five pieces (total) in order. All glass is $^{1}/_{8}$".

For good measure, take the plan for the side pieces and draw a full-sized template on a sheet of newsprint. It's a simple thing to draw — I mean, draw a rectangle, then draw a line from seven inches down on one side to seven inches up on the other — and the glasscutter will be able to just lay the glass on the rectangle and trace over the dividing line.

You can expect to pay eight bucks or so for those five pieces of glass. Considering how cheap the glass is, you may want to have two sets made up, just in case something from the first set breaks.

When you get your cut glass back, you'll notice the difference between this stuff and the kind that put in coffee tables and aquariums: your glass is still mighty sharp around the edges. Be careful when handling the glass during assembly at all further stages.

Yes, mother. Continuing. Before you permanently assemble all this glass, you ought to put the tank together dry, with masking tape, to make sure they're of the correct size and that you know how they fit together. That second bit is way important. The glass is an eighth of an inch wide, so if you fit the pieces together incorrectly (lay the back panel on top of the edges of the two side pieces, rather than between them, say) you'll wind up with a tank that's a whole quarter-inch out of whack. Use this assembly guide:



From the guide, you can see that the side panels are supposed to go on top of everything else, while the back panel is surrounded by glass on all four sides.

While you have the aquarium taped together, take the opportunity to label each pane with masking tape so there'll be no mistakes when you finally bond all that stuff together. The back and bottom panels look almost identical, but if you mix them up you won't get a good, tight fit.

The final step before actually assembling the tank is to give all of its interior surfaces a good cleaning with a moist cloth. It's easier to clean it now that when it's all assembled, so clean it now. Be sure to use nothing but warm water and maybe a pinch of salt. It's tempting to grab for the Windex to get rid of all the fingerprints the glass has accumulated, but soap and other chemicals have a nasty habit of killing fish.

Now you're ready to finally, permanently, truly, madly, deeply build the tank. The sole material needed to bond the glass together and form a strong, watertight tank is a tube of silicone adhesive. Go ahead and smirk…I was skeptical too. Nonetheless, it turns out that even with nothing but silicone holding it together, a small tank is plenty strong. My MacQuarium's been running for three months straight without a single leak. But be careful when you shop for adhesive; not all silicone adhesive is safe for fish. The stuff you generally buy in a caulking tube for sealing around a bathtub or a boat usually contains chemicals that, again, instantly teach fish how to float. Furthermore, a lot of that stuff doesn't even work underwater. Be sure to look for silicone adhesive specifically designed for aquarium use.

Some notes on silicone adhesive. First, it can be nasty stuff if you use it improperly. As it cures, it gives off gaseous acetic acid, so be sure to only use it in a well-ventilated room. It's an irritant, so try to keep it off your skin as much as possible; if you're making more than one tank at a time, wear rubber gloves. Even after putting together just one MacQuarium tank your fingertips will start to tingle a bit. Wash your hands after you finish up and for heaven's sake don't rub your eyes or any other sensitive body part until you've gotten the stuff off your hands.

Okay. Choose your work area carefully, because putting the tank together is a two-day, two step process and you can't move the tank until it's absolutely finished. The first step is just to bond the panels together to make a basic box. Later, you go back in and make the box waterproof. Take it just one goal at a time.

Cut the very tip off the nozzle that came with the adhesive so you can apply a nice, thin bead (about 1/16" or so) of adhesive. Practice your adhesive-application technique on a piece of scrap until you can lay down a neat,

consistent bead of gunk. Lay down the first side piece on your workspace and apply a thin bead across the three edges (facing UP) that'll be bonded. A consistent, thin bead is more important that a huge glob of goo that skips all over the place.

When the silicone leaves the tube, you have roughly five minutes to jockey your glass into position before the stuff starts to set up, so get cracking. The problem is, silicone doesn't stick to silicone; if it dries on the glass, that pane will be useless until you scrape that gunk off.

Apply a thin bead to the back edge of the front plate. Place the front and bottom panes of glass on the side plate as if you were building a house of cards, easing their thin edges into and through the adhesive. Tweak them into position with your thumbs (carefully! remember the glass is sharp!), sliding them back and forth a tad to that the sealant contacts every part of every edge. After a few seconds, the three panes will be stable enough to stand on their own. Take this opportunity to nudge the glass a bit to get them as square and close to the edge of their mates as possible…remember, the clock is running!

You should still have plenty of time to put that back pane of glass in. Lay a bead of silicone on the bottom edge of the back pane (the edge that will be making contact with the bottom plate) and ease it into position as you did the other two pieces.

Now you have a pretty solid four-sided shape. You've got all the time in the world at this point, as there's no strip of adhesive waiting to bond to a new piece of glass, so double-check the tank-in-progress to make sure all the corners are square and all the joints are straight.

Let things stand for ten minutes or so, to let things firm up a bit and become a little more stable. After finishing off the last of that six-pack, prepare the remaining side piece the same way you prepared the first: apply sealant to the three edges of the pane. Carefully align the pane over the tank-to-be, and drop it down onto the glass edges. Make final adjustments for fit and square and you're done for the day. Go out and get yourself some waffles…you earned it.

You now have 24 hours off, which is the amount of time the adhesive takes to form a strong bond. And boy, does it ever bond; if you put a dab of the stuff on a scrap piece of glass (useful, by the way, as a gauge for how far along the adhesive in the tank is in the curing process) there's just no way to get it off once it's set, short of a razor blade.

The next day, make your way through the overpowering stench of vinegar (dammit! I *told* you to use it in a well-ventilated room!) and then waterseal that puppy like there's no tomorrow. Cut the next two notches off

the sealant nozzle so you can apply a thick trail of the stuff, and squeeze a line of silicone into every joint inside the tank. Try to push the tube into the line of exiting adhesive, not trail behind it; that way you'll force more adhesive into the joint. When you've put a quarter inch or so in the cracks, use a finger or the rounded edge of a plastic card to smooth the silicone and work it further into the joint. At this stage you're making sure that the bloody tank won't leak, so make sure each joint is filled with solid silicone and has no air bubbles.

The last part of the tank you ought to slather silicone all over is that sharp edge of glass on the top-rear of the tank. Air hoses will be snaking over this edge, as well as a power cord if you're using an AC aquarium light, so you want to be prevent the glass from cutting through something and causing problems.

Now you have a whole 48 hours off, as you wait for the silicone to cure enough to become waterproof. Once your two days of rest are over, test out the tank (for the love of Mike, don't wait until you've put the fish in to discover that the tank leaks) in the bathtub. Set your tank down on an old newspaper on top of a solid, flat surface in your bathtub. Fill the tank with water and wait. If nothing starts leaking, well bully for you. Ten hours or so later, check again: if the water level seems to be right where it always was and you see no water stains on the newspaper, then congratulations! It's a fish tank!

The tank is now, technically, ready to use. The adhesive needs another five days to become as strong as it's ever going to get, but in terms of being a watertight receptacle conducive for fishy life forms, your tank is a tank right now. You might, however, want to wait the week anyway, and a few days before the week is out apply silicone to all those sharp glass edges to make your MacQuarium just that much less of a silent implement of doom biding its time until its secret date with tragedy and more of a fun place to put fish. It's your call.

6 Outfitting the MacQuarium

You got the shell. You got the tank. Before we start tossing in fish willy-nilly, we have to buy some more junk, specifically, Everything Else.

Platform

As you may have guessed after hefting the completed tank in your hand

Remember these important steps after you heft the completed tank in your hand: • Use direct pressure to stop bleeding. • Hold area of laceration above head. • Press clean gauze into wound; add new gauze on top as old gauze becomes soaked with blood. • If tourniquet is necessary, apply directly over branch artery and add pressure slowly. Write exact time of tourniquet application directly on skin above tourniquet to aid medical personnel. • Keep talking and treat for shock if able.

As I was saying, it should occur to you that a small platform must be built to elevate the tank to its proper position. Early MacQuarium prototypes were tall, all-glass prototypes, but much like Alexander Graham Bell (who decided to leave the juicer attatchment off his telephone), this design element was abandoned. Cost of making the oddly-shaped side pieces was astronomical, plus it was very fiddly to construct and usually resulted in a leaky tank.

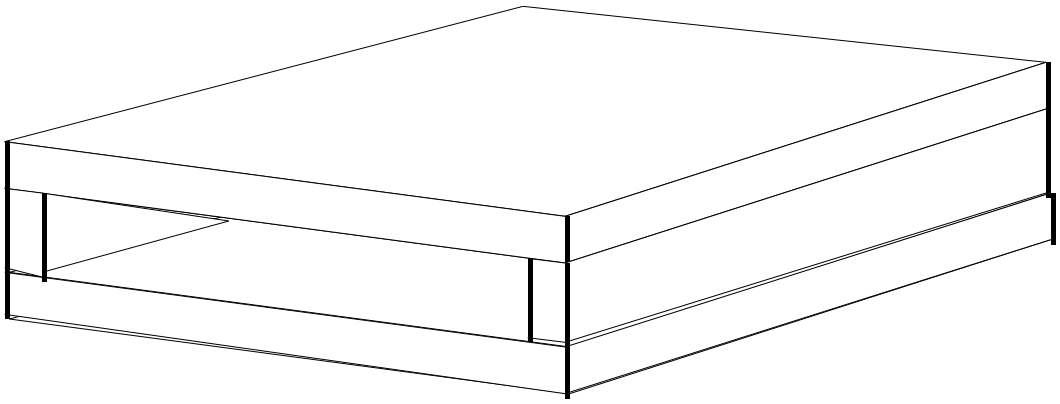
Good riddance. By setting the tank on a wooden platform, we save money and trouble, and also make it much easier to tweak the tank's position within the shell. All you need to do is build a platform of some sort, with the following dimensions:

Width: 8 1/2 ”

Height: 2 1/2 ” (exactly the same as 6 CD jewel boxes, by the way)

Depth: 7 1/2 ”

Actual design of the platform is unimportant, so long as the top is flat and solid. My platforms are built out of number two pine and look something like this:



It's very helpful to use a platform that has a hole of some sort all the way through its width; when you're setting up the MacQuarium you can pass a length of cord through the platform which can be used to pull the tank out as easily as you can push it in. You'll see what I mean a little later on.

Traditional Aquarium Junk

From the Macquarium-specific we move to the aquarium generic: if you're one of those people who want your fish to live, you're going to have to spend a good piece of change on some fundamental aquarium accessories:

Gravel	Provides an anchor base for installing fake plants and toys, also provides greater bottom surface area for friendly bacteria to grow. Also keeps the fish from freaking out in some way only icthyologists and other fish can understand. Ten pounds should do you fine. Available in several decorator colors.
Filter	Scrubs the water clean of tons of nasty things, such as uneaten food and the afterages of the food that was eaten. Small filters designed for goldfish bowls work best in the MacQuarium. The filter of choice would either be a small, spongelike filter that can be installed under the gravel, or a Penn-Plax cartridge filter that sticks to the wall of the tank with suction cups.
Air Pump	Constantly pumps new, fresh air into tank water, thus putting off the fishies' inevitable date with the Reaper as

much as possible. The air pump also goes into the filter and powers various action toys that work off air pressure. Pumps of about a dozen different power ratings are available; generally the second or third-least powerful pump in the store will work best with the MacQuarium.

Air Tubing — Clear plastic hose, needed to hook the pump up to all the things it has to be hooked up to.

Air Stone — This is a little porous stone you hook up to the air pump and bury under the gravel that generated a column or curtain of itty bitty bubbles. Looks way cool, also helps the fish.

Gang Valve — A multiplexor of sorts. It takes the output of the air pump and splits it into a number of nozzles whose flow can be regulated with a valve. A three-way valve will be just fine for the MacQuarium and will allow the installation of one air-powered toy in addition to the air stone and the filter.

Light — Kind of obvious. Penn Plax makes one called the Light & Warm which, when you saw off the little tab molded into the side of it, fits absolutely perfectly into the space on the shell once occupied by the handle. Other lights might fit, too, but be careful to get a good fit as it's an electrical device and really doesn't cotton to falling into water at all.

Check Valve — A little plastic valve you put in the air tube between the pump and the gang valve that prevents water from flowing from the tank through the hose to the pump, where it can cause an electrical short and from thence, in theory, a fire. Without one of these, you'd have to keep the pump above the water line, which is no fun.

Thermometer — The kind that stick-on are the best, and don't worry too much about getting one that's hyper-accurate. The point of the thermometer is to give you something to look at and worry over when it's the fourth day of 90 degree weather outside and you're curious about whether your fish will die soon or not.

Food — Any kind of flake food will do just fine, though some fish fanciers suggest buying some brine fish treats too, for variery. Honestly, I can't taste the difference at all.

Tap Water Conditioner — There's a lot of chemical nastiness in tap water – chlorine, metals, and the like – that are near-

instant death for your fish. Add a couple of drops of this liquid to the water while you're setting up the tank and all the nastiness will be neatralized.

pH Test Kit — In addition to the stuff in the water, the water itself can be hazardous to the fishies if it's too acidic or basic. A test kit is necessary to figure out what sort of water you're dealing with. If you find the tank water's too acidic or basic, a counteragent can be purchased that will raise or lower the pH a smidge as necessary.

Tchochkes — Okay, the plants give the tank ambiance, sure the action toys are fun, but they also promote healthy fish in that they give the fishies a place to hide when they're stressed out. You should have a plant in there, at the very least.

The one obvious aquarium gizmo I've left off this list is a tank heater. The thing is, they just don't make 'em small enough for a two-gallon tank like the MacQuarium, and so just about any heater you put in there will quickly result in a visit from Morpheus' elder sister, if you catch my drift, and even if you don't I could hardly be made to care less. I mean if you can't catch my references then it's your own lookout.

As you can guess, it's this category that eats the most out of the MacQuarium budget; expect to shell out at least twenty bucks for all these accessories, more if you have a penchant for extra toys and such.

7 Setting Up The MacQuarium

With all due respect to Guy Kawasaki, forget about all that “The Journey Is The Reward” crap; the journey is a long process of spending money and building stuff and the reward is a funky, unique MacQuarium housing your fishy friends. Right now, you’re a nine-iron away from being done. That is, a good tee shot put you on the fairway, you hit a gentle five-iron that put you in the rough about eighty yards away from the green, and a nice, precise nine iron will put you on the green with a two-putt left for par.

Be sure, however, to set up the tank slowly and deliberately. More than one MacQuarium has been lost because the installer rushed through things, and so far as fish in general are concerned omitting important steps in tank installation result in dead fish.

Check Components For Fit

First, fit all the major pieces together to make sure they all fit properly. Set the base halfway inside the shell, then set the tank atop the base, with their back edges lined up. Gently push the base backward, keeping it centered within the shell, until the face of the tank sticks out of the shell about a centimeter or so. Align the faceplate of the shell over the face of the tank. The tabs around the perimeter of the faceplate should fit nicely around the front of the tank. Gently push the faceplate and the tank backward until the faceplate is all the way in.

The key word to keep in mind when manipulating the tank is *gently*. If you failed to cut the handle basket away completely and the ceiling is therefore too low, it won’t take too much pressure on your part to crack the tank, and after all the work you put in it’d be a near-total bummer. If you do manage to create a vertical crack, though, all is not lost; paint over the crack inside and out with silicone adhesive, let cure, then test for watertightness once again.

If the faceplate just won’t go in completely, BACK OFF. Try flipping the base over or around. You might find that a slight warp in the wood makes the tank fit in flawlessly one way but not at all when the base is turned around. Above all, there should NEVER be any reason for you to use any force whatsoever in putting the MacQuarium together, dry.

The tank was designed with plenty of room for error. If you make a small mistake in measuring somewhere there’s probably enough “give” in the design that the tank will fit in anyway. If it doesn’t, you’ll just have to get out the file and chisel and scrape away whatever bits of the shell appear to be blocking the tank’s progress.

Once you've determined that the tank and base fit just fine, it's time to try out the light (if you've bought one). It's (probably) an electrical device and it's going to be quite near water, so you must be absolutely certain that wherever it's to be installed, it won't fall in the tank and cause trouble. The aforementioned Penn-Plax light will sit snugly in the handle well, the lamp below and a perimeter flange sitting above the case at all times, and even matches the original Mac Beige rather well. If the lamp is narrow enough to fall through the cutous, though, you MUST build a ledge for the light to sit in by gluing strips of plastic to the ceiling of the shell, providing an impeneterable lip inside the well that the light CAN'T slip through.

Please, folks, don't get yourselves killed over a MacQuarium!

Configure Tank

Now you're ready to start actually setting up the tank. Important information follows:

ONCE THE TANK HAS BEEN FILLED, IT CANNOT BE MOVED!

First, because it's way too heavy, second because the tank isn't strong enough to hold together while being jostled, fully loaded. So Step One is to select a permanent spot for the MacQuarium and move everything there. Once the tank is filled with water, the whole schmeer will weigh about thirty pounds, so make sure whatever the MacQuarium is to sit on can take the load. Also, allow for the possibility (however unlikely) of a Normal MacQuarium Nominal Transient, which is of course Nuke-speak for Complete and Total Failure. DON'T set the MacQuarium right above an expensive carpet! Set the shell in its final resting place. Put the empty tank on top of the pedestal close by.

Step Two is to wash your gravel. Out of the bag, the gravel is loaded with fine dust, which clouds water and kills fish. Dump the gravel in a deep bucket and run it under a strong faucet or hose for five or ten minutes, turning the gravel every now and then. Once it's all good and clean, you can put it in the tank. You want about two inches of gravel, sloping from back to front. This tends to promote good a good water current, and will cause your fish to favor the front of the tank.

Now to put in all the doo-dads that go in the MacQuarium floor. Well, not just yet, exactly. Since much of the stuff that goes in the floor needs to be hooked up to the pump, it's time to install the air system. Remember, the hose goes from the air pump to the gang valve, and from thence to the items in the tank. We won't bother with the air pump until we're almost finished, so we can just busy ourselves with the gang valve onward. Temporatily hang the gang valve off the back of the tank near the center, valves pointing

outward. For each item (air stone, filter, toy), cut a short length of air hose just long enough to reach from wherever you intend to put it, to the back of the aquarium, then up the back and into the gang valve. Connect each item to the gang valve this way, then embed the item into the gravel. On some lighter objects, you may want to try to wire a heavy object into the base to keep them from floating.

Here's what you should have at this point: the tank, on its pedestal near the MacQuarium's final resting place; two inches of clean gravel in the tank; the gang valve hanging off the back, with air hoses connected to the air-powered gizmos which have been embedded in the gravel. You should also install the non-air powered props, too (like a ceramic castle, a severed hand, etc.).

Stick the thermometer to the front of the tank, to the left of where the disk drive cutout will appear. This way the thermometer won't be visible but can be checked simply enough, by removing the front bezel.

Okay. Now you're ready to start filling the tank. BEFORE YOU DO, move the tank and pedestal into the shell. It's helpful to run a length of clothesline through the base at this point. When the tank is halfway in, you should have enough finger room to lift the gang valve off the tank and hook it onto the back of the case. Careful…lift too high and you'll disturb everything in the tank.

Adjusting the tank's proper position in the case is a fiddly job and moving the base and tank toward you is difficult without having that rope to pull on. As you did during the dry run, adjust the tank and pedestal so that the bezel fits cleanly in place and the front glass fits snugly against the monitor cutout. The simplest way to accomplish this is to keep the front of the tank jutting out of the case, then push the tank in (CAREFULLY and EMPTY) with the bezel over it. Again, if you're going to accidently break the tank at any point, it's probably going to happen right here so BE CAREFUL. You want to do most of your pushing and pulling on the BASE and not the tank. If necessary you can push the tank around a bit by putting your thumbs near the edges, but as always remember that the edges may be sharp.

With the tank and base shut up inside the tank, you may now fill the tank with water through the handle cutout. So as not to create big water currents that will disturb the gravel and the stuff embedded within, pour the water in through a length of wide tubing or pipe that ends just short of the bottom of the tank. Do not fill tank to the very top; stop when the water level is halfway up the monitor cutout (you may have to stick your hand in to make adjustments, and you don't want to displace water all over the desk). Check to see that all your tank stuff is still in place and carefully make adjustments if necessary. You may now fill the tank the rest of the way.

If everything has been built and installed to specification, you should be able to get the water level *just* high enough so that no waterline will be visible through the monitor cutout. Don't risk overfilling, though; a centimeter of dead air in the monitor is better than a centimeter of water on your desk!

Finally, hook up the air pump. You plug a short length of air hose to the pump itself, plug the check valve into the hose, then run a liberal amount of hose from the check valve to the gang valve. Make sure you install the gang valve in the right direction; the "point" should be away from the pump.

Plug in the pump. There's no on/off switch, so it'll start up immediately. Adjust each individual valve in the gang until each device hooked up thereto is getting a supply of air (that is, bubbles coming out of the filter and airstone, little pirate chest flaps up and down or whatever).

Okay! now nothing more than busy work. Let the system run for a couple of hours to let things settle down a bit, then add water conditioner as recommended in the package's directions. Test the pH according to package directions, and add pH-Up or pH-Down (available in small bottles) to bring the pH close to neutral 7. Better to err on the side of acidic rather than basic.

This is important: let the system sit for the rest of the day, to allow the water to assimilate thje chemicals you just dumped in and to reach room temperature. Do a final pH check and you're ready to add some fish!

Finally! Actual Fish!

I've waited until now to reveal the awful truth: the best sort of fish for the MacQuarium are goldfish. Goldfish are very hardy, and aren't as sensitive to temperature changes as tropical (read: Much more colorful and interesting) fish are. Goldfish are work horses, alove because they know how to live, dammit, while the flashier tropicals are lap dogs who'd keel over if you so much as looked at one funny. Good riddance to 'em. Goldfish are available in many different varieties, so it's not much of a loss.

The second awful truth is that, being a two-gallon tank, the MacQuarium cannot support huge, teeming schools of fish that one might hope for. The fewer fish you put in there, the healthier those fish will be. One goldfish of any reasonable size (non-leviathan) is just fine, two shouldn't cause any problems so long as they're not that big, but three is really pushing it. Start off with one fish, then add another in a week or two after the first has become acclimatized to its new environment.

The actual Adding The Fish procedure is simple. You'll take the fish home in a plastic bag. With most aquariums, you'd want to float the bag in the water to allow the fish to get used to the temperature change, then cut the bag away, but unfortunately there might not be room through the handle cutout for that. So long as the two water temperatures are reasonably close, there probably won't be a problem. The best solution, before buying the fish, is to set out a deep bowl of water nearby, allow it to reach room temp, then float the fish bag *there*. After a half hour or so, transfer the fish to the MacQuarium by cutting open the bag and pouring the fish in. Contrary to belief, this is much less stressful to the little dear than scooping it *out* of the water with a net and then dropping it in.

The leading cause of death in newly-added fish is the stress of the move. As such, keep the lights out for a day or so as the fish becomes used to the unfamiliar water. After a week or so, you may add a second fish.

8 A Vague Education on Elementary Fishery And the Upkeep of our Gilled and Scaled Brethren

Time to pay the piper. The respect, the admiration, the increased attention from all members of whatever appropriate target gender is for you;it all comes at a price, that is, the day to day and week to week upkeep of your finny friends.

Feeding

Goldfish should be fed twice a day. Give em a single shake of food in the morning, another shake at night. Dont overfeed em as that makes em go belly-up. Remember that youre feeding the *fish*, not the tank.

For variety, give em some brine shrimp every once in a while, perhaps as reward for performing a trick like fetching the paper or not appearing to be dead.

Lighting

Try to create an artificial sense of day and night if at all possible. Don't leave the light on all the time, as it does generate some heat and might result in your waking up one morning to find two gallons of chowder on your desktop.

And the worst part of 'em all;

Cleaning

Chop off the head and tail. With a shart filleting knife, make an incision behind the gills and slice longitudinally along the dorsal, following the backbone…oh, not *that* kind of cleaning, how silly of me.

The thing is, and it's an unpleasant thing, but hey this isn't for publication so I can say it, but nonetheless those of you with weaker constitutions may want to lash yourself around the neck or whatever it is you people do when about to face phrases like the following: fish live in their own toilets. Honestly, they're like pigs, only it takes much longer to fillet a pig. As such, unless you want to have a tank full of dense, smelly liquid (not to mention dead fish) clean your tank regularly.

For starters, change half the water in your tank every week. Dip or siphon it off and replace it with room-temperature water. When you've replaced the water, fill up another jug so by the time you next to a water change, you'll have some water of proper temp all set to go. Fail to do this and the water will become so polluted with the fishies' own waste that they'll learn how to float right quick.

Second, vacuum the gravel once a month. You can buy a simple siphon-like device which will such up all the residue that collects at the bottom of the tank (and believe me, until the tank ecosystem is firmly established, stuff will *collect*). Fail to do this and the residue will congeal into gunk, which is harder to remove and smells *awful*. Just plain horrible.

Third, every other month you should completely empty the tank, scrub it down with cloths and warm water (NO soap), and replace the gravel. It's a big job, and you'll have to keep your fish in the toilet bowl until you're done (joke), but it's worth it in terms of Having A Pleasant, Non-Smelly Tank For A Very Long Time.

For this and many more reasons, you might want to build a second, backup tank. Speaking personally, it's much simpler to have another, spotlessly clean MacQuarium all set up and ready to receive the transported fish, then take your time cleaning the first one.

Appendix: Abbreviated Directions

This appendix is here so you can have a concise step-by-step list of what you have to do right at your elbow once you're ready to do it. This appendix is NOT an alternative to reading the entire document; the list leaves out many small but crucial details that could very well spell disaster in eight different flavors.

1) Remove everything non-plastic from the Macintosh shell.

2) Remove the front bezel. File/saw down posts and fittings.

3) Saw out handle basket from back of shell. Smooth down rough edges.

4) Test glass for correct size and fit.

5) Assemble tank with silicone adhesive. Let stand at least 24 hours. Waterseal all interior edges with thick bead of silicone. Let stand at least 48 hours.

6) Build platform.

7) Test tank for leaks.

8) Test-fit tank and platform inside closed shell.

9) Wash gravel.

10) Move MacQuarium pieces to final resting place. Fill with gravel.

11) Attach air hoses to in-aquarium items. Plug hoses into gang valve.

12) Embed in-aquarium items in gravel.

13) Close up semi-configured tank and platform inside shell. Move gang valve to hang off back of shell.

14) Fill tank with water halfway. Check to see that aquarium items' placement hasn't been disturbed, then fill rest of way.

15) Connect air pump to check valve, check valve to gang valve, and plug in air pump. Adjust flow of air to individual items with valves.

16) Let system settle down, then add water conditioner, test and correct pH.

17) Let system rest for a day before adding fish one at a time.

COLOPHON

Each page in this document is a hand-painted 300 dpi bitmap executed by Andy Ihnatko in a process far to technical to describe here, but trust me it was pretty darn hard. The fonts Andy tried to mimic were Zapf Dingbats, Palatino, and Helvetica.