Fountain Pen Primer

someonesdad1@gmail.com

Revision History

Date	Revisions
19 Nov 2015	Edit to reduce size. Marked broken links as defunct. Updated things with better measurements.
4 Dec 2012	Initial release.

Document from https://someonesdad1.github.io/hobbyutil/project_list.html

Introduction

This document's goal is to provide information to help people get started using fountain pens, as well as put down a few things I've learned, thought of, or investigated. The situation can seem overly complicated to a newcomer.

Key terms are in **this font**. If I think something is especially important, I'll **emphasize it like this**.

What exactly is the lure of using fountain pens? Here are some reasons:

- **Ergonomic**: a good fountain pen on good paper affords one of the least tiring methods of doing a lot of writing.
- **Cheap**: you can buy inexpensive fountain pens and refill them many times.
- **Repairable**: you can get a fountain pen repaired if it breaks.
- **Choices**: there are many pens, inks, and prices to choose from.
- **Heirloom**: a fountain pen can become a family heirloom -- or you can use an old reconditioned fountain pen from 50 or more years ago. A fountain pen can outlast you.
- **Attractive writing**: a fountain pen's writing can exhibit appealing visual characteristics.
- **Customizable**: you can have a technician fine tune the writing characteristics of a fountain pen for your tastes.
- **Waterproof and archival**: you can find inks that will still be legible after getting the paper wet and have a neutral pH to avoid damaging the paper over the long term.
- **Lefties**: left-handed overwriters can find a pen and ink that they like writing with and that the ink dries quickly and doesn't smear.
- **Appearance**: some people with magpie tendencies find they love collecting (and using) fountain pens.
- **Fabricate your own**: if you're handy around the shop, you can make your own fountain pen and have a writing instrument nobody else has.
- **Unusual, personal, and expressive**: write a letter with a fountain pen to someone. Few people hand-write letters anymore compared to the days before email and cell phones.
- **Sensual**: making some personal notes in your journal or notebook on a cold winter day with snow coming down outside the window while you write can be quite pleasurable.
- **Care**: you may find that when you write with a fountain pen, you slow down and write with

more care and thought. It's similar to the effect many scientists know about when writing in a lab notebook -- maybe it's because since you know the information may be carefully read later, you spend extra effort thinking, composing, and writing now.

- **Community**: there are many other folks who share your interests.

I didn't bother including the reason of "novelty", as those of us who grew up using fountain pens don't consider them a novelty (people have been writing with sharp tips and a water-based dye for thousands of years). But many young folks today may have never seen or used a fountain pen, so to them it will be a novelty.

There are disadvantages to fountain pens too:

- You may or may not be able to make carbon/carbonless copies.
- Some inks don't play well with some papers or pens. Some pens don't write very well.
- Fountain pens are not as convenient as other pens because they require filling and cleaning. This may appear onerous to someone who's used to just tossing out a pen that no longer writes well and grabs another.
- Fiddling with fountain pens can lead to ink on your fingers.
- The ink may smear.
- Inks can bleed through paper, feather, and show through to the other side.
- YMMV: i.e., "your mileage may vary". This means you may not have the same experiences that someone else does -- fountain pen use is subjective and personal.
- A pen leak can coat you and your clothes with ink.

Tidbits

The four main players in writing with a fountain pen are **you**, the **nib**, the **ink**, and the **paper**. After you've used fountain pens for a while, you will find combinations that work well for you and use those a lot.

Subjective: The enjoyment of a fountain pen is a subjective experience composed of a variety of things such as how a pen writes for you, how you like holding and using it, how it looks, how smoothly it moves across the paper, and a number of other things that only you can define. Listen to others' opinions, but the decision on what to buy and use is ultimately yours, so get and use what makes you happy (it's a journey -- not a destination).

Fountain Pen Network (FPN) contains discussion on fountain pens, inks, and papers: http://www.fountainpennetwork.com/forum/. There's a lot of reading material and conflicting opinions, but you can learn a lot about fountain pens, inks, and paper there. There are also many blogs discussing fountain pens and their use.

Pricing: A common sentiment about fountain pen pricing is: up to roughly $150, you're paying for the **nib**; more and you're paying for the bling.

Expensive pens: More expensive pens aren't necessarily better. The true test of a fountain pen is how it writes for you on the papers you like to use and with the inks you like. If you're interested in expensive pens and the prestige you feel that is associated with them, that's fine too. But you may find that inexpensive pens can work nicely for you too. You pays your money and takes your choice.

Old pens: Some people purchase old fountain pens and recondition/repair them themselves or pay someone to do it. A good fountain pen with a good tip should have nearly unlimited life as long as replacement parts are available or can be made. There are numerous 50 to 100 year-old pens out there still being used.

Make your own: You can buy nib assemblies and make your own fountain pen.

Many vendors: Type "fountain pen" into a search engine and you'll find many places that sell fountain pens competing for your dollar.

Clean it: If you're not going to use a pen for a while (weeks or months or more), clean it. Virtually every used pen I've come across needed cleaning because the last user didn't clean it out. If you have an inked pen that has been sitting unused for some period of time, you should probably clean the thing out and store it (you can always put in fresh ink and start using it again). I can't recommend a specific period of time -- I've had pens that would dry out and be hard to start after sitting for a week and other pens that could sit for a month or two and take up right where they left off. If I had to suggest a time, I'd pick a week or two. You'll probably find that if you use your pens for a few minutes every few days, they'll work fine.

Smearing: Are you concerned about writing with a fountain pen, then having the ink smear if the writing gets wet? A quick test is to write a couple of words with the pen, then let things dry for an appropriate time (here, "appropriate" is your definition). Wet your finger and wipe it over the writing -- if it smears, you may have problems with the ink if the paper gets wet. You may then want to search out a suitable waterproof ink.

Rarity: In the last few decades, particularly since Internet marketing became popular, there has been an apparent large increase in the number of sellers and models of fountain pens and inks. Yet fountain pens are still a rarity compared to ballpoint, rollerball, and gel pens -- I'll go for many years between sightings of someone using a fountain pen.

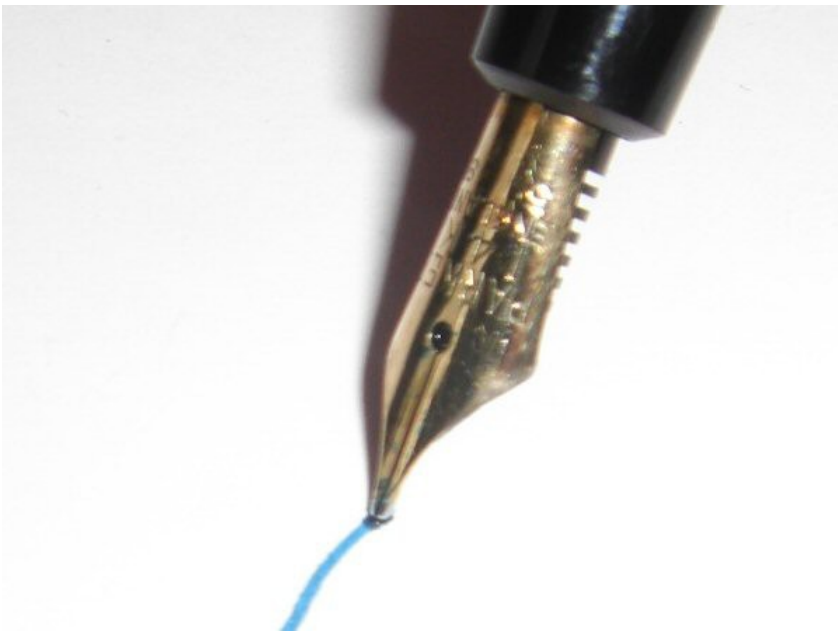
Pen

How a fountain pen works

Here's a description from about 100 years ago (11th edition of the *Encyclopedia Brittanica*, slightly edited for minor mistakes):

> *Various devices have been adopted in order to increase the time for which a pen can be used without a fresh supply of ink. These fall into two main classes. In one, the form of the nib itself is modified or some attachment is added to enlarge the ink capacity; in the other, which is by far the more important, the holder of the pen is utilized as a cistern or reservoir from which ink is supplied to the nib. Pens of the second class, which have the further advantage of being portable, are heard of under the name of "fountain inkhorns" or "fountain pens" so far back as the beginning of the 18th century, but it was not till a hundred years later that inventors applied themselves seriously to their construction. Joseph Bramah patented several plans; one was to employ a tube of silver or other metal so thin that it could be readily squeezed out of shape, the ink within it being thus forced out to the nib, and another was to fit the tube with a piston that could slide down the interior and thus eject ink. In modern fountain pens a feed bar conveys, by capillary action, a fresh supply of ink to replace that which has been left on the paper in the act of writing, means being also provided by which air can pass into the reservoir and fill the space left empty by the out-flowing ink.*

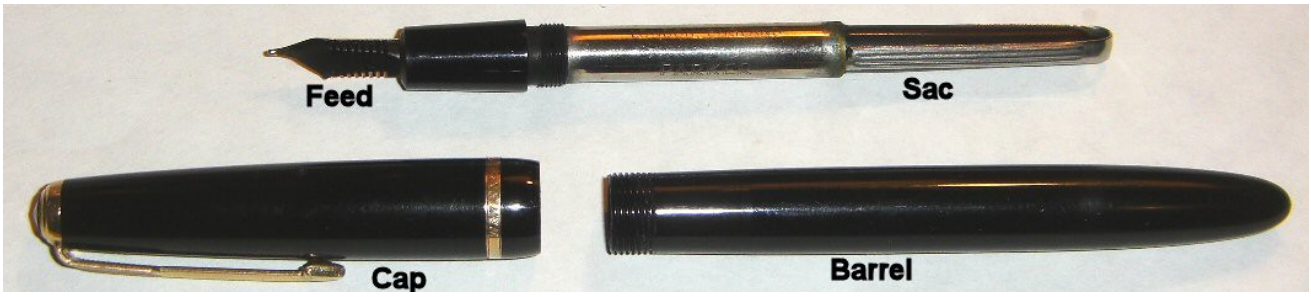
That captures the essence of the operation. Here's a picture of a pen in the process of writing:



I had to stop the pen long enough to hold the camera and take the picture with my other hand; you can see a small blob of ink under the nib starting to collect on the paper (this wicking onto the paper is especially severe on papers like newsprint). You can also see the sheen of liquid ink in the hole of the nib; under closer examination, you can also see ink in the slit in the nib. This is a time-tested design of getting ink to the where the nib is contacting the paper and leaving behind a trail of ink. The ink flows to the tip through the slit channel via capillary action.

Pen construction

For detailed pictures of various fountain pen construction types, see [*binder*]. I'll discuss the construction of a pen with a sac that holds the ink, as these are common and inexpensive pens. Here's a picture a Parker Slimline pen purchased new in 1958:



The ink reservoir (here, an elastomeric **sac** inside the metal squeeze mechanism at the top right) stores ink and lets it flow to the nib through the feed by capillary action (the metal pieces are squeezed to fill the pen and these metal pieces squeeze the rubber sac). The **feed** is usually a piece of plastic with numerous channels/ribs in it to store ink at the ready. There are channels in the feed that allow atmospheric pressure to equilibrate inside the pen as ink flows out of the pen into the feed. These were the fundamental advances made in the 1880's that ushered in the modern fountain pen. The millions of fountain pens made since then are just various engineering improvements over the original design. There have been few revolutionary advancements in the fountain pen since the early 1900's. Still, it took many years and design evolutions to reach good, reliable designs. Most of the engineering went into various methods of filling the pen and changing the appearance of the pen to make it visually attractive to buyers.

Here's a disassembled view of a Hero 616 pen. This is an inexpensive Chinese pen that looks similar to the Parker 51 pen.

These pens can be disassembled by unscrewing the sac assembly with respect to the nib's hood; it's a right-hand thread. I didn't flush all the (blue) ink out of the sac the last time I cleaned the pen. It can take some trial and error when reassembling the pen to get the nib aligned with the nib hood again.

The tip of the nib is what's in contact with the paper and is the heart of the pen. You can get decent writing abilities from cheap steel nibs that cost under a dollar up to precious metal nibs that cost hundreds of dollars. The nib, feed, and **section** assembly usually thread into the **barrel**. The **cap's** purpose is to protect the nib, provide a reasonable seal to minimize evaporation of ink, and contain any spilled ink drops from rough handling.

But don't be fooled by the apparent simplicity of the parts shown in the pictures. It took many years for reliable and robust designs to be developed. The pens we have today work with a variety of inks and can do so under fairly wide environmental variations.

The major ink storage methods in fountain pens are:

Sac A flexible **sac** holds the ink. The sac is squeezed by various means while the nib and feed are immersed in ink; the ink is drawn into the sac when you release the squeeze pressure. If you have a pen with a broken sac, it may be something you can fix yourself.

Cartridge A sealed plastic cartridge containing ink is dropped into the barrel. When the barrel is screwed to the section, a tube (the **nipple**) punctures the end of the cartridge, carrying ink to the feed through the tube. A common cartridge size is the international short cartridge; many vendors use proprietary cartridge sizes instead, trying to lock you into their products.

Cartridges can be replaced with **converters** which are small devices with an internal piston. Converters let you use bottled ink in a pen that takes cartridges.

Eyedropper The pen's ink storage is a cylindrical volume that is filled with ink. This design typically gives the greatest ink storage for a given pen. There are no moving parts. The seal that prevents ink from leaking needs to remain functional; otherwise, you'll quickly have an unpleasant experience with an ink leak.

Piston A **piston** in the barrel is moved with a screw; the piston allows ink to be sucked from a bottle into the ink storage chamber. Next to an eyedropper, this design can have the most ink storage.

Sacs have the advantage of being cheap and fairly easy to replace (you can buy replacement sacs on the web). These tend to be used in the lower cost pens. It can take a bit more work cleaning out

a pen with a sac to change ink colors compared to the other types (but it's not an onerous job). An opaque sac is a disadvantage, as you can't see how much ink is left in the pen (and similarly for a translucent sac if you can't remove the metal support around it).

Cartridges have obvious conveniences. They are easy to change. Many pens use the short international cartridge (about 38 mm long); some use the long international cartridge (about 73 mm long). Some pens that use the long cartridge can take one short cartridge backed up by another short cartridge as a spare in case you run out of ink. Sooner or later, you'll be busy and forget that your pen is low on ink; your spare allows you to quickly be writing again and provides a place to store the empty cartridge.

On a cost per unit volume of ink basis, cartridges are more expensive than bottled ink, so you pay for the privilege of using them (a short international cartridge contains about 0.75 ml of ink, so it's easy to calculate how much you're paying for ink per unit volume). **Example** (Jan 2016): a web store sells 16 Diamine short international cartridges for $8.5 for a unit ink cost of 71 cents per ml. The same store sells an 80 ml bottle of this ink for $17.5, or 22 cents per ml. Water can evaporate from the cartridge over periods of decades by permeating through the plastic, making you think the manufacturer didn't fill the cartridge properly (top it off with water to restore it).

Piston and eyedropper pens give you lots of ink storage. This is important to people who do a lot of writing and don't want to fill their pens all that often. These pens often have a transparent window that can let you see how much ink you have left. Example: a Platinum Preppy eyedropper conversion holds more than 4.5 ml of ink.

Some pens come in "demonstrator" models. Factories would make their salesmen special transparent demonstrator pens that showed off how the pen was constructed. These demonstrators became something customers wanted, so today you can find pen vendors who sell various demonstrator models.

Disposable pens

There are disposable fountain pens that can cost a few dollars each and prove to be a convenience. A well-known brand is the Pilot Varsity pen (called the V-pen outside the US) and they can be refilled pretty easily.

After you take one of these pens apart, you'll see that Pilot reduces the pen's ink capacity by blocking off the barrel just past the ink window. If that barrier wasn't there, the pen would hold about 75% more ink. This is obviously done to sell more pens. You can't drill the barrier out unless you're willing to plug the hole in the end of the barrel. I'd estimate the ink volume as a cylinder 40 mm long by 8 mm wide, or 2 ml. Contrast this to the international short ink cartridge; I've measured one of these cartridges will take 0.81 ml of water using a 1 ml syringe graduated in 0.01 ml. Thus, the Varsity gives you about 2.5 times as much writing as a cartridge. For comparison, the Platinum Preppy eyedropper conversion will hold a bit more than 4.5 ml.

> The Pilot Varsity 7-pen set on Amazon for about $13 gives you pens about $2 each and you can probably refill them a number of times (I don't know how long the main seal will last as the section is removed and replaced). Then your only other cost is the ink. The pens I have are marked M on the nib (indicating a medium size) and these write a 0.5 mm vertical line and a 0.4 mm horizontal line with Noodler's Heart of Darkness (about 0.3 mm using the tip upside down). Pens with fine points are available too.
>
> Some of the Varsity pens I've had have had a design flaw: it was possible to put the cap on accidentally in such a way that the nib caught on something in the cap and bent permanently the nib out of shape, destroying the pen. These particular pens were probably purchased in the late 1990's or early 2000's, so Pilot may have fixed this flaw. I believe I had a few Pilot Varsity pens I bought in the early 1980's and they were excellent pens and never had a problem.

You'll also occasionally find other brands of disposable pens. In the 1980's, a coworker was passing through Hong Kong and bought me a box of Hero pens for 80 cents apiece. This could be considered a disposable price, yet I'm still using some of those pens more than 30 years later.

Eyedropper conversions

Some pens can be converted to eyedropper pens (search the web for "eyedropper pen conversion"). For example, the Platinum Preppy pen is easily converted to an eyedropper pen by slipping a suitable o-ring over the threads of the section. Using Teflon tape on the threads to make a seal is not recommended because they are not tapered threads and do not seal like pipe threads. Tighten the barrel only enough to properly compress the o-ring. You will crack the plastic if you tighten things too much and that can lead to a leak.

The Platinum Preppy is an inexpensive pen (less than $5 each). The ones I have had wrote nicely. As an eyedropper pen, it will hold about 4.5 ml of ink (about 6 times as much as a short international cartridge). The o-ring seal works well if it's not overtightened. The ones I have had typically lasted for a few years of everyday use (the plastic eventually cracks and they leak). Thus, I consider them disposable pens (but keep the nibs, barrels, and caps for spares). The clear color makes it easier to tell when things have been cleaned properly. You can get extra fine (02), fine (03), and medium nibs (05). Different colors are available so you can identify the ink color in the pen. You can get marker, highlighter, and rollerball tips for them and interchange them with the fountain pen points. As an eyedropper pen, they have more than twice the ink capacity as a Pilot Varsity, but you can also refill a Pilot Varsity.

Some people convert other pens to eyedropper pens by coating the barrel's threads with silicone grease. This probably works (I haven't tried it), but I don't like it from an engineering standpoint. I prefer a proper elastomeric seal. I've never bothered putting silicone grease on the threads or o-ring in a Platinum Preppy conversion and I've never had a leak. It doesn't hurt to put a small amount of silicone grease on the o-ring, as it will help it seal better.

After filling, tilt the pen down and ink should flow into the feed and you can start writing (this may take a little time). If you're impatient, dip the nip into the ink you just loaded the pen with.

A quirk with eyedropper pens is that you may find you need to keep them fairly full of ink (say, more than 1/3 full). The reason is that a nearly empty pen has air that can be heated by your fingers; the air expands and can push a blob of ink into the feed, causing a drip. The cure is to keep the pen filled with ink. You can minimize this with a pen low on ink by holding the pen with the nib facing up for a short period to cause the air to expand without pushing ink out.

Buying a pen

If possible, buy a pen from a store that specializes in fountain pens, or at least is knowledgeable about them and will let you try the pen out. Usually they will let you dip the pen in some ink and write with it, but they typically don't allow the pen to be filled with ink (this turns it into a used pen). These stores will often have excellent paper to let you write on; this paper shows the pen off to its best advantages. If possible, bring your own paper to try the pen out on paper you use a lot. If you're a new buyer, this probably won't mean much to you, but if you've been using fountain pens, you'll know how your pens behave on different papers.

In the 1970's and before, it was common to be able to walk into nearly any drug store, stationery store, or college bookstore and find a reasonable selection of fountain pens. This is no longer the case and you'll find it harder to find places that sell pens -- but not impossible. If you are traveling to a large city, you may want to set some time aside to visit a fountain pen store.

Converters

The converter is a device that acts as a refillable cartridge. This lets you use bottled ink in pens that are designed to use cartridges. Here's a Schmidt converter (note the green ink remnants staining the left end of the clear plastic barrel):

When the straight-knurled black shaft on the right is turned with respect to the body of the converter, the piston moves up and down in the clear plastic barrel. There's a rubber seal on the piston that forms an ink-tight seal. This operates like a syringe, allowing liquid to be drawn into the converter. This particular converter appears to be composed of at least seven separate components. The converters I've measured have about the same volume as a short international cartridge (0.75 ml).

Typical converter retail costs range from $5 to $10. This probably means they cost well under $1 each to manufacture in high volume.

Converters range from good to awful. It is not uncommon to hear of people using a pen with a converter where the pen writes for a while, then the converter "vapor locks" so that ink won't flow to the feed/nib. This has to be fixed by the user by manual intervention, such as flicking the converter to get a bubble to move, turning the converter to force more ink into the feed, or filling the converter again. I've been lucky in not suffering this problem, so I can't give first-hand advice. I've read that one can try to flush out the converter's ink chamber, rinse it with some soapy water, then try again. If that doesn't work, then dip e.g. a paper clip in some soapy water and then dip the paper clip into the ink in the converter. Some converters put a small diameter helical spring in the ink chamber to help break the surface tension of the ink; you might try putting in a substitute to emulate this by using e.g. a fine nylon bristle that can be compressed by the plunger.

Nib

This is the heart of the pen and probably should be the first focus of your attention, assuming your greatest interest is in the pen as a writing device (if you're instead collecting pens, then you already know your criteria). You can get decent nibs on cheap Hero pens from China or spend hundreds of dollars on 14 or 18 carat gold nibs that have been **tuned** to your tastes by a **nibmeister**. There are lots of choices in between.

The high quality nibs use a hard alloy for the tip (typically made of iridium, ruthenium, or other metals from the platinum family of metals) that will stand up under the wear of writing on paper. Good nibs are also made from gold alloys to avoid corrosion from the inks (this is probably less relevant today than it was 50 to 100 years ago). One advantage of gold nibs (14K and above) is that they can be easier to repair if they get damaged (see http://www.nibs.com/beforeandafter.htm for some examples).

I only have a few pens with gold nibs on them; some of them are good and some are so-so. I also have cheap Chinese pens with steel nibs on them and some of these write quite well. They probably won't last as long as the expensive nibs; but, on the other hand, some of these pens cost me less than $1 each. I can throw a lot of $1 pens away from wear before reaching the same cost as a $200+ pen with a gold nib.

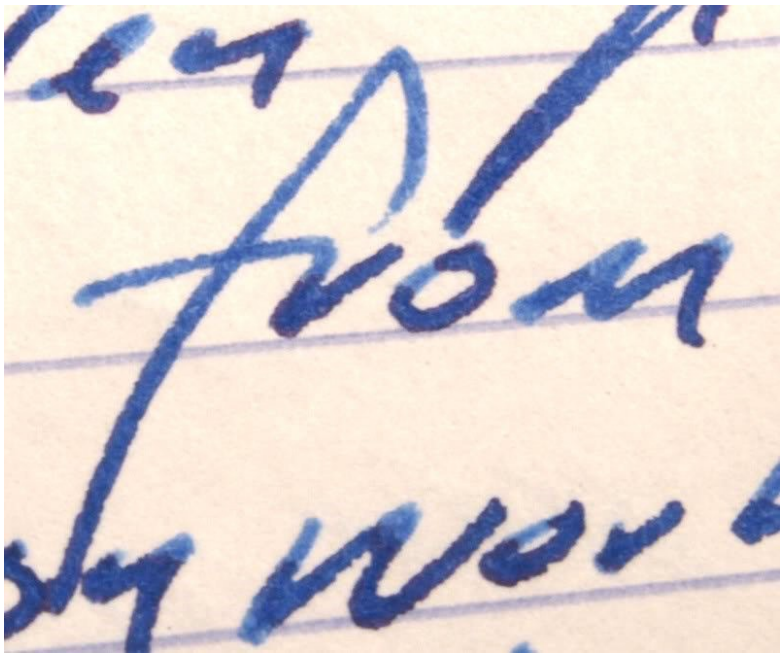
Be aware of a bit of creative lying by marketing people. You'll often see "Iridium point Germany" on pen tips from China. The innocent buyer thinks this means the whole point was made in Germany and, since some manufacturers in Germany have good reputations for making fountain pen points, it looks like the pen has a point made in Germany. But this may not be the case -- all it may mean is that the nib's tipping material was made in Germany -- and basically, the whole nib is fabricated in China. It's not a barefaced lie -- but it isn't the entire truth either; caveat emptor.

Some people with disposable cash and strong tastes in writing will work with nibmeisters to get a particular nib tuned to write the way they like. I've had one pen worked on in this way because I liked the pen that I wanted to have a little more flow (i.e., have it put a bit more ink on the page when I'm writing). I paid a guy in the southeast US around $20 including shipping to do this and was

satisfied with the results. As this is such a personal thing, I don't think you need to bother with such a thing for your first few pens -- get some experience with fountain pens before you make such decisions.

Nibs are graded by the line width they write, such as extra fine (XF), fine (F), medium (M), etc. Since there is no standard, you'll have to ask for guidance on exactly what the line width is. A flexible nib can produce a broader line if you press down harder. Japanese points tend to be finer for the same width grade as other pens. Line width varies with the type of paper and ink used too -- and the "flow" of the nib, meaning how much ink it puts on the paper while you stroke. Various customizations by the nibmeisters can produce a variety of effects and behaviors. For a beginner, the plain constant-width line of a stock pen is probably adequate. As you get more experience with fountain pens, you'll want to try the different types of nibs that are out there, both in width and type. There are obliques, italics, stubs, flex nibs, and other specialty nibs. I'll refer you to FPN and a bunch of reading for more information.

Some pen/ink/paper combinations can give a characteristic called **shading**; this is a variation in the density of the ink deposited on the page and gives fountain pen writing a characteristic flavor that other writing instruments don't have. Here's a picture of shading that came from FPN:



Shading is the variation in the saturation of the blue in from the top of the f to the bottom, as well in the other letters. You'll find some pen/ink/paper combinations shade more than others. You can also get more shading from more specialized points, such as italics and obliques (see the web for more information).

Testing a pen before you buy it can be quite important. You may have to go to a specialty store or pen show to do this; however, ask at the store that has a pen you're interested in. If you're serious about the pen, bring some innocuous ink like Waterman Florida Blue (renamed to Serenity Blue) and some of the paper you like to write on -- the store clerk might give you the opportunity to write with the pen by dipping. Even if the pen has a nib size rating like fine, medium, broad, etc., you won't know what the pen will write like until you try it. You'll also see variations due to the type of paper you use.

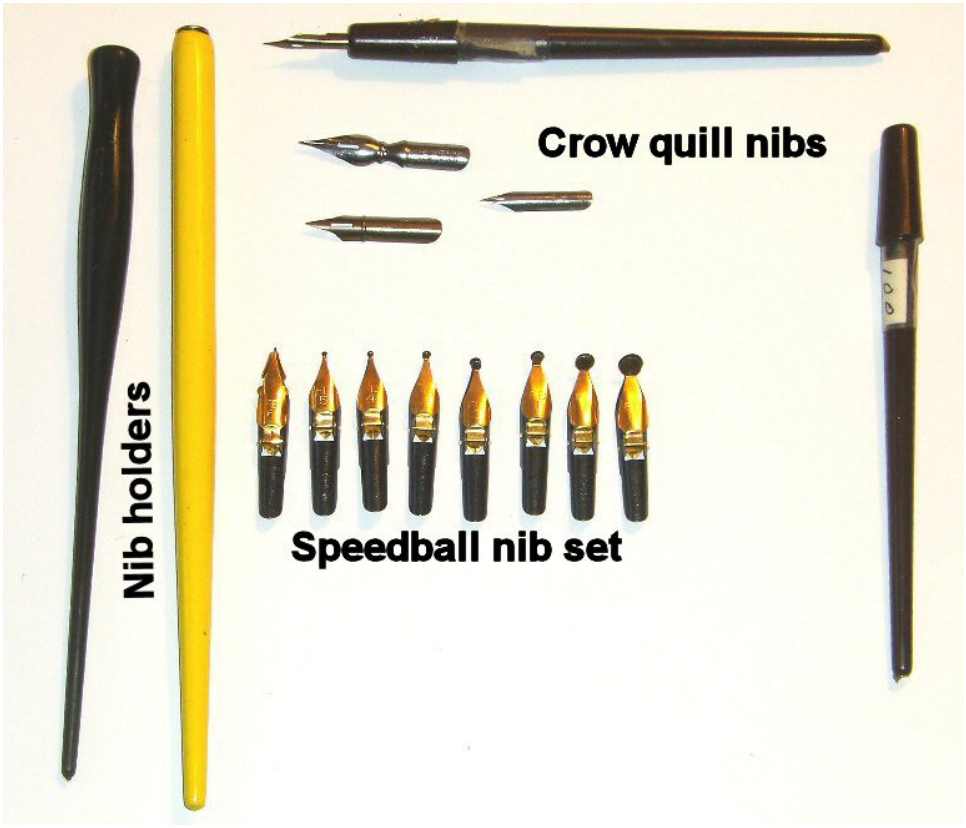
Some pens allow easy interchanging of points; Pelikan is one example. Other pens require more or less disassembly to change the point. If I did a lot of writing and wanted to do it with a single fountain pen, I'd consider a Pelikan pen and buy two or three different points for it. The Pilot Vanishing Point pen also allows readily-changed points (about $70 for a new point). One advantage of having multiple points is that you can be quickly writing again if you drop and damage a point. If I

had such a pen, I'd use a fine point for normal writing and calculations and a medium or broad point for writing letters.

Other nibs

You can buy inexpensive artist's nibs and handles at artist supply stores. These come in many different types and shapes. There's a PDF from Hunt on the web showing their Speedball nib styles and the types of lettering that you can do with them.

Here's a picture of some Hunt crow quill points (these are steel nibs, not feathers from a bird) and some Speedball nibs:



The yellow handle is 177 mm long. Eight Speedball nibs are shown lined up and are numbered from left to right as FB6, FB5, FB4, FB3, FB2, FB1, FB1/2, and FB0. The three nibs above them are crow quills, as is the one in the handle. The nibs are just pushed into the handle and pulled out when you want to change nibs. Handles are usually around a couple of dollars each and nibs can be $1 to $2 (or perhaps less if you buy a bunch at once). It wouldn't be hard to make a holder in the shop from a dowel if you have a lathe (drill out a hole and make a stepped-diameter piece that can be glued into the hole; you'll want to see a commercial nib holder if this doesn't make sense).

The nib just below the holder/nib at the top is a Hunt #512 extra fine bowl point. This point *almost* lets you write like you can with a fountain pen (but it is a "wet" nib in that it puts more ink on the paper than my fountain pens do). The crow quill pens are primarily for artists drawing lines and they can vary the line width by the pressure on the nib. These nibs don't write well unless you pull the nib towards you. They tend to be favored by artists for pen and ink drawings.

For a fountain pen user, the Speedball FB5 and FB6 nibs are useful in that they can show you *approximately* what an ink with a fountain pen will write like. The FB6 is roughly equivalent to a fountain pen fine point and the FB5 will be more like what a broad fountain pen nib will write.

Another type of nib is a glass pen. These are pens fabricated from glass; an advantage of glass is that none of the ink will stain or stick to the pen, as it will be easy to clean off (this assumes the ink

doesn't have e.g. shellac in it). I haven't used a glass pen, but if I was doing a lot of ink testing, I might try one out. However, the typical glass pens cost $15-$20 or more and the artist nibs can cost an order of magnitude less, so if you want to save a bit money, go with the artist nibs. If you only test inks occasionally, I recommend you use a toothpick and a holder (see *Testing inks*) because it's low cost and can show you things about an ink that you can't see easily with other tools.

Cap/body

There are two ways of writing: capped and uncapped. This means you either leave the cap off the pen while you write or you "post" the cap on the other end of the pen to store it while you're writing. Owners of expensive pens will sometimes not post their caps because this can scratch the end of the barrel and reduce the value of the pen. Other people don't care and post away. Some folks decide whether to post or not by the pen's mass and center of gravity.

There are two basic cap types: friction-fit and threaded. Choices are personal and the majority of pens I've owned are friction-fit. I always thought I'd prefer a threaded cap, but you'll find that they're a little bit more work each time you want to use the pen. If you do a lot of "jot a simple thing and put the pen back", then you may find the slight extra work of unscrewing the cap annoying. If you pull the pen out to do a significant amount of writing, the time to unscrew the cap is probably irrelevant.

One characteristic of not posting the cap is that some pens will be either too short in your hand for your tastes, too light, or they won't have the right balance.

There's one special design of pen that doesn't have a cap: the Pilot Vanishing Point pen. I discuss this pen below.

Pocket clip

The pen's pocket clip can be important to some folks. When I was working, I'd carry a fountain pen in my shirt pocket and I wanted the thing to clip securely in place, but lightly enough to not damage the shirt. The clip must be smooth enough to not catch on fine denier fabrics. If you're buying a pen, the only way to tell (besides trying it out) is to use an eye loupe and examine the clip in a good light. Some cheap pens have nearly unusable clips in that they take way too much force to clip into a shirt. Considering that a heavy pen user might pull their pen out of their pocket and replace it 50 to 100 times in a day, this seemingly trivial thing can be worth worrying about.

Vanishing Point Pen

Pilot makes an interesting pen called the Vanishing Point Pen. It has a fountain pen tip, but a push-button on the pen causes the nib to retract into the body or extend for writing. I find this alluring, especially because I rarely write for long periods of time anymore. Rather, I grab a pen, make a few notes, then put the pen back. Doing this many times exacerbates the "fixed cost" of pulling a cap off (especially a threaded cap), posting it, then putting it back on when you're finished. It would be much easier to just click the pen like a retractable ball point and start writing.

Here's a picture with the nib extended on the left:

Note the clip right above the point on the left. This has me a bit concerned, as it may be that this interferes with the feel of the pen while writing (I've never held one of these pens). The pen is 30 g. It can be used either with Pilot cartridges or a converter.

Refilling other pens

Some disposable pens can be refilled if you can figure out how to get them apart. Here are some examples.

Pilot Varsity: I had a Pilot Varsity that quit writing, so I pulled the section out (use parallel plier jaws with no serrations if possible). I soaked the nib overnight in 5 ml of water with 10 drops of ammonia, then flushed it out with my syringe/rubber tip. I filled it with ink and pushed the section back in until it clicked (this requires a fair bit of force). You know it's correctly seated when the section is about 1 mm below the plastic barrel's lip.

Staedtler Liquid 7 roller ball: These can be taken apart by pulling the rollerball/feed assembly out. I rinsed the parts out with water (the center wick took a bit of effort) and refilled it with fountain pen ink. Flushing/cleaning took a fair bit of time, but the pen wrote for 6-7 years after that refill.

Others: Some pens have plastic caps on the back that can be pulled off (e.g., Faber-Castell Pitt brush pens, Pigma Micron pens). Inside you'll see a plastic fibrous reservoir that can be pulled out and the ink flushed out (also flush the tip). Let dry to avoid diluting the replacement ink, then fill the reservoir with fountain pen ink (I used an 18 gauge needle in a syringe to fill the reservoir from both ends); dip the tip into the ink too. Reassemble and your pen should be working again.

Three of my Pigma Micron pens were nearly dried out; pulling the cap off and putting 9 drops of distilled water into each pen revived them; this is an easy way to get a dry writer going again. When they run dry again, I'll flush them out and refill them with Heart of Darkness ink.

Ink

Fountain pen ink is special in that it will never clog a pen in normal use with proper maintenance. Never use an ink like India ink or technical drawing ink in a fountain pen -- these inks can clog and ruin the pen. None of the quality fountain pen inks will harm a pen (as long as you occasionally give the pen a good cleaning), although some can stain the pen's materials.

Another ink to be wary of is an iron gall ink because it may have an unfriendly-pH to your pen. When just starting out, I suggest you stick with modern inks made for fountain pens from one of the many well-known manufacturers. Note there are a few inks that may be problematic in some pens; you can do a search on FPN to learn more.

These modern inks are basically dyes dissolved in water. Other additives are used in small quantities to change the viscosity or flow properties, reduce the possibility of crud growing in your ink, or surfactants to improve writing properties.

Buffers may be added to control the pH of the ink. An acid pH is a no-no for long term archival writing, as it can lead to damaged or destroyed paper over decades or centuries. You've no doubt read that acid-free paper is desirable for archival purposes; thus, you want an acid-free ink for the same reason.

It's easy to go overboard and buy lots of inks. I have over 50 different samples of ink that I've traded with people I found on the web -- and probably half of them are still untried. I would hazard a guess that most bottled ink purchased never gets used.

The web is another source of information on inks, but you'll find thousands of pages. One of the problems with online photos is reproducing the exact color of a specific ink on a given paper -- given the various challenges with digital scanners/cameras, light sources, and computer monitors. Thus, realize that what you see on your monitor will only be an approximation of what you'll see for real on paper after writing with that ink. My experience is:

> **That ink you're so interested in because you like the looks of what another person got and posted on line will almost certainly look different when used in your pens on the paper you use.**

Some businesses sell small samples of various inks (do a web search for "fountain pen ink samples"). This is convenient because it can allow you to try out a candidate ink without buying a whole bottle. There are FPN members who sells samples besides the commercial stores and you

may be able to find folks on FPN who are willing to trade inks.

If you get interested in inks, I suggest you study the ink reviews on FPN and elsewhere. You will find many opinions and you'll occasionally get led to uses that probably hadn't occurred to you. As an example, I could never quite see the purpose of a gray ink. Then I tried Noodler's Lexington Gray and Sailor Gray in a fine point Hero 616 and they write surprisingly like a pencil -- which may be desirable.

Typical inks are $8 to $15 per bottle (more expensive inks can be $20-$35 per bottle) and there are many, many inks to choose from. Typical volumes of ink per bottle are 30 ml (1 fluid ounce) to 130 ml (4.5 fluid ounces). There is a huge selection of colors available. Two advantages of buying bottled inks are 1) you can get inks that aren't in cartridges and 2) you can mix them to get colors you can't buy.

Before rushing out and buying a particular ink, I recommend you spend some time researching that ink's properties and people's reviews on the web. You'll usually find lots of opinions -- and reading enough of them can give you a feel for how well that ink might work for you. As is typical for the web, you'll often find some text extolling the virtues of the ink, then find a totally contrary opinion farther down the page.

Some inks are touted as fast drying. This may be important for some left-handed over-writers whose hands would otherwise smear the ink. Private Reserve sells some quick drying inks and some Noodler's inks are known to be quick drying. I've used Swisher's North Sea Blue ink and it dries nearly instantaneously, but (as mentioned), Swisher's is out of business (I've read that Noodler's made Swisher's ink, so there may be a Noodler's ink with similar properties available). The type of paper you write on also has a strong bearing on how fast ink will dry on it (here, "dry" means that the ink won't smear, not that the water in the ink has evaporated).

If you have a pen that doesn't put much ink on the page, there are some inks that are known to flow quite well from the pen and may improve performance of that pen. One is Private Reserve's Tanzanite, a purple ink that, according to some, almost gushes from your pen (it is sometimes described as the "ex-lax[1] of inks"). I've tried it and it has worked well in the pens I used it in. I've read that Private Reserve's Ultra Black can flow so much that it is not usable with pens with broader nibs. Thus, if you have a nib with a fine point that doesn't put enough ink on the page for your tastes, try one of these inks.

Another trick to increase flow is to dilute some dishwashing soap, then add a drop of the diluted soap to a small quantity of the ink (do it in a small container of ink not your whole bottle -- and keep notes on how much you use). This may help the ink to flow better from your dry pen.

Not all ink/pen/paper combinations work well together -- there's a lot of variability. Thus, if a pen and an ink aren't working well for you, try a new ink or change the pen. Also change the paper if possible. If you experiment and keep good records, you'll find what works well for you.

If you're worried about an address on an envelope getting wet and smearing, you can use the old dodge of rubbing a candle over it to make it more water-resistant. I've read about a wax product called Microglaze that is rubbed over writing and waterproofs it, but I haven't tried it. Artists have fixative sprays that can be used or you can use an acrylic spray like Krylon (I've used Krylon to waterproof paper so it can be put out in the weather -- spray both sides[2]). In a pinch, put a piece of transparent tape like packing tape over the writing. Finally, the best solution is probably to use a waterproof ink in the first place (e.g., something like Noodler's black) -- or use a dip pen and India ink or a rollerball known to have waterproof ink.

Ink makers tend to be small businesses (fountain pen ink sells to a tiny market) and may even be a single person or a family-owned business. Since people do the formulating and mixing of materials,

1 That's the way it's written and spelled; it's a registered trademark of Novartis.

2 But be aware that the solvents in it might dissolve the polystyrene in typical laser printer toners, so test it first -- and then put on multiple light coats rather than one heavy coat.

mistakes and variations happen. I don't use enough ink to notice, but I've read that others have experienced differences in formulations over time or in different batches of ink. Thus, be aware that this can happen. If you find an ink you truly love, you may want to buy a larger batch of it to be sure you have enough over time. Most of us don't have access to a chemistry lab with expensive equipment, so we won't be able to evaluate the inks quantitatively -- we just have to put it in a pen and write with it.

I've never had an ink get moldy or scummy, but I've read of it happening to people. If this happens to you, I recommend tossing the ink out. If you want to reuse the bottle, I'd recommend a thorough cleaning with boiling water and a bleach to make sure you've removed all the traces of the mold or scum (don't forget to clean the cap too). Since the spores probably came from the air, you may have the same problem with more of the same ink. Thus, the only solution may be to not use that ink anymore or store the ink in the refrigerator to retard mold growth -- or even consider finding a suitable small amount of a bacterial growth inhibitor (do some web research to find out what might be useful to use).

Toothpicks, swabs, etc. used to put ink onto paper will only give you a rough idea of what a particular ink will look like when you put it into a particular pen. Unfortunately, the only way to really know what a particular ink will look like when written from a pen is to try it out. Because of this, you may want to try the ink samples from various vendors before committing to a whole bottle.

Another characteristic of ink is its archival qualities. This is determined by the ink's lack of an acid pH as well as its ability to remain readable for decades to centuries, especially after being exposed to chemicals in the air and UV light. If such things are important to you, you can research such things on the web. Perhaps contrary to intuition, a good pencil mark can provide quite good archival qualities as long as it isn't erased or damaged by chemicals.

You can use bottled ink or cartridge ink. Though cartridge ink is more expensive per unit volume, it can be a convenience because all you do is drop the cartridge into the pen, screw the barrel closed, and start writing. But cartridges don't hold much ink (one clue is that you virtually never see the manufacturers state an ink volume on the package).

Reusing ink

One thing you'll find if you acquire a number of inks is that you'll want to try them in different pens. What usually happens is you've seen enough of the writing of one particular pen and want to see that pen with a different ink. Should you squirt the unused ink back into the bottle or dispose of the ink down the drain?

Personally, I just squirt the remaining ink in the pen back into the bottle it came from, clean the pen thoroughly, and switch to the new ink. But I must be positive I know which ink it is; if there's any uncertainty, then I flush it down the drain. This practice has worked fine for me for many years.

I keep a document that shows which ink is in which pen; this helps reduce mistakes.

Other people feel you should flush the ink down the drain and not put it back into the bottle because of the risk of contaminating the bottle. Unless the pen is actively breaking down or corroding, I doubt that anything is going back into the bottle that didn't come out of it. But, it's your decision and you may want to play it safe.

Instead of putting the ink back in the bottle, some people keep one or more "graveyard bottles" of ink that collects the remnant ink. Then when they want to play with a big wet Speedball nib or a brush (or let the kids use some ink), they've got something they don't mind using because otherwise it would have been disposed of.

If instead you have a partially used cartridge that you want to save, you need to seal it. Commonly-used methods are to put a piece of plastic (e.g. from a zip-lock bag) over the end and fix it in place with a rubber band or seal the hole with a dab of hot-melt glue. Or, use a syringe to extract the remaining ink and save it in a small bottle.

Another argument for dumping the ink over saving it is if you're prone to grabbing the wrong bottle. Putting a different ink into a bottle is an unplanned mixing experiment and you will have just contaminated a whole bottle.

Permanence: waterproof, archival, etc.

Sometimes people want inks that are "permanent". The term "permanent" needs to be defined: permanent with regards to what?

Common attributes of permanency can be waterproofness, resistance to fading from UV light, pH-neutrality to avoid damaging paper over long periods of time, and resistance to forgery attacks.

It is not uncommon for a person to document something in writing, then find that documentation damaged or destroyed years later because something spilled on the writing or chemically attacked it. Then the need for a permanent ink is obvious. The time to think about permanency is when you're doing the writing or before. A key question to ask is "What it will cost if that information is lost?"

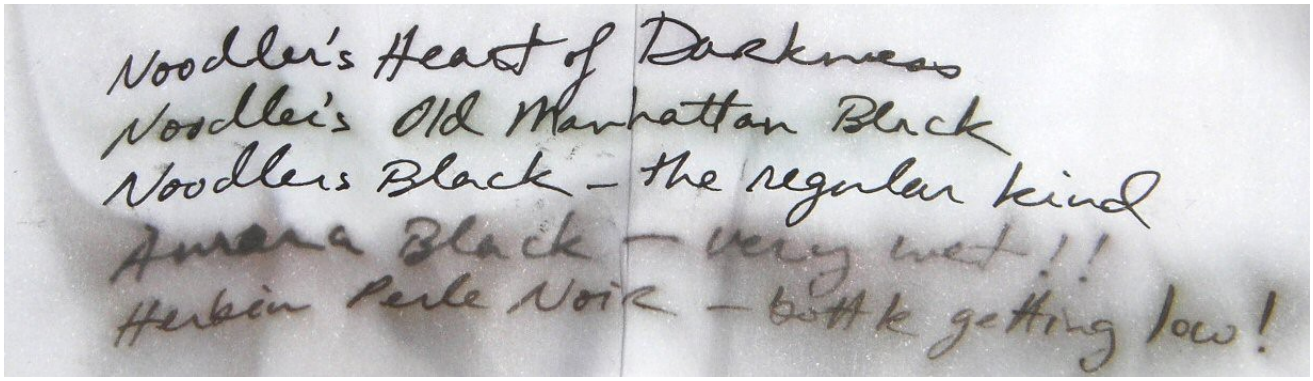
You should do your own testing with the inks and papers you plan to use; this will force you to define what permanent means to you. Some factors to consider in this permanence definition:

- Water: very humid environment, a few drops of rain in walking to the mailbox, spilling a glass of water or coffee on the paper, long-term soaking.
- Other chemicals: solids, liquids, and vapors.
  - Example: a lab notebook in a chemistry lab could be exposed to chemicals that might damage the writing over time.
  - The adhesive in transparent tapes can damage writing or printing: I have seen computer printouts and pen writing samples from decades ago that have disappeared completely under some transparent tape, but the printing/writing not under the tape was fine (this routinely happened with most thermal printing paper -- and I found out about it by data in lab notebooks disappearing).
- Abnormal temperatures
- IR, visible, and UV light (for the physicists, perhaps other radiations/particles)
- Forgery attempts
- Abrasion
- Archival: pH neutral and the writing lasts for an indefinite period of time.

For archival purposes, you may want to do some research on what's appropriate (ask librarians, museum curators, archaeological conservators, chemists, etc.). Iron gall inks, Diamine's Registrar's ink, Chesterfield Archival Vault Permanent Black, and other choices could be appropriate.

> Noodler's "bulletproof" inks bond with the cellulose in the paper, meaning the ink can't be removed without damaging the paper. Don't assume this means these inks are also archival in the sense desired by librarians, where the written word must survive centuries exposed to oxygen and other atmospheric gases/contaminants. Noodler's ink has only been available for a short period of time compared to centuries, so no one really knows what will happen to it over the long term.

Here's an example test for waterproofness I did for this document using five black inks (in order from top to bottom: Noodler's Heart of Darkness, Noodler's Old Manhattan Black, Noodler's Black, Aurora Black, and Herbin Perle Noire) after soaking in water for 10 hours:



I used a Hunt 512 nib to write with; this nib puts a fair bit of ink on the page. The Aurora ink wrote especially wet (lots of ink on the page); this resulted in a goodly amount of ink lifting off the page as soon as I dunked the paper in the water. I would label the Aurora Black and Perle Noire (I misspelled "Noire" in the picture) as water-resistant, but not quite in the same class as the Noodler's inks. Here, by water-resistant, I mean that I can still read the writing after the dunking. All of these inks are fine blacks and I don't hesitate to use them.

You've probably heard about how ballpoint pen inks can be washed from paper by solvents like acetone. Some of the inks being sold are claimed to be resistant to the attacks like this that a forger might use. The appearance of some inks on paper may be modified by such treatments, but still legible -- this tells you the ink was attacked but the writing would still be readable.

> I use permanent inks or pencil in my lab notebooks because the information being written was probably expensive to obtain (e.g., from an experiment or lots of thinking) and I want myself or others to be able to read that information, possibly many decades later.
>
> Pencil is stable if it isn't erased. There are indelible pencils that contain silver nitrate or copy pencils that contain an aniline dye that e.g. turns purple if the writing gets wet (and they don't smudge). I like to use a General #555 layout pencil; it has a soft lead like a 6B pencil, so it puts down a dark line, but it doesn't break as easily as a 6B lead.
>
> Note that acetone can remove pencil marks. I sometimes use pencil to mark metal for cutting and the marks easily wipe off with a little acetone on a paper towel. You can also experiment if some pencil writing on paper can be wiped off with acetone and a paper towel.

Specialty inks

Noodler's makes some Polar inks that are intended to be used to write in temperatures down to -20 °F (-28 °C) or lower; these are temperatures where other inks would freeze solid. These would be good for people who have to write outside in winter conditions or order an ink in the winter that might sit in a mailbox overnight.

There are scented inks on the market; J. Herbin is one vendor. The scents they offer are rose, orange, lavender, apple and violets.

Noodler's makes an ink called Blue Ghost that writes invisibly in room light, but fluoresces under UV and blue light. It's a bulletproof ink, so once it has bonded with the cellulose in the paper, it's permanent. This could be used for some fun playing around with secret writing with the kids or grandkids. Noodler's Russian series of inks are also fluorescent.

Other inks are iron gall inks intended for permanence; Diamine's Registrar's ink is an example. You can also find recipes on the web for gall ink you can make yourself. You can also find web pages that tell you how to make ink from walnut hulls.

Ink bottles

All the bottles of fountain pen ink I've purchased from ink manufacturers have been made from glass. The reasons for this probably are that glass bottles can be inexpensive in high volumes, the

bottle's material won't react with the ink, and the ink won't dry out (assuming the cap seal stays tight). If you're working around concrete or other hard floors, you'll want to be careful, as a dropped and broken bottle of ink is going to be a royal pain in the neck, especially if it splashes over things (some inks can be hard or impossible to remove). One thing I recommend you do is be fastidious about keeping the threads of both the bottle and cap clean to avoid them getting stuck together (I also lubricate the threads with a small amount of silicone grease). Another less obvious problem of ink on the threads is that the ink can dry, leading to small flakes of ink getting on things when you unscrew the cap. These tiny flakes may be difficult to see when they fall off after opening a cap, but become very obvious after they get wet and cause a stain.

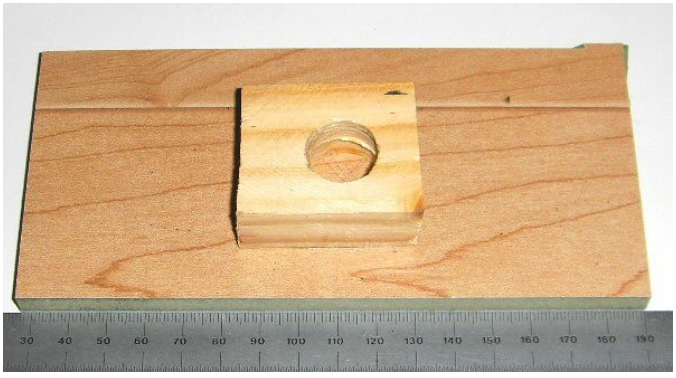
Look for an ink bottle shape that makes it easy to fill your pens. Some of these have side wells or a tapered bottom to help you get most of the ink out of the bottle.

When using bottled ink, you can be away from the bottle and run out of ink. The risk of this can be lowered by having a pen with a large reservoir of ink (e.g. a piston pen or eyedropper pen). Another approach is to take the bottle with you, but it risks getting broken. If you're willing to spend $80-$90, you can buy a Visconti ink pot. Personally, I'd use the ink sample bottles mentioned next.

You can buy ink sample bottles that will hold 5-7 ml of ink:

They can easily be mailed in a padded envelope. These bottles have volume graduations and a tapered bottom, probably intended for pipettes. I've never had one leak that was securely tightened and they work well to send ink through the mail.

If you get such sample bottles, you'll want to make a holder to reduce the chance of an ink spill when filling pens; here's a simple one made from scrap wood (a chunk of flooring and a cutoff from ripping a 2x4) in my shop and some Duco cement:



In a pinch, other things can work, such as a Crescent wrench, a small C-clamp, a machinist's clamp, or a pair of pliers with a rubber band holding the jaws closed. You'll find these plastic bottles are easy to tip over, so I recommend making a holder -- otherwise, it's probably only a matter of time until there's an ink spill.

Another source for ink bottles can be old pill bottles. Test them first to assure yourself that the lids are waterproof.

Mixing inks

Should you mix inks? Some people say yes, others say no. You can do some research on FPN about this topic and make up your own mind. I've mixed a few inks and had good luck at it; I tend to want to mix only inks that come from the same vendor (but I have no hard data to support whether this is a good practice or not). Some people have reported reactions between different brands of ink when mixed. Obviously, you should be on the lookout for such things when you mix inks. You experiment at your own risk (and your pens' risk); this could be an area where it could be smart to rely on other people's experiences. Platinum and Private Reserve sell ink mixing kits.

For experimenting, use a small syringe or disposable pipette (say, 1 to 3 ml total) and use it to mix measured volumes of ink into a container. Then your experiment will only involve a few ml of ink. If you like the results, it's easy to make a larger batch if you're careful to write down the volumes of the components. While you can of course use one of your regular pens for testing (just dip the nib in, don't fill the pen), it may be more convenient to use a dip nib or glass pen.

It's easy to go overboard in mixing -- and you usually wind up with a brown sludge. Go cautiously, test often, and keep good notes.

Another method of modifying an ink is through dilution with water. I have one particular ink I like to use in a particular pen and I dilute this ink 50:50 with water.

An interesting "color wheel" was posted to FPN a number of years ago (I can't attribute it because I can't find it again, but it might have been here; here's a location that apparently copied the original file); it used three Noodlers inks as primary colors and gave mixing proportions to get a variety of colors. The magenta was Shah's Rose, the yellow was Yellow, and the cyan was Navajo Turquoise:

Name	Yellow	Magenta	Cyan
Yellow	1		
Yellow yellow orange	15	1	
Yellow orange	3	1	
Orange yellow orange	5	3	
Orange	2	5	
Orange red orange	1	4	
Red orange	1	7	
Red red orange	1	12	
Red (magenta)		1	
Red red violet		40	1
Red violet		15	1
Violet red violet		7	1
Violet		5	2
Violet blue violet		1	2
Blue violet		1	4
Blue violet blue		1	10
Blue (cyan)			1
Blue blue green	1		20
Blue green	1		10
Green blue green	1		5
Green	2		3
Green yellow green	2		1
Yellow green	6		1
Yellow yellow green	30		1

Testing inks

I keep some wooden toothpicks in my ink box and use those to dip into the ink and write with (also see the *Other nibs* section above). If you want to get fancy, drill a hole in the end of a wooden dowel of suitable diameter (I used a 10 mm diameter dowel). Break a toothpick in half, insert the toothpick

half in the hole, dip the tip and start writing. This makes a crude pen that lets you test the just-mixed ink (you'll have to dip it frequently, but you can write with it like a pen until the tip dulls). In fact, one of the things you'll find when you make such a "pen" is that it will dry up when you're writing with it and you'll see how the ink behaves when it's written very wet vs. very dry. Another holder for these toothpicks is a 2 mm drafting lead holder.

Here's an example using a toothpick pen with some blue inks I have:

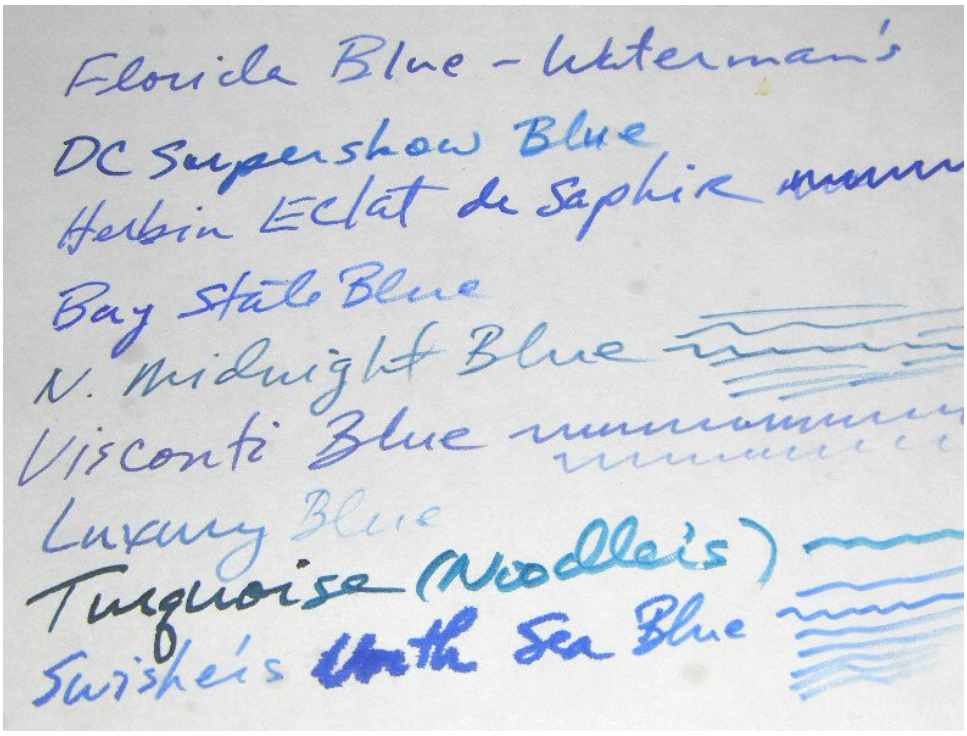
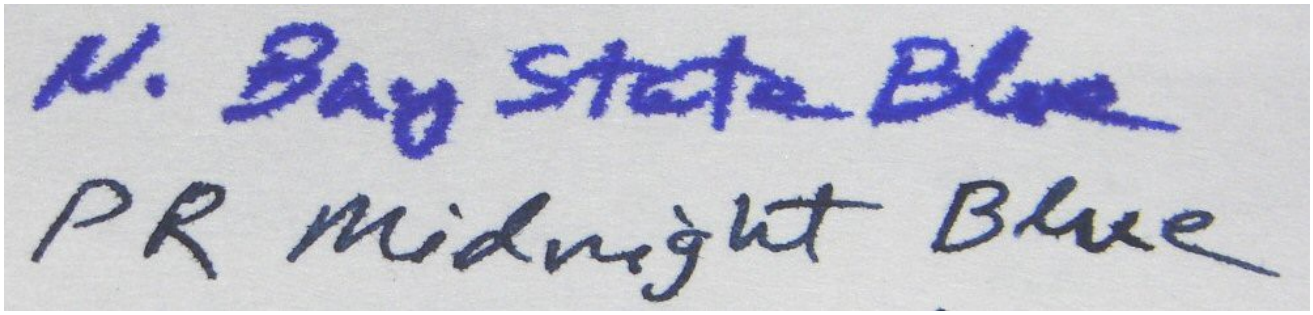


Figure 1

Note how the DC Supershow blue shows its turquoise nature as the ink's density on the paper lessened. The Herbin ink was nearly dry by the light squiggles at the end (I dipped again and made the darker squiggle). You can see where the "pen" was dipped before writing was resumed: the second "l" in Florida Blue and the "d" in the Herbin line. The picture also shows that the Herbin blue and Florida Blue are very similar inks on the paper. The Noodler's Turquoise line shows dramatically how the amount of ink put down on the page affects the appearance -- this, in a nutshell, is why you need to test a particular ink you think you'll like in the pen(s) that you'll write with; otherwise, you may be disappointed. The Swisher's North Sea Blue shows feathering caused by way too much ink on the paper in the word "North", yet the latter writing in the word "Blue" is quite nice. Thus, the appearance you get depends on how your pen lays down the layer of ink on the paper. **This "toothpick variation" can be an advantage, as you can see a continuous spectrum of behavior**. Of course, you'll probably only see one of those particular behaviors with a particular pen and paper.

The word North in the above photo shows both feathering and spreading. Here's an example of feathering (written with a Hunt 512 nib on cheap and crummy 3x5 white cardstock):



You can see feathering on both inks, although the lower ink shows less feathering.

Finally, here's a bit of advice about testing inks. A common question is "What ink is the blackest black?". You'll see many opinions given and comparisons amongst the different inks. However, I know from first-hand experience that you really need to see these different inks written with the same nib on the same paper by the same person at the same time to do a fair comparison. Plus, you'll want to pay attention to the light you look at the results in and how you inspect the results. I used my desk's lamp (an incandescent) and my 4X loupe to make the comparisons -- and I could really spot the differences in a black ink test I did.

Just when you think you've got the definitive answer, you'll find a different ink/pen that gives you a blacker mark on another type of paper. Thus, I know from experience that the answer is "it depends". This explains why you see so many dogmatic opinions out there that simply aren't correct for all situations.

Keep good records

A useful reference is to write a line of text into a notebook when you fill a pen with a new ink. This is even more useful if you keep a number of sheets of different types of paper so you can see the variations in performance. You'll find you'll use these records as comparison standards.

Poor-man's chromatography

An interesting thing to do is "poor-man's chromatography" with an ink to see what it's made of. Cut out a rectangular chunk of paper from a coffee filter. Draw an ink line on the paper a few mm from the bottom of the paper. Then dip the bottom of the paper into some water, but keep the water level a mm or two from the ink line, which should be horizontal. The paper will absorb water and the ink will separate into the ink's components, as long as it's not an ink like a bulletproof ink from Noodler's. You can find out a lot more by doing a web search on "ink chromatography" (and it makes a great experiment to do with a child).

Using old inks

If the ink doesn't have any sediment, goo, look or smell funny, you can test it with the toothpick pen described above. If it seems to work well, it's probably OK to use in your pens if there's no scum, particulates, etc. When stored at normal room temperatures out of the light, fountain pen ink should have an indefinite shelf life. I've read that some people feel that ink older than a year or two should be thrown out (or that some manufacturer recommends this). You have to make up your own mind on this, but it sounds to me suspiciously like a statement trying to get me to buy more ink. Most inks probably have indefinite shelf lives if stored in innocuous conditions. You can store them in the refrigerator to retard mold growth. I've used inks I purchased more than 40 years before and they all worked fine.

Eradicator

In the 1970's and before, bottled ink eradicator was common and cheap at the five and dime (the precursor to the dollar store). This was a type of bleach in a bottle with a small glass applicator with a little ball on the end that let you wipe the eradicator across some fountain pen writing. It would cause the ink to disappear and, when the paper dried, you could write over your mistake (the

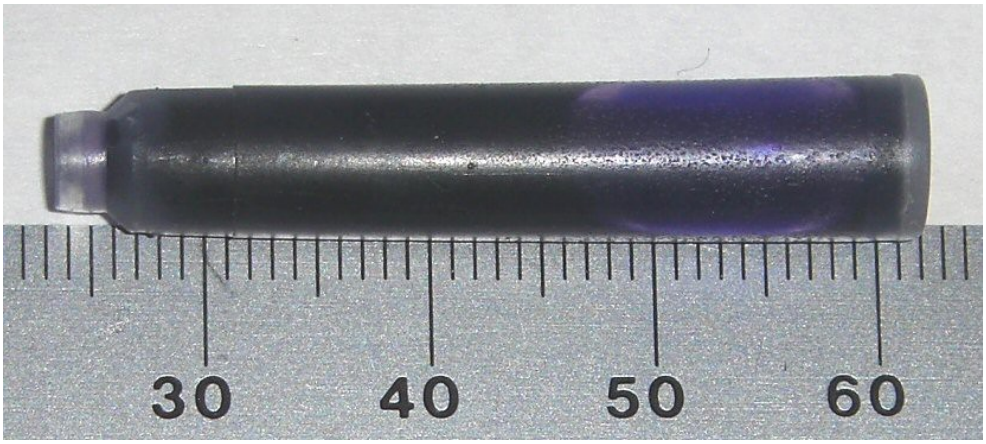
eradicator didn't work with all inks, but worked fine with the Sheaffer blacks and blues made in the 1960's and before). A common problem was that you'd be in a hurry to get the correction written and the eradicator wouldn't be dry -- then the fountain pen tip would rip the paper. Of course, this was that homework you were rushing to do at the last minute.

Pelikan and Staedtler currently make eradicators for one of their inks.

International cartridges

Besides the proprietary cartridge sizes from different manufacturers (an old business trick to sell you more stuff), there are short and long international cartridges. The short international cartridge is the most common and convenient because they are available from a number of vendors. Some pens use one of these cartridges for writing and store a second cartridge as a spare.

Here's a picture of a short international cartridge:



The outside diameter (OD) of the small barrel on the left is 4 mm; the OD of the main cylinder at the left is 6 mm and the OD at the right end is 7 mm, so they're slightly tapered. The inside diameter of the small barrel on the left is 2.5 mm. The overall length of the cartridge is 38 mm. Long international cartridges have a length of 72 mm. The short cartridge's volume is about 0.5 ml and the long cartridge's is about 1.2 ml. Some international cartridges are sealed with a small glass or plastic ball:

When the pen's barrel is screwed to the section, the section's nipple forces the ball into the cartridge. If you have a spare ball, you may be able to refill the cartridge and seal it again.

Some pens allow you to put a spare short international cartridge behind the cartridge that is being used. The taper of the cartridge can help the cartridge fit into the tapering back end of the barrel. This can be handy when you forget that your pen is running low on ink.

If you use cartridges that are unlabeled, you might want to mark them somehow so that if they get separated from the box they came in, you can identify the color and manufacturer. I have some unmarked blue cartridges in the bottom of my ink box -- I think I know what color they are, but I'm not sure.

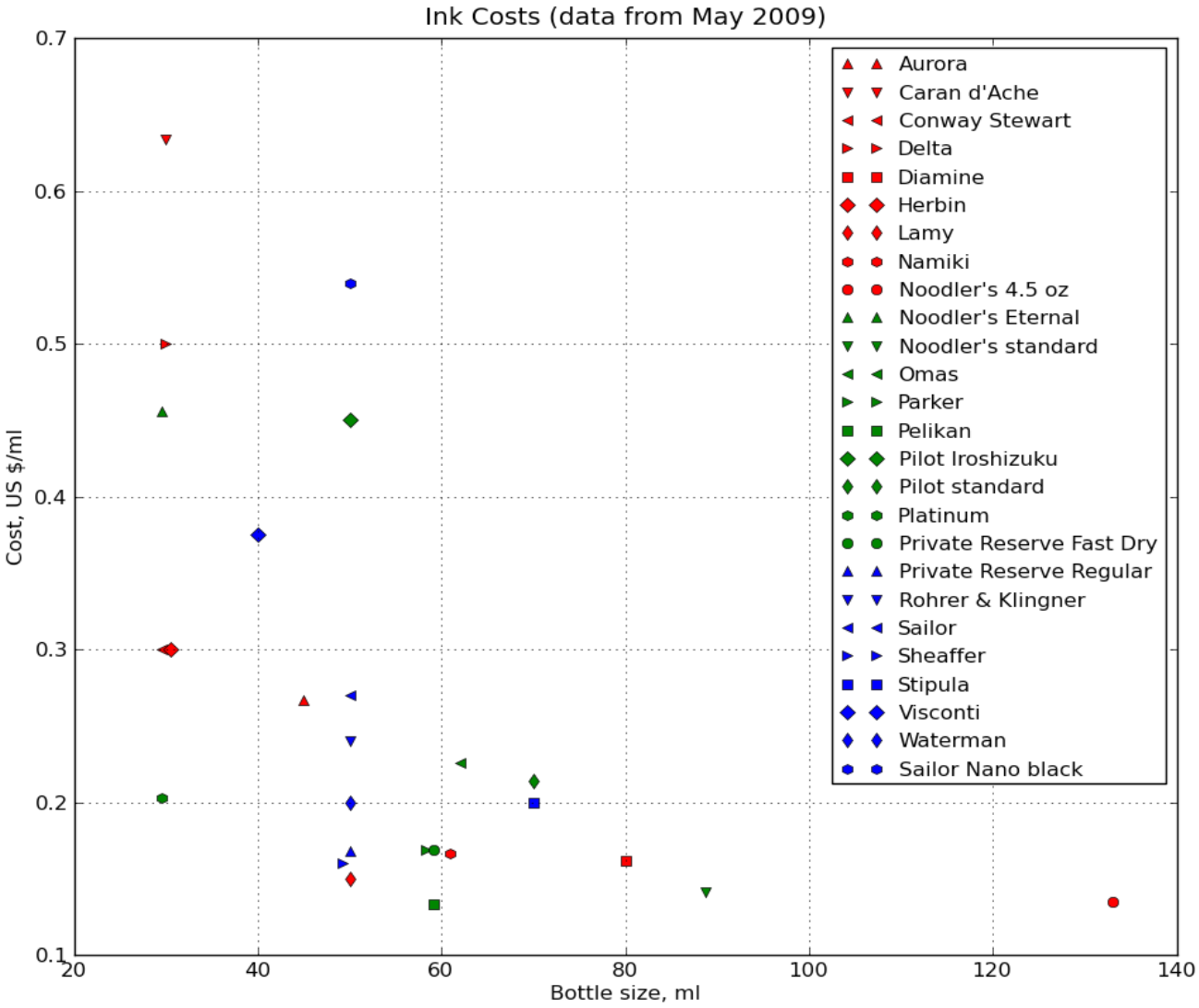
> A cheap way of marking such things is to buy some white vinyl electrical tape and write on it with a Sharpie pen.

Other things being equal, I recommend you use a pen that uses international cartridges -- you'll have more choices and places to buy ink.

You can save your empty cartridges rather than throwing them out. This will let you refill those empty cartridges with ink from a bottle (use a syringe with a blunt needle). But they will eventually leak because the seal around the nipple will fail. I've read you can cut the large end off and use it to cap a partially-used cartridge.

Ink costs

Here's a graph of ink cost in US dollars per ml of ink; the data were taken from web retail outlets in May of 2009. These prices are for bottled ink (you can see that 30 ml and 50 ml bottles are popular because of the vertical groupings). As of November 2011, the Pilot Iroshizuku inks are 0.62 $/ml, so you can see that they've increased 50% in price in 2.5 years.



You pay more for the convenience of cartridges. In November 2011, a US web store listed an aluminum container of 6 Herbin short international cartridges for $5. With shipping or sales tax, call it an even $6 or $1 per cartridge (other US web stores will sell you six Herbin cartridges for up to $10 delivered). This makes the cartridge ink cost $1.3/ml or roughly ten times the lowest-cost inks in the above graph.

If you write with a fine point or fill up a rollerball pen, you'll find that a bottle of ink can last you a long time, so cost is probably not a major concern. Broader nibs and people that spend a lot of time writing will obviously go through more ink.

Paper

The paper you write on can make a big difference in your enjoyment of using a fountain pen. After you've played with inks and pens for a while, it's only natural that you start looking for a favorite paper.

If you use your pen at work, businesses often use the cheapest copy paper they can find. You may have to experiment a bit to find a pen and ink that works well on such papers. For starters, I recommend an inexpensive pen with a fine point and Noodler's black ink -- then branch out from there. Some inks feather badly on some papers; a few examples I've seen are examples are Noodler's Baystate Blue, Noodler's Lexington Gray, and the ink Noodler's made for the Fountain Pen

Network, Galileo Brown. Wetter writing pens (those that put more ink down on the page) will also lead to more feathering and spreading, so one cure is to change to a drier or finer nib pen.

A popular paper is HP's Premium Choice LaserJet paper in 90 and 120 g/m^2 weights. Two other paper brands popular with fountain pen users are Clairfontaine and Rhodia. I shy away from Clairfontaine and Rhodia papers because they take a bit of time for the ink to dry, meaning you're more likely to smear what you've just written. However, they are good papers and if drying time isn't an issue for you, give them a try (also note they're pretty expensive based on cost per unit area or mass). Crane is another paper manufacturer that some fountain pen users like.

It's useful to keep a binder of different papers with tests of different inks and pens. Over time, you'll accumulate useful information that you can refer to later.

You will probably experiment with your pens and inks on a wide variety of papers. For a daily writer that needs to write on a large variety of types of papers, you'll want to find an ink that fits your needs. Numerous times I've found an ink I'd like to use, only to find out later that it doesn't work well on certain types of paper that I like to use. This is all part of the game and helps give fountain pen writing its character, joy, and frustration.

Journals: Many fountain pen users complain about the problematic paper and inconsistent quality in journals such as those made by Moleskine; feathering and show-through are common complaints. If you insist on using such notebooks and want to minimize the show-through, use a pen with a fine point (a less-saturated ink could help too). Consider using a gray or diluted ink for less show-through.

Newsprint: Try writing on newsprint. If your pen writes well on that paper, chances are it will do well on most other papers. A simple test is to just place the pen's nib in contact with the paper and leave it in place for 5 or 10 seconds. You should see a blob form; the more absorbent the paper is, the bigger the blob will be (try this on a piece of toilet paper -- you'll almost hear the sucking sound). Newsprint usually gives a big blob; better papers give smaller blobs. It will also demonstrate how much ink bleeds through to the back side of the paper. It is not unusual for fountain pen writing on newsprint to bleed through or at least show through on the opposite side. But a good pen and ink should at least perform adequately on newsprint.

Sizing: Papers that have smooth finishes and more sizing than the average paper can be problematic. Sizing is a compound used in the paper's manufacturing to change the paper's absorbency and/or its finish. Heavily-sized papers can have the ink stay liquid on the surface of the paper much longer, leading to smearing -- especially with a pen that writes wet. Even after the water in the ink dries, the residual ink dye on the surface can still smudge. You'll find these papers by experience and learn to avoid them or use a different ink or pen. An example where this smudging will always happen is on the Mylar "paper' used for drafting -- your ink will just dry and sit on the surface. This is why drawing inks and India inks have shellac in them -- the shellac hardens to help the ink pigments stay put (when the water in fountain pen ink dries, dried dye is left).

Vellum: Vellum can be interesting to write on with fountain pens -- on some vellums, the pen just glides over the paper like it's on ice and, since vellum tends to be translucent, you get a lot of show-through, so you only write on one side. I have some Deitzgen Quickdraft vellum in some pads I bought 40+ years ago and my fountain pens write on it nicely with no feathering. It's called "100% rag tracing vellum". A local paper store had heavier vellums that were even better to write on -- they'd make some distinctive letters to someone. For someone with excellent handwriting or good at calligraphy, this type of paper would make snazzy and personal marketing materials.

Blob test: Put a blob of ink on a paper. Unless the paper is highly sized (has lots of material coating the surface) or is very thick, this will probably bleed through to the back side of the paper. You'll also see spreading and feathering -- even a well-behaved paper like Rhodia 80 g/m^2 will feather and bleed badly with this treatment. You may see the ink separate into separate components as it does in paper chromatography.

Old paper stocks: You may be able to find old paper stocks from relatives, friends, and stores with old stocks. These can be worth testing, as you may find a paper you like. I have some papers that I bought many decades ago and some of them work very well with fountain pens. Also test different papers you come across -- I read where someone found a packing paper that was excellent to use with fountain pens.

Copy/print paper: A few years ago, I evaluated various copy/print papers available to me in the US (I was thinking of starting a small mail-order paper business). I evaluated about 90 different papers from local stores in the northwestern US. One conclusion was that there is no "grail" paper out there in the copy/print category. There is no paper I've tried that completely eclipses all the others with respect to the performance characteristics that are important to me: feathering, bleeding, show-through, and spreading. However, there were papers that were distinctly better than others when grouped by some category like g/m^2.

I found one specialty paper sold by Staples that performed extraordinarily well. In particular, it had no bleeding or show-through and beat out papers of twice its grammage and more. It was an expensive paper and would not be suitable for everyday use because of its cost.

This testing did uncover an excellent paper for my needs (made by Domtar) and I bought a ream; a few months later I found out that the manufacturer had discontinued that paper (**lesson**: if you find a paper you like, buy a bunch).

By reading FPN and blogs, you may find others who share your interest in pens, papers, and inks. You can exchange paper samples with pen pals and find papers that are good to write on without having to buy a bunch at one time. An added benefit is that you can share letters written with your favorite pens, inks, and papers -- and letter writing seems to be becoming a lost art in today's world of emails and text messages.

Grammage and other paper metrics

The areal mass density of paper is called grammage and is expressed in g/m^2. See the Wikipedia article on paper density.

You can measure the paper's linear dimensions in mm and the paper's mass in g; then it's trivial to calculate the areal mass density in g/m^2, often abbreviated as "gsm".

The following table gives the mass in grams and ounces of an 8.5x11 sheet of paper of specified grammage. For other sheet sizes of paper, scale the table's mass by the area of the sheet divided by the area of an 8.5 by 11 inch sheet. For other grammages, scale proportionately.

	Mass		US pound
Grammage	grams	ounces	weight
75	4.52	0.160	20# bond
80	4.83	0.170	21# bond
90	5.43	0.192	24# bond
100	6.03	0.213	27# bond
105	6.33	0.223	28# bond
120	7.24	0.255	32# bond
190	11.46	0.404	65# cover
205	12.37	0.436	76# cover
215	12.97	0.458	80# cover

Suppose you purchased a ream of 75 g/m^2 copy/print paper for $4 and 100 3x5 index cards for 50 cents? Which represents the better purchase? First, we need to define "better". While we spent less for the index cards, we got less paper, measured by either area or mass. This leads us naturally to define two normalizing paper cost metrics that help us compare paper purchases.

Cost per unit area: The first is $/m^2. I find this useful because it lets me compare how much writing area I get per dollar spent. If you write at a constant information areal density, then it tells

you which purchase will let you record the most information. However, it blindly lets you compare onion skin paper to cardstock material. Since these contain different masses of paper pulp, it can also make sense to normalize with respect to mass.

Cost per unit mass: Mass normalization leads to $/kg. You can calculate it by first calculating $/m^2, dividing by the g/m^2, and multiplying by 1000. It tells you how much the paper manufacturer values its paper pulp by mass, although shipping costs and profits for the middlemen are in there too. You'll see this metric run from around $1/kg for cheap paper up to 20 to 30 $/kg for papers like Rhodia and Clairefontaine. Some specialty papers are significantly higher.

You might want to set up a simple spreadsheet to help you see these metrics for different paper purchases. It might change the way you think about a particular paper.

Making your own forms & booklets

With a printer, you can make custom forms and booklets for yourself. I won't go into how you create the information to be printed, as there are many tools out there.

You may be surprised to find out how easy it is to make your own little saddle-stapled notebooks. This can be done with papers you know to work well with the pens and inks you like to use. Here's a prècis of how I make mine.

I use a paper cutter to cut a letter-size sheet into four equal rectangles. These sheets then get folded in half and a number of them are cuddled together and stapled in the middle with a cardstock cover to make a little booklet (the end of the staples go inside the booklet). The page size winds up being about 70 mm by 110 mm with US letter-size paper. Print lines, dots, or a graph pattern if you wish before cutting the paper. If you'll be doing lots of folding, a stainless steel spoon can be used as a burnisher to flatten the folds, saving your fingers (or buy a "bone" folder on the web).

If you want to get fancier, you can sew the pages into signatures and sew these into booklets (search the web for instructions). When carefully made, sewn booklets can last longer than stapled booklets and contain more pages, but the advantage of the stapled booklets is that they are made surprisingly quickly. You can do a web search on "make your own booklet" for more ideas and tools. If you staple the booklets together, use a screwdriver to press the staples' ends in the booklets down because some staplers don't do a good job of getting the end safely tucked away -- and you may occasionally get stuck by a staple that isn't all the way down.

For the do-it-yourselfer, a quick-and-dirty technique to add some robustness to the booklet is to cover it with duct tape or clear packing tape, but you won't win any fashion awards with it.

I sometimes make these small booklets with useful reference information printed on each page. You'll find it's a bit of work to create the imposition, which is the positioning of the booklet's pages on the physical page of printed paper. There are software tools that can help with this task, but unless you're going to do a bunch of this type of work, it doesn't make economic sense to purchase something. I make my little reference booklets by printing out sheets with the cut lines and numbered with a page order. After cutting them out, folding, and stacking, you can see where they wind up in the booklet. I also print the information on the cardstock covers to maximize the amount of information in the booklet.

Using a fountain pen

New pen

If your pen is brand-new or freshly-cleaned, then using it for the first time should be straightforward: fill it with ink and start writing with it. This sounds simple and usually is, but there are a few tricks. I can't speak authoritatively on piston pens, so I'll let you search the web for appropriate details about them.

Some people recommend cleaning a new pen with room-temperature water and a small amount of

detergent (say, a drop or so per 50-100 ml) to remove any residual oils in the pen. Flush thoroughly with water to remove any traces of detergent. If detergent remains in the pen, it can make subsequent use "runny" -- meaning you may get excessive flow of ink.

> This is one technique of making a dry-writing pen put a little more ink onto the paper). If you choose to do this, do not do it on a full bottle of ink -- mix only a small amount and store it in its own container. Mark the container to show how it has been modified.

Eyedropper pen: (this is specific to the Platinum Preppy pen) Ensure the sealing o-ring is installed; it should nestle against the step in the plastic past the threads on the nib section. Some folks coat the o-ring with some waterproof silicone grease and may also put grease on the threads of the section (I don't bother if the o-ring is new and the pen is clean). Fill the mating back piece of the pen with ink. Screw the parts together and snug down on the o-ring. It's easy to tighten things too much and run the risk of cracking the plastic. Tip the nib down and the pen should soon be writing.

Cartridge pens: Unscrew the barrel, drop in a cartridge (ball end to face the feed/nib), screw the barrel back on, and start writing. It may take some time for the ink to make its way to the nib's tip. I sometimes reduce this time by unscrewing the barrel and giving the cartridge a squeeze so that a drop of ink bulges slightly from the feed. If you have an open container of the same ink, you can dip the nib to accomplish the same thing. Once the pen is writing, you shouldn't have any more troubles until the cartridge is empty. I've read that some brands of ink cartridges aren't fond of such squeezing and can show crazing or cracking after this.

Sac pen: Dip the nib/feed into a bottle of ink and compress the sac to expel the air and suck ink into the sac. This wets the feed, so the pen should write immediately after filling. I keep a tissue handy to give the parts of the pen that were dipped in the ink a quick wipe -- otherwise, you may get ink on your fingers.

Pen with a converter: There are two ways of filling the converter. 1) Keep the converter attached to the pen and fill the pen by dipping the nib into the ink and operating the converter's piston to suck ink into the converter. 2) Remove the converter and fill it from the ink bottle. With the second method, you may want to dip the nib in the ink bottle to help get ink in the feed. The second method has the advantage that it can get the last bit of ink from a bottle if you can get the converter to the bottom of the bottle.

There are pens with other filling methods (e.g., the Sheaffer Snorkel), but you'll need to find their instructions elsewhere.

In the best of all possible worlds, your pen is now writing and should continue to do so with only occasional filling and cleaning required.

Things to think about

There are a few things to think about when using a fountain pen.

Avoid pressing too hard. This can be a bit of a challenge if you have written mostly with a ball point pen. A fountain pen should require almost no pressure to write well other than keeping it in contact with the paper. If you have a flexible nib, then you may find that you vary the pressure to vary the width of the drawn stroke -- but this is going to take practice. You're painting on the paper with a brush of two bristles (i.e., the nib) -- and, since you've probably used a brush, you know that little to no pressure is required. If you press too hard, you may get two lines -- this is called "railroading".

Make sure the pen is properly capped after use. If you don't cap the pen, the nib and feed are going to dry out and the pen isn't going to write. If they do dry out, a quick fix might be to dip the nib and feed into the bottle of ink you're using and fill the pen. This should help dissolve any dried ink and get the pen writing again. If you're away from the bottle of ink, the usual dodge is to wet the tip of the nib with your tongue and try to write immediately -- sometimes you have to scribble for a fair bit before the pen starts writing. If there's ink in the pen and the feed's channels aren't clogged, this may get things working. Sometimes shaking the pen can help get ink to the nib, but you risk a splat

of ink coming from the pen (do it over a wastebasket or scrap piece of paper). If the pen has a cartridge or converter, squeeze the cartridge or manipulate the converter to get a blob of ink on the feed to get things started again.

Some pens write better when held at a particular angle. If this angle doesn't suit your tastes, you may be able to hone the point yourself or send the pen to a nibmeister with instructions on what you'd like fixed.

You'll find some pens that you can write with at unusual angles. I don't use an italic or stub pen (or other such modified pens -- search the web if you're interested), so I can't comment on how those write. Most regular fountain pens can be rotated 180° about its longitudinal axis and they will write with the nib upside down. This usually results in a substantially finer line. In one of my pens, the normal line is about 0.5 mm wide; with the pen upside down, I get a smooth line of 0.2 mm wide. This is handy for fine notes or hatching. Some pens respond variably to various rotations of the nib.

Accessories: there are many accessories sold for fountain pen use, but these are beyond the scope of this document.

Troubleshooting writing problems

It is discouraging to spend a lot of money on a pen and not have it work well for you. Most writing problems that aren't caused by the paper can be traced to poor nib performance or improper ink supply. If your pen isn't working correctly for you, your first tasks should be 1) make sure that the pen is clean and 2) use a safe, well-understood ink (Waterman's Florida Blue/Serenity Blue could be a good choice).

I'll give some of the remedies I've found for problems, but don't consider this list authoritative or complete. A web search will uncover more advice -- and you may want to consult with a fountain pen technician for a persistent problem. If you've recently purchased the pen, you should first consult with the folks you bought it from.

The first rule of fixing your own pens is to do no damage -- this requires that you know what you're doing. If you don't, the best advice is probably to send the pen to a pro. If you instead want to try to fix it yourself, you may want to get a reference book on fountain pen repair; one is [*fd*].

When I have a pen problem, the first thing I always do is to clean the pen. You can soak the nib and exposed feed in water, but if you have an old pen, the materials in the barrel and elsewhere might not be compatible with soaking. If you're not sure, find out before you do any more.

The good news is that virtually any problem can be fixed with nearly any pen. The bad news is that it might cost a fair bit of money if you have to pay a pro.

Problem	Possible cause and/or fix to try
Pen writes for a while, then dries out.	◆ Running low on ink: fill pen or converter or switch to new cartridge. ◆ Balky converter: clean or replace. ◆ Dirty pen: clean (dismantle and clean section if possible). ◆ Plugged vent: send to a pro if you can't find and fix it yourself.
Pen barely writes or skips badly.	◆ If the pen hasn't been used in a while, the ink in the feed could be partially dried. A quick fix is to dip the nib briefly in water, wipe off the excess, then let the pen sit for a while. If it starts writing again, then that probably fixed the problem.
Pen won't write at all	◆ No ink: fill pen. ◆ Really dirty or used with wrong ink: dismantle and clean if you know what you're doing. If the pen is valuable or old, probably best to send to a pro.

Problem	Possible cause and/or fix to try
	◆ Plugged vent: unplug if you know how and where; otherwise send to a pro. ◆ Not capping pen and letting it dry out: put cap on sooner.
Damaged or incorrectly adjusted nib	◆ Fix if you really know what you're doing and have the tools; otherwise, send to a pro.
Poor starting (pen won't write immediately after you start writing, but will after a bit)	◆ May be endemic to pen (you can try different inks; if that doesn't work, consider sending the pen to a pro for repair). ◆ Dried out: get feed and nib wet in the ink bottle of the ink you're using or try wetting on your tongue and scribbling. Large vents may be causing the pen to dry out (consult with a pro, as they may be able to plug them reversibly with wax). Blow into or suck on the cap: if you can feel air flowing, it's not air-tight and may be causing the pen to dry out. ◆ Change angle at which you use the pen. ◆ Wrong point for your style of writing. ◆ Make sure the pen is full of ink to rule out a low ink condition. I'll sometimes squeeze the cartridge or turn the converter's knob to show a blob on the feed to ensure I have enough ink in the feed.
Skipping	◆ Air bubble in converter or cartridge: squeeze cartridge or screw down converter. Refill if possible. ◆ Nib problem: tines too close together or too far apart -- probably should send to a pro for fixing. ◆ You're trying to write too fast -- the pen's feed can't keep up with you. Either slow down or send pen to a pro for improving the ink flow (or try a wetter ink).
Emits blob of ink when writing	◆ Pen could be low on ink: fill the pen. ◆ You could be using an ink that flows too freely (Tanzanite is an example): switch to a drier ink (search FPN for advice or ask a pro). One thing to try might be to let some of the ink air out for a time to allow water to evaporate.
Pen dries out too quickly with the cap off	◆ Put the cap on, Luke. ◆ Try a different ink.
Pen dries out too quickly when left to sit with cap on for a period of time	◆ The cap might not be sealing well enough with the pen (send it to a pen tech). ◆ The cap might leak too much air (suck on it to see if it leaks air; ideally, it should be air-tight). Try using a long Q-tip dipped in a shellac/alcohol mixture (make sure the cap material is compatible with alcohol) and rub the shellac inside the cap over the places where hardware penetrates the cap. See the comments below.
Excess ink in cap or pen body	◆ You're handling the pen too roughly: change your habits. ◆ Try capping the pen gently with the nib pointing up. ◆ A seal in the pen may have gone bad or there could be a crack somewhere. If you can't find it, you may need to send it to a pro.
Pen writes too wet (too much ink on paper)	◆ Needs nib adjustment: send to a pro. ◆ Switch to a drier ink (search web or FPN for advice or ask a pro).
Pen writes too dry (too	◆ Needs nib adjustment: send to a pro.

Problem	Possible cause and/or fix to try
little ink on paper)	◆ Switch to a wetter ink . Tanzanite is one of the wettest inks and might be worth trying; adding a surfactant (like a small amount of dishwashing soap) to the ink might be worth trying (do in a small amount of ink -- don't contaminate a whole bottle).
Scratchy writing	◆ Bad or out-of-tune nib: send to a pro if you're not confident that you can fix it yourself (search the web for smoothing techniques). ◆ Some pens (crow quills, cheap pens) are naturally scratchy.

Other problems

Evaporated water

If an ink bottle's cap isn't sealed well, you may have the water evaporate. Try adding some water to make up for the losses (distilled water preferred). Since the bottle is ruined otherwise, you probably have nothing to lose by trying.

Long-term (decades) storage of plastic cartridges can result in the loss of water by permeation through the plastic. These cartridges can still be used: add distilled water with a syringe and blunt needle to nearly fill the cartridge.

Stuck ink bottle lid

This can happen with a bottle that gets ink on the threads.

First turn the bottle upside down in a small container and fill the container to just over the top of the cap with warm tap water and let it soak. This may loosen the cap enough to get it off (but it has never worked for me).

If that doesn't work, grab the bottle in a vise with rubber jaws. Grab the cap with pliers and it should turn off. This is a delicate balancing act, since you want to grab the bottle to keep it from turning, but not tight enough to break it and wind up with a big mess. Do it over a bucket and wearing old clothes if you're not sure you can do it without breaking the bottle.

Once the lid is off, clean the lid's threads and cap's threads with a moist towel. I put a small amount of waterproof silicone grease on the cap and bottle threads to help avoid sticking in the future. Inspect the cap threads -- if they are rusted, toss the cap out (and the bottle unless you have a spare cap).

Getting ink on the threads of a bottle can lead to another problem: flakes. Little flakes of dried ink can fall off when you open the bottle. These may be invisible when dry, but if you get them wet, they can make a colorful, visible smear. If it happens later, you may wonder what's going on. Fix: use a piece of moist toilet paper to wipe off bottle and cap threads before closing the bottle. These are the little things that cause many people to reject the idea of using a fountain pen because they're too much maintenance effort.

Ink on fingers

If you use bottled ink, you're going to get ink on your fingers. You can get finger cots (these are rubber finger protectors that look like miniature condoms) or rubber gloves to protect your fingers and hands. There are also chemicals that you can buy that are touted to remove ink stains readily from your skin (Ink Nix) and fabrics (Amodex). For ink on my hands, I wet the stain and rub it with Lava soap.

Useful tools

You can do little or lots of maintenance on pens. If you get into repairing and restoring old pens, you'll need knowledge and special tools. You'll also want to find some written instructions on fixing pens; [*fd*] is one place to start. Simple tasks can be done with easily-acquired tools. You can

search the web or FPN for more specialized tools.

Here are some tips that come to mind:

- Some places sell section pliers, but they might just be spark plug boot pliers made by K-D Tools.
- You don't have to buy waterproof silicone grease from a fountain pen vendor; just go to your local plumbing supply (but make sure it doesn't contain petroleum distillates; if it does, get the silicone grease from a dive shop). Dow-Corning vacuum grease works well.
- Shellac: go to a local paint store and buy a small container of shellac flakes and dissolve them in denatured alcohol.
- Buy very fine grit polishing paper at your local auto supply (it's used for body work).
- Get cotton wipes at the drug store (women use them for cosmetics).
- If you need heat, I recommend using a hot air gun that has an adjustable heat output. You can stick a thermometer into the air stream and make sure that you're not getting it too hot.
- If you need to work on a pen and find it hard to grab, get an old inner tube and cut out a chunk. Clean off any powder. You can also use those rubber grid mats they sell for the bottom of tool box drawers.
- A knockout block is used to help knock the feeds out of the sections. You can make one with a drill press or look for a machinist's bench block.

Some sites to visit for more information:

http://munsonpens.wordpress.com/category/fountain-pen-tools/

http://www.vintagepens.com/pen_repair.shtml

http://www.penpractice.com/

http://www.richardspens.com

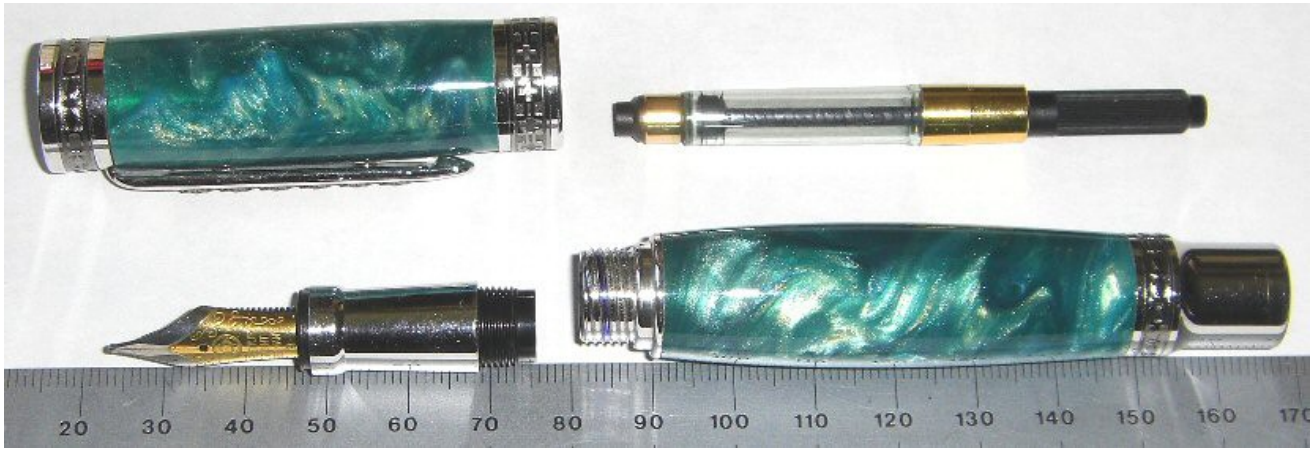
Cleaning a pen

If you have a used pen and don't know its condition, it's almost certain that your first task should be to clean the pen thoroughly. A used pen will likely have dried ink in it and you want to remove this dried ink, both to ensure good ink flow and make sure it doesn't contaminate a new ink of a different color.

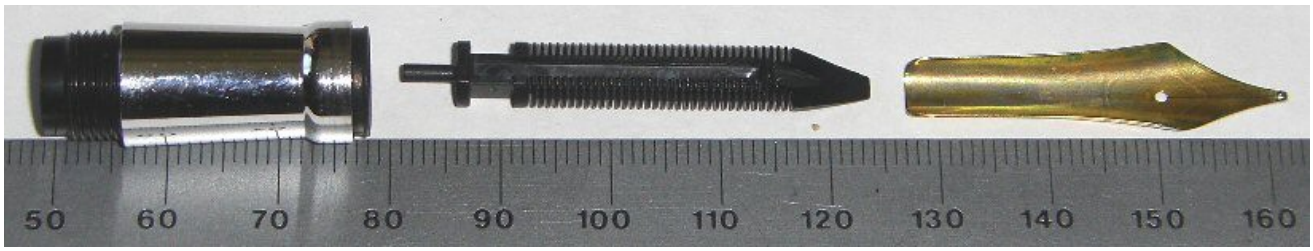
A pro will likely disassemble the pen and inspect all the parts and replace any that need replacing. I don't recommend doing this unless you know how the pen is constructed and you have the required tools. You may break some seals or void a warranty on an expensive pen, so know what you're doing before you do it -- in fact, don't do anything unless you know it's OK to do. But many pens are basically pretty simple and can be dismantled for cleaning when needed. I'll show an example using a custom-made large pen (I'm not implying that all pens are constructed this way):

The rule will be included in the pictures to give you a sense of scale (the divisions are mm). This pen

disassembles into four pieces:



The converter used with this pen is at the upper right (if the converter broke, I would probably replace it unless it was easy to figure out how to fix it). The nib/feed/section unit at the lower left can be disassembled by just pulling the feed and nib out of the section with your fingers (some pens require "section pliers" and a rubber grip to hold the barrel to do this):



The feed and nib are held in the section by friction. The section (the piece on the far left in the above picture) is keyed so that the feed can go in only one way:

It might be a bit difficult to see, but the keying is accomplished by a flat near the bottom of the hole. To reassemble, the nib is put over the feed and the two are pushed back into the section. This is perhaps one of the simplest designs of a fountain pen; other designs that I've taken apart are more complicated with more parts.

When a pen can be fully disassembled like demonstrated in the above pictures, the individual parts can be cleaned: your first step should be to soak them in room-temperature water. Note it's important to use room-temperature water, not hot water -- hot water is capable of damaging some parts of older pens. I keep a small squeeze bottle of non-detergent ammonia handy and will squeeze a few drops of ammonia into the water (some people recommend up to a 10-20% solution of ammonia). This is especially helpful for soaking pens with sacs that have dried inks in them. You can be patient and let the parts soak -- I often let things soak overnight or, for quite dirty pens, a few days. I occasionally come in and flush things out and put new soaking solution in and start the process again. I keep at it until the water comes out clear, meaning there's no ink left. When a pen flushes clean, there's essentially no (soluble) ink inside it.

Note there can be exceptions to all advice -- I've read that hard rubber (ebonite) or casein pens shouldn't be soaked very long because they may swell up and cause other problems. Thus, if you have an older pen where you're not sure of it's construction or materials, it may be best to send it off to a pro for cleaning or reconditioning.

If the parts have ink encrustations on them, consider gently scraping with a tool that's softer than the part you're scraping (you want to avoid scratching or damaging the part). Use a toothpick or a piece of soft plastic. Be gentle! It's better to be patient and soak things for many days rather than risk damaging a valued pen.

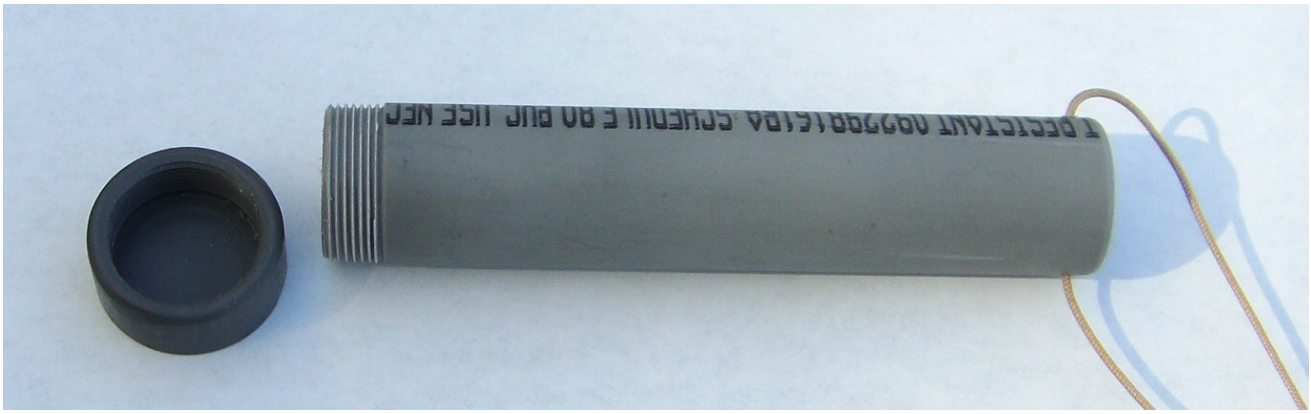
You can use small amounts of soap in the cleaning water and it won't harm anything and may help, especially if there are some oils that need to be removed (some people recommend cleaners like 409, but I've never needed such a thing). Rinse things out thoroughly with plain, clean water.

If you do choose to send a pen off somewhere to have it serviced, you might want to take close-up photographs of the pen's visible parts before you send it off. This might help you settle any

disagreements you have with the vendor or determine if any parts have been substituted. A jeweler's loupe is handy to help you get close-up photos.

When should you clean your pen? I clean my pens whenever I change ink colors or I feel that the pen has been sitting unused for too long. I also will clean a pen if it doesn't seem like it's operating as it should. Since a properly-maintained pen is cleaned by flushing with water, this isn't an onerous task unless you let things go too long. Some sites will recommend you clean a pen every time you fill it with ink, but I've never found that necessary as long as I'm using the same ink. You'll have to use your judgment and experience. Note that it doesn't hurt a pen to clean it, so you can error on the side of caution if you wish.

It can be a challenge to get all the water out from a pen with a sac. This water will dilute the ink you subsequently put into the pen; if this doesn't bother you, then there's no need to make the following tool. I made a simple tool I call the "centripetal pen dewaterer" -- it's just a piece of schedule 80 PVC pipe with a threaded cap on one end and a string handle on the other end:



As I had the materials and felt like doing a bit of threading on the lathe, that's how I made it. A sane person would just get a schedule 80 PVC threaded nipple and screw a PVC NPT pipe cap on the end. A piece of toilet paper is wadded up and pushed into the capped end and the cap is screwed in. The pen is inserted point-down in the other end and the string is wrapped around my hand for a secure grip. Then I swing the tube around to centripetally remove the remaining water from the pen.

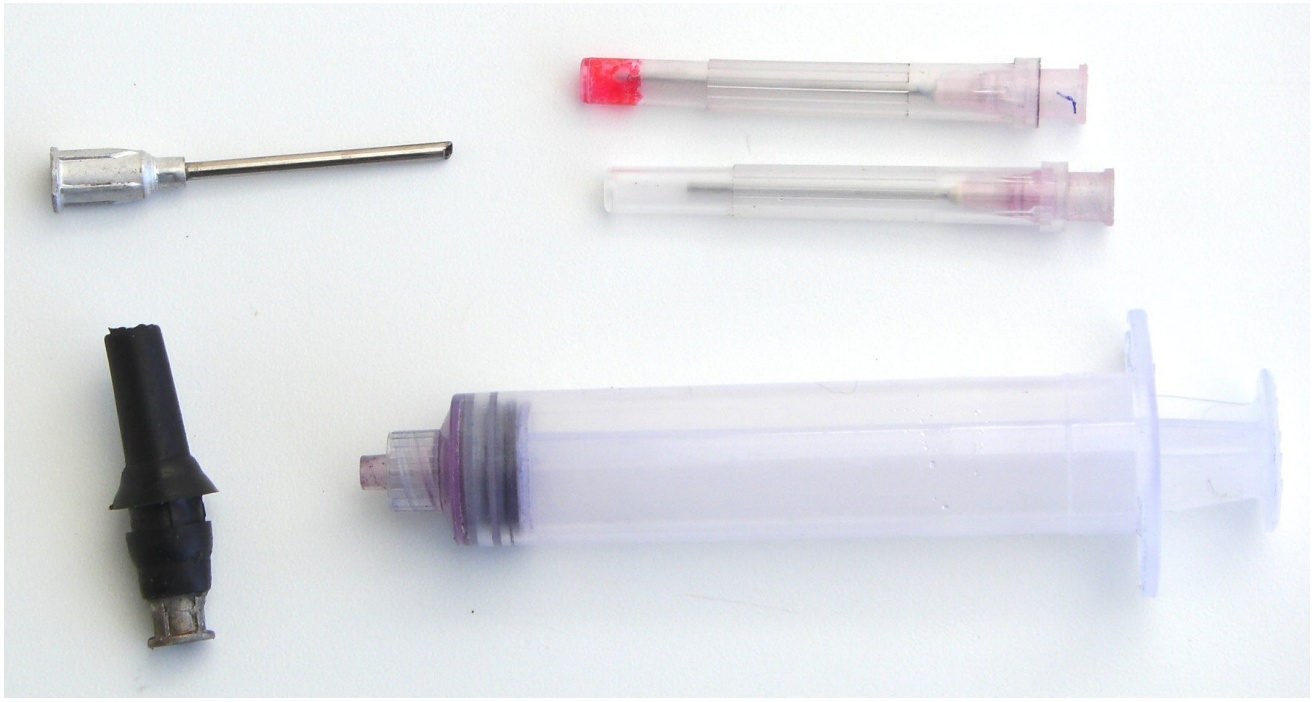
You may be able to disassemble your converter for cleaning. If so, there's usually a threaded cap that can be unscrewed. Others, like the Schmidt converter shown in the photographs above appear to be permanently assembled.

If your pen occasionally drips ink into the cap, you may want to occasionally flush the cap out too (or soak it if this is appropriate). I've found the some pens can accumulate quite a bit of ink in the cap (especially if the pen gets dropped), so such a cleaning is appropriate and may avoid a messy problem down the road if your pen accidentally gets wet.

If you have an ultrasonic cleaner for jewelry, you'll probably find that it's excellent for cleaning pens. I don't have one, so I can't comment.

Syringes

I use a syringe and a home-made tool to help with flushing out my pens:



The syringe has been used for years, so the markings have worn off (it's a 10 or 11 ml syringe). The big needle is a 14 gauge needle with the tip ground off. The two sheathed needles are 21 gauge needles (an 18 gauge needle could also be a good choice). The one with the red marking is sharp and the other was ground off blunt. Note the stains in the syringe's plastic due to one or more inks that have been in the syringe; this syringe is used a lot for both flushing and transferring inks.

The black tip at the lower left was made from a piece of rubber I found in my rubber scrap drawer; **this tip gets a lot of use in cleaning out pens that use cartridges or converters**. I used "Shoe Goop" to glue a 14 gauge needle to the rubber (silicone adhesive/sealant would also work). The rubber tip fits tightly over the cartridge nipple sticking out in my pens and lets me use the syringe to push water through the feed without it leaking out the back. This is effective in flushing out a feed. Another such tool could be an ear-cleaning syringe found at the drugstore. Or use a clean converter filled with water. It will be slower, but basically do the same job.

The syringe with the 21 gauge blunt needle also works well to flush out and fill used cartridges. Converters and cartridges can have small glass balls in them; these may surprise you if you're not expecting them (e.g., they can mysteriously hold the needle inside the cartridge).

Depending on where you live, it can be easy or hard to get syringes and needles. One way is to ask your doctor for a prescription for some and then buy them at the drug store. Where I live, agricultural supply stores sell syringes and needles for giving animals injections. I grind the sharp tips of the needles off on my shop grinder. Today, it's pretty easy to find syringes and blunt needles on the web.

I used to use a syringe and sharp needle to extract ink from cartridges, but you risk a mess or needle stab. Instead, now I just puncture the cartridge with a pen and squeeze the ink out.

Filling a used cartridge

I have a Parker pen I like to use, but I don't have a converter for it. Since I have a number of Parker cartridges, I use them as a poor man's converter: I refill them with a syringe and a blunt needle. This is straightforward as long as there's an air gap between the needle and cartridge.

Suck up about 2 ml of ink into the syringe. Hold the cartridge vertically over the sink with the hole facing upwards. Insert the needle into the cartridge and go most of the way in -- ideally, have the needle touch the bottom of the cartridge (this minimizes the production of bubbles inside the

cartridge). Slowly inject the ink to fill the cartridge. You may get a bubble at the mouth of the cartridge; you can let it pop or dab it with a tissue or Q-tip held in your third hand. I usually fill the cartridge to about 80-90% full. Squirt the left-over ink back into the bottle and cap it. Wipe any excess ink off the cartridge and insert it into the pen. Clean the syringe.

The Parker cartridges in my pen will eventually leak after 15-20 refills because the hole in the cartridge becomes too big to seal around the nipple (I first learned about this problem by blue ink all over my hand). A temporary fix might be some judicious heating with a heat gun, but I haven't tried this.

If you're not going to use the cartridge right away, it needs to be sealed to avoid evaporation and leaking. There are a variety of techniques suggested on FPN.

Filling disposable pens

Manufacturers sell disposable pens, hoping you'll buy new ones when the pen runs out of ink so they maintain their revenue stream. You might be able to save a little money, however, by inspecting the pen and seeing if you can refill it. This applies to any disposable pen, not just fountain pens.

A disposable fountain pen like the Pilot Varsity can be refilled by pulling out the section. It's best to use parallel pliers (e.g., the Knipex pliers wrench) for this to avoid dinging the plastic and metal of the nib, but any suitable pliers can work (use a machinist's parallel clamp if you have one). The ink chamber can be rinsed out and the nib may need to be soaked and flushed to clean it out. I put about 10 drops of plain ammonia into a 6 ml container with the nib and fill the remaining space with about 5 ml of water; let it soak overnight. You might want to repeat this a few times. After a good soaking, I'll force water through the nib with a syringe to remove any remaining stuff. I consider the pen clean when the flush water has no color to it. Let things dry out, then fill the barrel with ink, push the section back in place, let it sit point down for a while so ink can wick to the nib, and try writing again. If it works, you just gave more life to the pen.

Rollerball, felt, and brush pens can be rejuvenated or filled too. If a felt pen like the Pigma Micron is writing a bit dry, pull the back cap off with pliers and put a few drops of distilled water onto the internal reservoir. Let it sit for a while (I let it sit overnight), then try it out. If it hasn't improved, repeat with a few more drops. Go slowly to avoid diluting the ink too much.

If you can't fix the pen with a few drops of water, you may be able to remove the reservoir and flush it out. I've done this with the Faber-Castell Pitt brush pens and it works well. Pull the back cap off and remove the fibrous reservoir. Flush the reservoir out with clean tap water; also flush out the tip. The reservoir will become white when it's completely flushed out. Let things dry for a suitable time (you don't want the remaining water to dilute the ink you put in). I use a syringe with a blunt 18 gauge needle to squirt ink into both ends of the reservoir. Let it sit and the ink will diffuse through the reservoir. Dip the pen's tip into the ink, reassemble, and you'll probably have a working pen again.

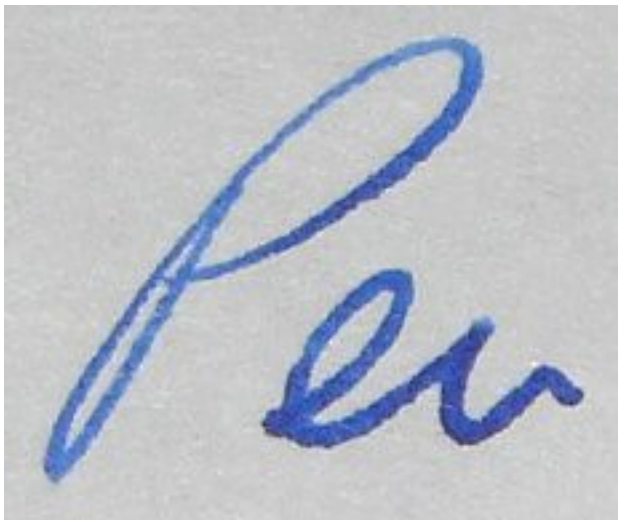
Rollerball pens are similar; the ones I've refilled took quite a bit of flushing out and there was a central slim fiber piece that needed to be pulled out and soaked. After adding some fountain pen ink, the pens gave years of more service.

Glossary

For an extensive glossary, consult Richard Binder's website's glossary: http://www.richardspens.com/?page=ref_info/glossary/A.htm.

bulletproof	A term used in conjunction with Noodler's inks that chemically react with the cellulose in the paper to become a permanent mark on the paper (i.e., you have to destroy the cellulose to destroy the ink mark).

dip pen	A pen that must be repeatedly dipped into a container of ink to continue writing. The toothpick pen described in the text qualifies, as does a pen you can make from a bird's feather. However, in most cases, people are referring to the dip pens that artists use or glass pens.
feathering	Unwanted chaotic ink flow at the edges of the line. There are little "streamers" of ink bleeding from the edge of the line out into the paper. Many people object to feathering. For examples of feathering, see the word "North" in Figure 1 on page 19 and the figure below it.
flow	A characteristic of a pen, ink, and paper to try to describe the amount of ink that gets deposited on the paper and how smooth that process of putting ink on the paper feels to the user.
gsm	grams per square meter; this refers to the mass per unit area of paper (i.e., the areal density). This is easy to measure: measure the mass of a sheet of paper in g and divide it by the sheet's area in square meters.
ink eradicator	A chemical that was common up to around the 1970's or 1980's that was used to bleach out fountain pen ink on paper. It was essentially a correction fluid and allowed you to rewrite something after the eradicator had dried.
nib	The metal portion at the writing end of a fountain pen. It is often tipped with a hard metal. This hard tip is the only part of the pen in contact with the paper.
nib creep	A characteristic of some nibs and inks to have the ink flow over the top of the nib and coat it with ink. Some people find this objectionable; others ignore it. Richard binder gives a good discussion of it here.
nibmeister	A person who is recognized as being expert at modifying and repairing fountain pen nibs.
permanent	A term used decades ago to describe whether inks could be washed out ("permanent" vs. "washable") from fabrics. It has an imprecise meaning today.
saturation	A measure of how strong the color of an ink is. As the saturation increases, the ink approaches a pure color. As the saturation decreases, the color washes out and becomes a gray color. In general, the more saturated inks require more dyes and may be more problematical in some pens (i.e., require more cleaning).
scratchy	Describes a characteristic of some nibs to write in a scratchy manner, either acoustically or because it feels scratchy. A scratchy nib can sometimes tear the paper, especially if it is damp or wet.
shading	The tendency of some pens with some inks to exhibit varying ink density in various parts of the handwriting. Some people highly-prize this characteristic. Here's an example:



Note the different ink densities in different parts of the writing; this is shading. In particular, note how the right part of the downstroke of the P's loop is darker than the rest of the letter. Shading can be one of the hallmarks of fountain pen use.

SITB	"Stuff in the bottle". Refers to crud that appears in an ink bottle: contamination, mold, mixing crud, etc.
skipping	A pen skips when it writes for a while, stops writing for a moment, then starts writing again. It can be caused by not enough ink getting to the nib tip (e.g., a clogged feed or ink channel) or the nib tines being too close together or too far apart.
spreading	Refers to the ink, when written on the paper, spreading out uniformly to a wider line than the nib's width. Contrast this to feathering, which is a chaotic spreading of the line's width.
stain	An ink can stain the plastic of a pen. This may or may not be important to you. Some people use "demonstrator pens" which are made of clear or colored transparent plastic to show you the internal parts of a pen. If you had one of these pens, you probably wouldn't want the plastic to be stained. If you are worried about a pen getting stained, you should research an ink on FPN and the web before using it.
waterproof	Describes inks that won't come off the paper if the paper gets wet or is soaked in water. Note there are varying levels of waterproofness; I've used some inks that will show some degradation after soaking for days, but other inks are not changed at all by soaking or boiling.

Recommendations

Pens

If you've never used a fountain pen before, buy an inexpensive pen and try one out. Here are some suggestions.

Pilot Varsity: You won't have to worry about buying ink or filling a pen. You may find that you like to take a cheap disposable pen places where you don't want to take a more expensive pen. They are a convenience for a small amount of money and you're not going to be terribly put out if you lose it. If you can disassemble them by pulling the feed/nib assembly out, then you can rinse them out and use any fountain pen ink you want.

Platinum Preppy: These are intended to be used with ink cartridges or a converter, but they can be converted to eyedropper pens with an o-ring. These can introduce you to the slightly more maintenance-intensive tasks of cleaning and filling a pen. There's an adapter that allows it to be used with short international cartridges.

Lamy Safari: Around $35. This is a cartridge pen that can be used with a converter. The Lamy cartridges are proprietary, so you'll need to buy Lamy cartridges unless you use a converter.

Hero: There are inexpensive Hero pens (made in China) that can make good first writers. These are sac pens that are easy to fill, clean, and use.

These inexpensive pens I've mentioned will be made with steel nibs (gold nibs typically don't start appearing until you get above around $100). Some write surprisingly well, some are just OK.

Since the heart of the pen is the nib, you may want to try more expensive pens. I won't recommend anything because it's a journey you'll have to take yourself -- much will depend on how much money you want to spend and what features you think are most important.

Inks

I recommend you buy a bottle of Waterman Florida Blue and use it as your first ink (now called Serenity Blue). This will set a standard for future comparisons. If you can't get a pen to work well with Serenity Blue, there's may be something wrong with the pen.

If you want a more permanent ink, I recommend starting with Noodler's Black.

A good strategy when starting out is to order samples of a variety of inks -- then test them out in the pens you like to use. A few ml of ink is plenty to see how the ink works in a few pens and once you find one you like, you can order a bottle.

Nothing you'll see on your computer will exactly predict what a particular ink will look like on a particular paper from a particular pen. You'll probably get close -- but if you set your hopes too high from what you see on the web, you may be in for disappointment, either because the ink doesn't look like you hoped or it doesn't write nicely to your tastes in your favorite pens on your favorite papers.

Paper

I suggest starting with some HP Premium Choice LaserJet paper in 90 g/m^2 weight. It's a good paper for both printing on and writing with fountain pens.

Paper behavior is variable and subjective, so you'll want to try a variety of different papers. Desirable performance is not strongly correlated with price -- remember that fountain pen users are a vanishingly small fraction of paper users and do not strongly influence the large paper manufacturers' products.

Your local office supply store may sell small quantities of various papers in their copy center. I suggest you buy a selection of these papers and try them out. You'll want to evaluating things like smoothness, feathering, spreading, drying time, smearing, blotting, and visibility of ink from the other side.

If you do find a paper that becomes a favorite, I recommend buying a reasonably large quantity -- I've had a few favorite papers and later found out that the manufacturer discontinued them.

References

If you're interested in finding places to buy fountain pens or inks, type "fountain pen seller" into a web search engine.

The following URLs were checked for existence as of 11 Nov 2018.

[*black*] http://www.fountainpennetwork.com/forum/index.php?/topic/192607-just-the-blacks/ Post concerning different black inks, their waterproofness, and links to a variety of information.

[*binder*] http://www.richardspens.com/

[*fd*] Frank Dubiel, *Fountain Pens: Complete Guide to Repair and Restoration*. Pendemonium sells some other books you may want to think about: http://www.pendemonium.com/books.htm#repair.

[*fpnir*] FPN ink reviews; the index is http://www.fountainpennetwork.com/forum/index.php?/topic/160612-index-of-ink-reviews/.

[*fpnlb*] http://www.fountainpennetwork.com/forum/index.php?/topic/183466-women-how-do-you-carry-your-pens/page__p__1849802#entry1849802 Simple but elegant design from Lorna Reed, FPN member; I thank her for the permission to use her photo. The link no longer contains the picture.

[*gp*] Goulet pens, http://www.gouletpens.com.

[*jp*] JetPens https://www.jetpens.com/

[*pd*] Pendemonium, http://www.pendemonium.com/