

# Fountain Pen Primer

Document from <http://code.google.com/p/hobbyutil/someonesdad1@gmail.com> Version: 12 Dec 2011

## Table of Contents

<a href="#">Introduction</a> .....	2
<a href="#">Tidbits</a> .....	3
<a href="#">Pen</a> .....	6
<a href="#">How a fountain pen works</a> .....	6
<a href="#">Pen construction</a> .....	6
<a href="#">Buying a pen</a> .....	10
<a href="#">Converters</a> .....	10
<a href="#">Nib</a> .....	11
<a href="#">Cap/body</a> .....	15
<a href="#">Vanishing Point Pen</a> .....	16
<a href="#">Refilling rollerballs</a> .....	16
<a href="#">Ink</a> .....	17
<a href="#">Reusing ink</a> .....	20
<a href="#">Permanence: waterproof, archival, etc.</a> .....	21
<a href="#">Are expensive inks worth the cost?</a> .....	23
<a href="#">Specialty inks</a> .....	23
<a href="#">Ink bottles</a> .....	24
<a href="#">Mixing inks</a> .....	26
<a href="#">Testing inks</a> .....	30
<a href="#">Poor-man's chromatography</a> .....	32
<a href="#">Using old inks</a> .....	32
<a href="#">Eradicator</a> .....	32
<a href="#">International cartridges</a> .....	32
<a href="#">Ink costs</a> .....	34
<a href="#">Paper</a> .....	34
<a href="#">Making your own forms &amp; booklets</a> .....	37
<a href="#">Accessories</a> .....	37
<a href="#">Carrying devices</a> .....	38
<a href="#">Pen holder</a> .....	39
<a href="#">Blotter</a> .....	41
<a href="#">Using a fountain pen</a> .....	41
<a href="#">New pen</a> .....	41
<a href="#">Things to think about</a> .....	42
<a href="#">Troubleshooting writing problems</a> .....	43
<a href="#">Other problems</a> .....	45
<a href="#">Useful tools</a> .....	46
<a href="#">Cleaning a pen</a> .....	47
<a href="#">Glossary</a> .....	55
<a href="#">Recommendations</a> .....	57
<a href="#">Pens</a> .....	57
<a href="#">Inks</a> .....	57
<a href="#">Appendix: measuring</a> .....	58
<a href="#">Length</a> .....	58

<a href="#">Mass &amp; volume</a> .....	58
<a href="#">Appendix: density of ink</a> .....	60
<a href="#">References</a> .....	62

## Introduction

A relative recently passed away and left me her Parker Slimfold fountain pen (made in England in 1958) that she bought when she was in England in the late 1950's. A few years ago she had sent it to me and I cleaned it out and got it working for her. She told me in a letter that she would make sure her executor got me the pen after she passed away. While it's a pen that doesn't have much monetary value, it has great emotional value for me -- I treasure it and love writing with it (it's 10 mm in diameter, short, and weighs less than 14 g). The executor's son had the pen for a number of months and came to like fountain pens; I suspect he was disappointed in having to give it up. His mother is planning to get him a replacement pen, so I put together a document for her that summarizes some of the things I know (or think I know) about fountain pens. Then I gathered other miscellaneous stuff I had related to pens, ink, and papers and included it. This stuff resulted in the present document.

My 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 -- and this isn't helped by all the marketing-speak and detailed technical talk by fountain pen aficionados.

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

Oh, and I'm not affiliated with any company or business -- any opinions expressed here are my own.

Now that this document is nearing completion, I wonder: how can anyone write many tens pages on fountain pens? I mean, most people will just think "Criminy, they're just sticks for writing -- what's the big deal?" So what exactly is the lure of using fountain pens? Some of the reasons you'll figure out on your own by trying a fountain pen. Here are a few things to like about fountain pens:

- ◆ **Ergonomic:** a good fountain pen on good paper affords one of the least tiring methods of doing a lot of writing. The pen can seem to glide across the paper almost effortlessly.
- ◆ **Cheap:** you can buy inexpensive fountain pens and refill them many times. This is not the case with rollerballs<sup>1</sup> and ball point pens. Over a period of time, this can result in a low cost of writing -- and less junk being put into a landfill.
- ◆ **Repairable:** you can get a fountain pen repaired if it breaks.
- ◆ **Choices:** a fountain pen can use hundreds of different ink colors available on the market. There are thousands of different pen types to choose from and you can find a length and weight that satisfies your tastes. You can spend pennies to a king's ransom.
- ◆ **Heirloom:** a fountain pen can be or become a family heirloom -- or you can use an old reconditioned fountain pen from 50 or more years ago. If you don't lose it or destroy it, a fountain pen can outlast you.
- ◆ **Attractive writing:** a fountain pen's writing can exhibit visual characteristics that many people find appealing.
- ◆ **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 be legible after getting the paper wet and have a neutral pH to avoid damaging the paper over the long term.

<sup>1</sup> There are some rollerballs that can be refilled with ink; I discuss one of these in the document.

- ◆ **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. I guarantee it will be a surprise to them, as so few people hand-write letters anymore (at least compared to the days before email and cell phones).
- ◆ **Sensual:** you'll find 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. You can also find some special papers that makes writing with a fountain pen a treat.
- ◆ **Care:** you may find that when you write with a fountain pen, you slow down and write with more care and thought. Why this happens, I don't know -- but it often does (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 carefully write now).
- ◆ **Community:** if you get hooked on fountain pens, inks, and their use, you'll find other users out there who are just as looney about them as you are.

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). However, many young folks today may have never seen or used a fountain pen, so to them it will be a novelty. Some people may also think it's cool to use a fountain pen because few people around them do.

There are disadvantages to fountain pens too:

- ◆ You may or may not be able to make carbon copies with a fountain pen (it depends on the nib's stiffness). If you don't know what a carbon copy is, then don't worry about it. 😊
- ◆ 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 can require filling and maintenance. Maintenance primarily means cleaning it occasionally. 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 (some people consider this a curse, some consider it OK, as it marks you as a fountain pen user).
- ◆ YMMV: i.e., "your mileage may vary". This means you may not have the same experiences that someone else does -- fountain pen use can be subjective and personal.
- ◆ A pen leak can coat you and your clothes with ink -- and this can turn anyone off concerning fountain pens! Of course, remember that an occasional ball point or roller ball pen can leak too.

## Tidbits

This section collects tidbits of information as I think of them.

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. You'll also look for a pen and ink that work well on a large variety of papers. You'll find you do quite a bit of experimentation to find what you like, mainly because using fountain pens can

sometimes be quirky -- and that helps give fountain pens their character.

**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. In other words, "one man's meat is another man's poison". For example, some people wax rhapsodic about the latest high-priced offerings from well-known manufacturers and steal money from their childrens' college funds to buy these pens (OK, I'm (mostly) kidding ☺). Others just view the pen as a writing stick and focus more on the experience of writing with the pen. And there are all variations in between. The take-away here is that only you can define what's important to you. Listen to others' opinions, but the decision on what to buy and use is ultimately yours, so get and use what makes you happy. And remember, it's a journey -- not a destination.

The Fountain Pen Network (FPN) contains lots of discussion on fountain pens, inks, and papers: <http://www.fountainpennetwork.com/forum/>. While there's a lot of material to read and sort through (not to mention conflicting opinions), you can learn a lot about fountain pens, inks, and paper there. There are also a lot of blogs discussing fountain pens and their use.

Richard Binder has lots of information about fountain pens and an extensive glossary on his web site <http://www.richardspens.com/>.

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.

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.** Of course, if you're interested in expensive pens and the prestige you feel that is associated with them, that's fine too. However, let me relate what I've heard from a number of people. These people get involved in acquiring fountain pens and go down the rabbit hole of "more expensive must mean it's better" (yep, I've gone down that rabbit hole too, so I know whereof I speak ☺). After acquiring some more expensive fountain pens, they decide to try some cheap and/or disposable fountain pens. They're stunned to find that some of these cheap pens can write as well (or better!) than some of their expensive fountain pens. Keep an open mind and be willing to try new things.

One of the major reasons people like fountain pens is that it can be nearly effortless to write with one. A smooth nib, a good ink, and a fine paper can result in a very pleasant writing experience. Most people find that they press way too hard when they first start writing with a fountain pen -- this is because we get conditioned to using ball point pens.

Many 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 (my relative's pen is about 50+ years old and it works just fine with its original rubber sac).

You can go to ebay (or vendors such as <http://www.isellpens.com/hero.htm>) and find cheap but surprisingly functional pens from Chinese makers like Hero. Around 1996, I had a friend from work who visited Hong Kong bring me back a box of 12 Hero fountain pens for \$10 -- that meant fountain pens at a cost of 83 cents apiece. One or two of them had problems, but I wrote lots of stuff with the others (and I'm still using them today). I enjoyed them and didn't worry when I lost one, as they cost me less than a dollar each. One of my pens my wife bought me for only a dollar delivered to the US from Hong Kong (!) -- and it writes quite nicely. Thus, good deals can be found, but of course you're taking a little more risk. I have a number of Hero 616 pens which look a bit like the famous Parker 51 pen; these Hero pens can write surprisingly well and I've used one for years as my favorite everyday writer for black ink. I was able to buy these for about \$1.5 each directly from Hong Kong. This was a few years ago, but as of 23 Nov 2011, there are sellers on ebay still selling packs of ten of these pens for around \$15 delivered. And, apparently, it's such a popular pen that there are

people out there selling counterfeit<sup>2</sup> Hero 616s -- so you may want to read a bit more about such things on FPN before buying something blindly.

You can also buy nib assemblies and make your own fountain pen. Here's an extra-fine point I bought (along with a medium) to make my own pen one of these days:



This particular nib and section is set up to take **cartridges**. I'll make the pen use the **International cartridges** as I have a number of different inks in that style.

Type "fountain pen" into a search engine and you'll find a gazillion places that sell fountain pens. There are a number of stores in e.g. Manhattan (such as the Fountain Pen Hospital), as well as pretty well-known stores around the country. They're all competing for your dollar. There was one store in Manhattan (I can't remember their name) that sent me a gorgeous thick full-color and expensive printed catalog of expensive fountain pens (usually \$500 on up to tens of thousands of dollars). Such a marketing expense tells you that there's a lot of mark-up in some of these products.

One of the most important rules for fountain pen use is: **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 needs detailed cleaning because the last user didn't clean it out. This policy can require conscious effort on your part -- it's easy to get many pens inked that you are writing with at one time. Then, after the interest wears off a bit, you forget about those inked pens and they get dried out. Thus, 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. However, 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.

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. I recommend beginners start with Noodler's Black, as it's an excellent basic ink that should work well in many pens and on many papers. Since it bonds chemically with the cellulose in the paper, it's a permanent ink (i.e., once it's on the paper, it's not coming off without the paper getting damaged). With any ink, if there's ink residue on top of the paper, it may still wash off, even if the ink underneath it has bonded with the paper.

You may want to try your hand at making your own quill pens as they did for centuries. Here's a web page that discusses the basics and you can no doubt find more (search on "make your own quill pen"): <http://flick.com/~liralen/quills/quills.html>. I haven't tried it -- but our pet ducks have been a bit nervous around me lately for some reason. ☺

---

<sup>2</sup> It's interesting that people are counterfeiting a pen that's already a counterfeit!



# Pen

## How a fountain pen works

Here's a description from about 100 years ago [eb] (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 outflowing 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, I refer you to Binder's website: <http://www.richardspens.com/?refp=anatomy/lever>. 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 of my relative's Parker Slimline pen:



The basic operation is that 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 gravity and 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. This was the fundamental advance 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 actually have been few really revolutionary advancements in the fountain pen since the early 1900's (marketroids' claims notwithstanding). Still, it took many years and design evolutions to reach good, reliable designs. You can tip your hat to the many folks who tried various modifications and improvements and weeded out the poor ideas over the years. 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 (a few dollars) Chinese pen that looks similar to the famous Parker 51 pen; I use one of these Hero 616 pens for my daily writer with black ink.



These pens can be disassembled by unscrewing the sac assembly with respect to the nib's hood; it's a right-hand thread. A pen pro would use a properly-made tool (or two rubber grips), but I just used a pair of Channellock pliers and didn't mind the small ding in the plastic. You can see that 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 and 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 pens are:

- Sac** A flexible **sac** (some folks spell it "sack") holds the ink. The sac is squeezed by various means (an external lever was commonly used to squeeze the sac without disassembly on older pens) and the nib and feed are immersed in a bottle of ink. The ink is drawn into the sac. If you have a pen with a broken sac, it may be something you can fix yourself with a little effort: <http://www.pentrace.net/article012901050.html>.
- Cartridge** A sealed plastic cartridge containing ink is dropped into the barrel. When the barrel is screwed to the section, a metal nipple punctures the end of the cartridge, carrying ink to the feed through the hollow nipple. The cartridges can be replaced with **converters** (typically around \$5-\$10), which are small devices with an internal piston. Converters let you use bottled ink in a pen that takes cartridges.
- Piston** A **piston** 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.
- Eyedropper** The pen's ink storage is a cylindrical volume that is filled with ink using an eyedropper or syringe. This design typically gives the greatest ink storage for a given pen. It's also reliable, as 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.

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 -- one of the most important is that in some pens a spare cartridge can be carried in case you run out of ink (this is usually in pens that can take the short international cartridges). This is a real advantage -- 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 basis, cartridges are more expensive than bottled ink, so you pay for the privilege of using them. A surprising thing with the typical plastic cartridge (probably most are made from polyethylene) is that water can evaporate from the cartridge over periods of years by permeating through the plastic. I've seen this happen on four or five different brands, but it can take decades. Normally, this isn't an issue because you'll use the cartridges up.

As mentioned, 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, a desirable feature.

Some pens come in "demonstrator" models. This name comes from the older days when 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.

Some people convert inexpensive pens to eyedropper pens (search the web for "eyedropper pen conversion"). I haven't done this, but from an engineering standpoint, I'd worry about the type of seal used to keep the ink in the pen -- if it fails, you've got a messy situation. My first choice would be a **properly-designed** o-ring seal or square-cross-section rubber seal. (Note I said "properly-



designed" -- this probably doesn't mean the usual barrel-to-section seal in a typical pen.) Next would be a compression-type seal used on e.g. Nalgene bottles -- but these could be difficult to engineer into the small diameter barrels. I've heard of people also using waterproof silicone grease or dripped candle wax on the barrel threads. On the web, you can read about people who convert Platinum Preppy pens into eyedropper pens using an o-ring with a 3/8" OD, 1/4" ID, and a 1/16" cross-section. The o-ring is optionally covered with waterproof silicone grease<sup>3</sup> as are the threads of the section. You should then have a pen that writes for a long time without filling. Note that using Teflon tape on the threads to make a seal is not recommended for two reasons: the threads aren't tapered threads like pipe threads (and thus interfering; i.e., they'd probably leak even with the tape) and the plastic threads are not strong enough to avoid damage in general when used this way. A design issue I've read about is that it's easy to cause cracks and potential leaks in the Platinum Preppy pens by screwing on the barrel too tight.

If you do make such a conversion, note that you may be in for some surprising and less-than-desirable behavior of such a pen. If the pen has a tiny vent in it you didn't see, you may have an ink leak. The warmth of your hand can cause the air in the barrel to expand, causing ink to weep from the feed. The seal might leak over time. Such problems would not be desirable, especially if you were traveling, in an airplane, etc. Thus, you might want to research the issues on the web before playing with such a conversion -- then use the pen quite a bit at home before venturing out into the wilds with it.

I've not owned a piston or eyedropper pen, so I can't comment in depth on them. I've used both the cartridge and sac pens and can be happy with either.

Unfortunately, a number of pen brands use their own special size of cartridge rather than using the International cartridge (here's a list from Goulet Pens: [http://www.gouletpens.com/Cartridge\\_Converter\\_Guide\\_s/1049.htm](http://www.gouletpens.com/Cartridge_Converter_Guide_s/1049.htm)). Two that I've used are Parker and Shaeffer. Others I've read about are: Aurora (same as Parker cartridges), Cross, Lamy, Pilot, Platinum, Sailor, and Nakaya. Sheaffer has two different sizes of proprietary cartridges. If I was going to buy a pen that took cartridges, I would try to get a pen that used International size cartridges. However, if I was really sold on the pen, it wouldn't bother me all that much to have to use the special cartridges as long as I liked the inks the manufacturer sold. But I would make sure the pen could be used with a converter because I might want to use other inks than those supplied by the manufacturer.

If you are locked into a proprietary cartridge, you can refill them after they run dry (use a hypodermic syringe and a blunt needle). This, however, will eventually fail because the seal around the puncturing rod will eventually fail and the cartridge will leak ink into the barrel, making a mess.

I tend to prefer pens that are lightweight. To give you an idea of pen masses, here's a list of measured masses of some of the pens (with caps) that I have on hand (+ means the pen had ink in it too):

---

<sup>3</sup> You can find waterproof silicone grease in any hardware store that sells plumbing supplies.

Pen	Mass, g
Pilot Varsity +	8.5
Sheaffer pen (inexpensive pens that were made in the millions and blister-packed with two cartridges)	10
Parker Slimfold +	12.5
Hero 332 +	14
Mont Blanc 144 +	16
Hero 616 +	17
Unknown brand (oriental "maki" style) +	19
Parker (unknown model made in France)	19
Hero "Dragon" pen	38
Faber-Castell (unknown model)	47
Laban mother of pearl +	48
Custom-made pen	82

## 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. Hopefully, 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 70's and before, it was common to be able to walk into nearly any drug store or stationery store and find a decent selection of fountain pens (but not many of these stores let you try out pens by dipping -- that was usually reserved for the pen boutiques). 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 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.

This particular design piques my engineering interest, as it is a rather highly-engineered piece despite its mundane appearance. The thread on the piston's shaft appears to be a high-lead double interrupted thread and it appears to be a much-truncated Acme-style thread. The amount of friction with the "nut" (the black shaft on the right) is just perfect. The metal band at the left end likely is involved in making the ink-tight junction between the clear plastic hollow tube and the black plastic

piece that mates with the feed's nipple, but just how it's done I can't tell without taking the thing apart (I would imagine it's compressed beyond its elastic limit to deform its size to effect the seal). Overall, it appears to me to be well-made and nicely designed.

Typical converter retail costs range from perhaps \$5 to \$10. This probably means they cost under \$1 each to manufacture.

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. One other piece of advice I've read is 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. Apparently, 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 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**. And 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).

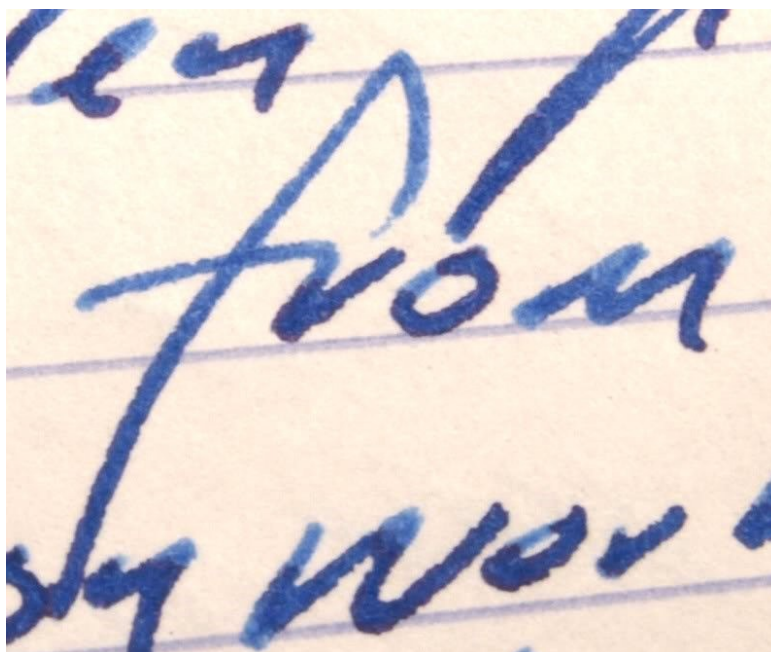
Personally, I only have a few pens with gold nibs on them; some of them are good and some are so-so. I also have cheap Chinese pens with steel nibs on them and some of these write quite well. They probably won't last as long as the expensive nibs; but, on the other hand, some of these pens cost me about \$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.

One thing to be aware of is 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 point material was made in Germany -- and basically, the whole point is fabricated in China. It's not a barefaced lie -- but it isn't the entire truth either -- because the intent is to get the consumer to think something that isn't true. Of course, a vendor would just say, "Oh, that means just the tip material is made in Germany" -- so it isn't prosecutable as fraud. As always, 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. You can pay more to the big names in the nib business ([Binder](#) and [Mottishaw](#) are two) and get a nib customized exactly the way you want it. As this is such a personal thing, I don't think you'd need to bother with such a thing for your first pen or two -- get a few months or years of experience with fountain pens before you make such decisions. But, as always, you pays your money and takes your choice.

Nibs are often 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. I tend to prefer finer point pens for everyday use because I like a line width of around 0.4 mm or so for both drawing and writing. For writing letters, I can be happy with a medium point. Line width varies with the type of paper and ink used too -- and the "flow" of the nib, meaning how much ink it lets get 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 (and that's all I use, so I guess I'm still a beginner ☺).

Some pen/ink/paper combinations can give a characteristic called **shading** that some people swoon over -- 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 (I refer you to the web for more information on these if you're interested).

Testing a pen before you buy it can be quite important. You may have to go to a specialty store to do this; however, ask at the store that has a pen you're interested in. If you're really serious about the pen, bring some innocuous ink like Waterman Florida 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. The reason is that 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. I have a particular pen that is labeled as having a medium point, but it writes very wet with the inks I've used it with -- almost to the point that I'd call it a broad point. With Waterman Florida Blue ink, the pen puts down such a heavy line of ink that it can take a minute or so for the ink to dry. The result is a very saturated line with no shading. This particular pen gets used mostly for writing letters -- it's too wet to use as an everyday pen because there'd be too many opportunities to smear the ink. I would have spotted this behavior in the store if I was considering purchasing the pen and either switched to the fine point or not purchased the pen (the pen was a gift and I was unable to return it).

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 probably look carefully at something like 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.

Here's a table showing the measured written line width (using a 20X Dumaaurier Micro-Mike) for some of my pens:

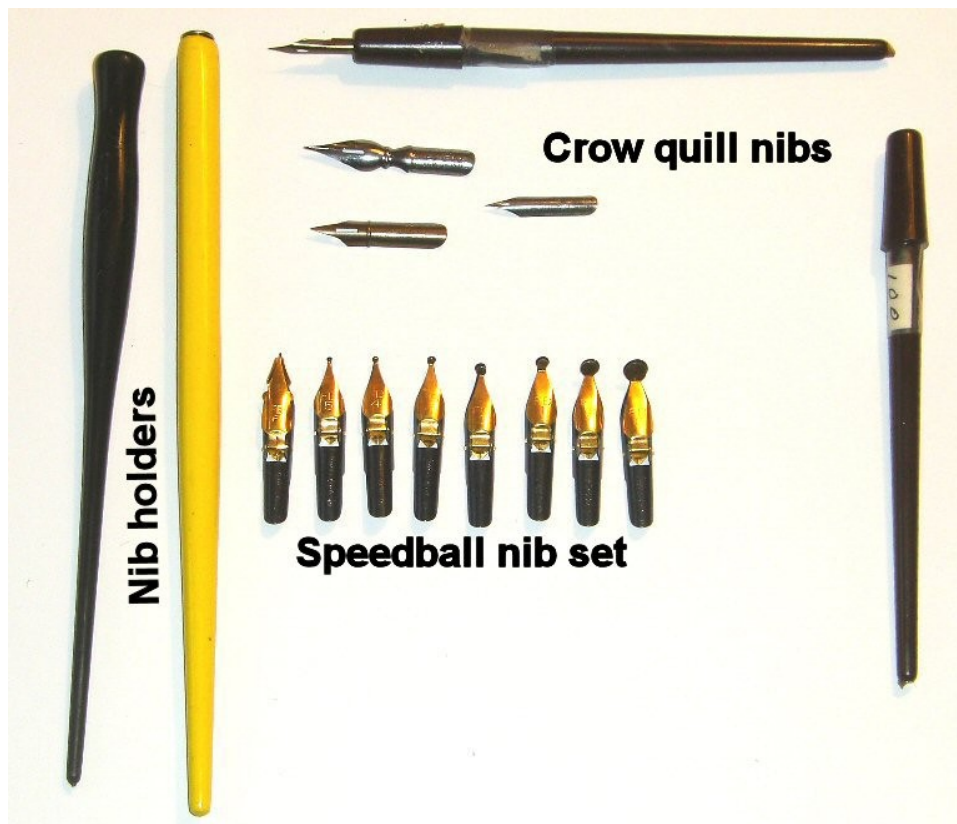
Pen	Line width, mm	
	Normal	Upside-down
Hero 616	0.4	0.28
Mont Blanc 144	0.4	0.3
Parker Slimfold	0.5	0.2
Hero 332	0.4	0.3

Note that most pens can be used upside-down to write a finer line. The Parker Slimfold (my relative's pen) is superb at this; most pens are a bit scratchy when used upside-down).

### 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 (but be aware that getting the results they show can take a lot of practice).

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

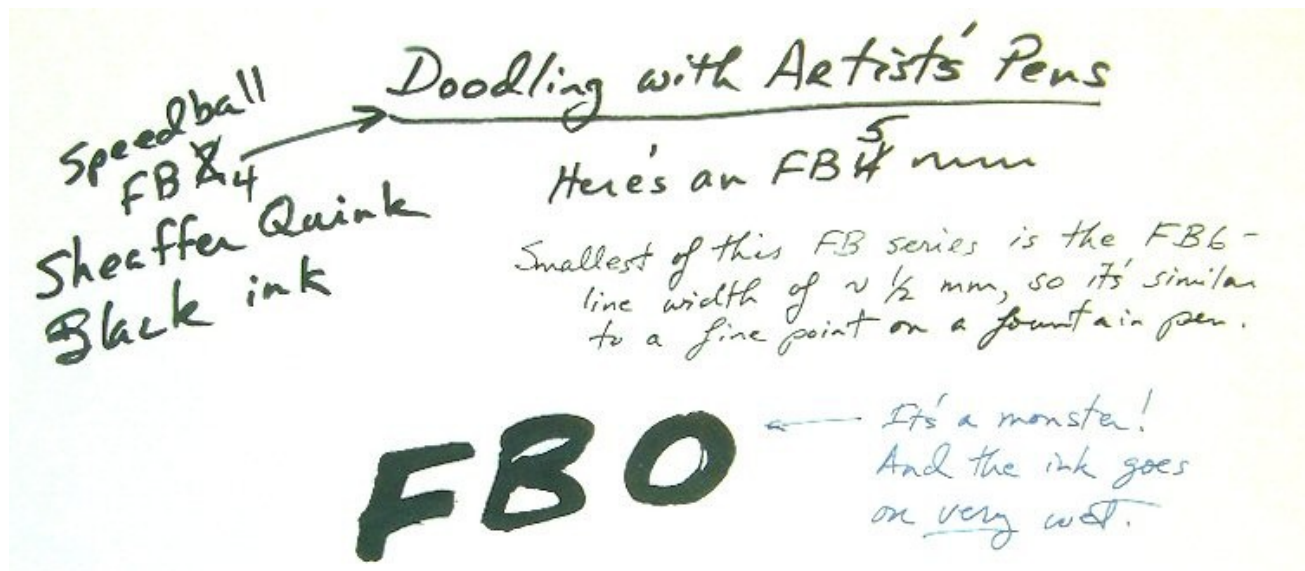




The yellow handle is 177 mm long. Eight Speedball nibs<sup>4</sup> are shown lined up and are numbered from left to right (in true screwball American style) as FB6, FB5, FB4, FB3, FB2, FB1, FB1/2, and FB0. The three nibs above them are crow quills, as is the one in the handle. The nibs are just pushed 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).

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.

Here are some doodles made with the Speedball nibs:



You can see that the FB0 nib writes a very broad stroke. It also put the ink heavily onto the page; I had to put a tissue over the writing and blot up the excess ink. I also mixed up my ink names and called it Quink, but Quink is a Parker ink -- Sheaffer's ink is called Skrip.

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. The advantage of these Speedball nibs is that you just dip them in the ink and write. They are easily cleaned off with a damp tissue or paper towel and then you can try a different color ink. The Speedball nibs have two brass-colored attachments that help the nib hold more ink (their function is similar to the feed in a fountain pen). They are an interesting mechanical design in that they can be flipped up out of the way so that the nib can easily be cleaned.

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 do this occasionally, I recommend you use a toothpick and a holder, as it's virtually no cost and easy to make. With my frequent attacks of maladroitness, I'd probably drop my glass pen and break it immediately after I got it. If you remember fiddling with glassware and a Bunsen burner from a basic chemistry class, you might even want to try to make a glass pen. Here's one website that describes

<sup>4</sup> The Speedball nibs came in a box marked Camden, New Jersey, so this probably dates those nibs to before the late 1950's. As they came from my father-in-law after he passed away, I'd imagine they probably date from the 1940's. The dark blue color probably indicates that the steel has a spring temper.

the process: [http://www.arrowsprings.com/html/making\\_glass\\_pens.html](http://www.arrowsprings.com/html/making_glass_pens.html). JetPens has a nice introduction: [http://www.jetpens.com/articles/Article:\\_How\\_to\\_Use\\_a\\_Glass\\_Dip\\_Pen](http://www.jetpens.com/articles/Article:_How_to_Use_a_Glass_Dip_Pen). Also take a look at the Ernst website: <http://glasspens.com/pens.html>; they make some attractive pens that sell in the \$60-\$150 range.

The practical side of me rebels at the fancy crud that many makers put on the pen where you hold it. I would prefer to have a constant diameter cylinder where I hold the pen, as that's what I'm used to. YMMV.

From some casual reading on FPN, it appears that glass pens can sometimes be a bit scratchy and they can take getting used to because you have to rotate the pen to get a new helix in the "feed" involved in giving ink to the point. The scratchiness can be taken care of by getting some fine polishing paper (from an auto supply store) and smoothing the nib. Like any dip nib, the pen will write darkly when freshly-dipped, then the line will dry out as the ink is used up. One use could be to use a waterproof or India ink with a glass pen to write the address on an envelope; this would save you the trouble of inking up a fountain pen. Another person commented that they use the glass pen for writing with Noodler's Blue Ghost, an ink that is invisible in normal light but that fluoresces under ultraviolet light. A common comment by users is that the glass pens tend to put down more ink than a fountain pen, meaning the ink will appear more saturated (an artist's dip nib behaves the same way). Thus, for imagining what a particular ink will look like with either kind of dip pen, wait until the writing indicates that the nib is drying out. Some quick experimenting and comparing with a fountain pen or two will get you calibrated.

## Cap/body

There are many different designs and materials. Sometimes the marketroids go a bit overboard -- like Mont Blanc saying their pens are made from "precious resin" -- sheesh, it's just plastic.

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. Purists with expensive pens will sometimes not post their caps because this can scratch the end of the barrel and reduce the value of the pen to another pen geek. 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.

Interestingly, one of the popular materials for pens (especially feeds) is ebonite, a plastic used to make bowling balls. This is a nicely-machinable material. A few years ago, one could watch a live video of a guy who makes ebonite pens in his shop: <http://edisonpen.com/>. Take a look at <http://edisonpen.com/page.cfm/Custom-Orders> to see some of the different materials available besides ebonite (lots of acrylics). There are also places that sell such materials and you can make your own pen if desired.

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. My relative's Parker pen is a threaded cap. 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 (and a pen like the Pilot Vanishing Point may interest you). 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 (like my relative's) will be either too short in your hand for your tastes, too light, or they won't have the right balance. I prefer to use my relative's pen with the cap posted.

One of the things I look for in a pen is a (nearly) air-tight cap. I pull the cap off and pull a suction on the open end of the cap with my mouth. If I can feel air come in (i.e., it won't hold a vacuum), then the cap isn't air-tight. I've found that my favorite Hero 616 that writes well has a cap that is nearly air-tight (all the other 616's I have aren't nearly as air-tight). This particular pen can stay capped and unused for weeks and it will start writing as soon as I pick it up. My other pens with "looser" caps won't do that. The other pens that I have that can sit for a while without use and write when picked

up also have nearly air-tight caps. Of course, this also requires that the cap not leak air around the cap to pen seal too -- and testing that would take more effort or sophisticated equipment than a quick test in one's mouth. All other things being equal, look for a cap that leaks as little air as possible. You may be able to plug any leaks with a suitable material (glue, epoxy, wax, modeling clay, etc.). If I was going to try to seal a cap, I'd probably first try some shellac in alcohol first by e.g. wetting a long Q-tip and trying to coat the inside around the top of the cap and clip penetration (if any). Note: see my comments at the end of the **Troubleshooting writing problems** below, as I'm not positive an airtight cap is necessary.

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

The pen's pocket clip can be important to some folks. When I'm working, I typically carry a fountain pen in my shirt pocket and I want 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 minute 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 is a review: <http://faculty.haas.berkeley.edu/rjmorgan/openions/pilot.htm>. Here's a picture:



You also may want to take a look at Brian Goulet's videos on this pen at e.g. [http://www.gouletpens.com/Pilot\\_Vanishing\\_Point\\_Black\\_Carbonique\\_Pen\\_p/pn-vp-blkcbrhod.htm](http://www.gouletpens.com/Pilot_Vanishing_Point_Black_Carbonique_Pen_p/pn-vp-blkcbrhod.htm).

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. Personally, I wouldn't know until I had the pen in my hand and tried to write with it (I've never held one of these pens). The pen is also 30 g, so it's roughly twice the mass of the pens I normally like to use. Thus, before you buy the pen, you should find some place that will let you try it out, as the usual policy of most stores is that once the pen has had ink put in it, it can't be returned. The Vanishing Point pen can be used either with Pilot cartridges or a converter.

## Refilling rollerballs

Sometimes I want to write with a rollerball pen. Years ago I bought a package of Staedtler Liquid 7 pens; there were four pens in the package in black, blue, red, and green inks. These are nice pens to write with, but they're also interesting to a fountain pen user because you can take them apart and fill them with your favorite fountain pen ink. They can be pulled apart with your fingers. It can take a goodly amount of flushing to get them clean -- and remember to pull out the center wick and flush it too. I have one of these filled with FPN Galileo Brown (a bulletproof ink made by Noodler's) and it can sit for a year or more, then start up writing immediately. It works quite well. Note: I did this a few years ago with pens I probably bought around 2005. You may or may not find that the pen design is the same (e.g., they might be gluing the pens together to stop people from doing such

things).

Some companies sell roller ball pens that are intended to be refilled with fountain pen inks (e.g., Noodler's, Platinum Preppy).

## Ink

Fountain pen ink is special in that it will never clog a pen in normal use with proper maintenance. One of the absolute taboos is using an ink like India ink or technical drawing ink in a fountain pen -- these inks can clog the pen in short order and can sometimes ruin the pen because 1) they can contain pigments that will clog the pen and 2) they can contain shellac that will dry and clog the pen. Read Binder's <http://www.richardspens.com/?page=ref/care/inks.htm> page for some more information. 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.

These modern inks are basically dyes dissolved in water. Other additives are used in small quantities to change the viscosity (I've read fountain pen ink has a viscosity about 50% or 60% of water) or flow properties, reduce the possibility of crud growing in your ink, or surfactants to improve writing properties. See **Appendix: density of ink** for an example of measuring the density of an ink.

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 will likely 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.

Some people can go overboard in buying inks (the same type of "overboard" that many people with pens exhibit ☺). I have over 50 different samples of ink that I've traded with people I found on the web -- and probably a fourth of them are still untried. A very generous friend I made on-line sent me 4 or 5 different bottles of ink and some pens for free because he had too much on hand (and had told me that he had a number of other recipients for such stuff too). I used samples of these inks to trade for other inks with other folks on FPN. Such an inventory is valuable because it lets you try out different inks and find something you like. However, be forewarned that another rabbit hole waiting for you is the search for the "perfect" ink. You can see lots of ink reviews at [fpnir]. Also take a look at Glenn's Pens page at <http://www.marcuslink.com/pens/ink/index.htm>.

Another source of information on inks is to search the web -- 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 (but it's at least a guide). 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.**

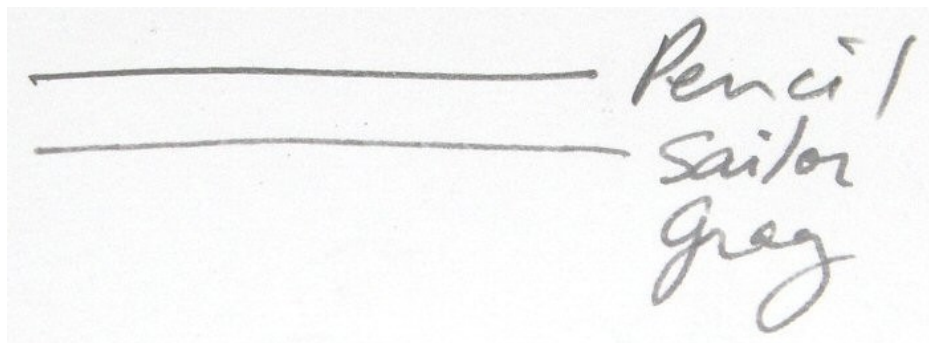
Here's a good example of this principle. I had been wanting to try two of the Pilot Iroshizuku inks, but I wasn't willing to pay \$30 per bottle to just try the ink. I ordered some samples and when they came in, I tried them with a Hunt 512 dip nib. One of the inks looked like it was exactly what I wanted and what I had in mind from examples seen on the web -- I was quite enthusiastic about it after seeing the writing sample. However, when I later inked up the pen that I would use it in and did some writing with it, it was much lighter and not what I wanted. While I could probably get what I wanted by mixing some of these inks (or paying someone to change the pen's nib), it's more trouble and expense than it's worth to me, so I won't be buying a bottle of this ink (but I'll still use up the sample, so it wasn't a wasted purchase).

Some businesses sell small samples of various inks. This is convenient because it can allow you to



try out a candidate ink without buying a whole bottle. One way to find such places is to do a web search for "fountain pen ink samples". Also check FPN's classified ads, as there are members who sell ink samples. Another way to get samples of ink is to buy a few bottles of various inks, then post a message on FPN that you're willing to trade some samples of your inks for samples of such-and-such inks (start at <http://www.fountainpennetwork.com/forum/index.php?topic/127-ink-sample-exchange-united-states/>). This is how I got nearly all of my samples.

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, even after trying Herbin's Gris Nuage a few years ago. However, I recently tried Noodler's Lexington Gray and Sailor Gray in a fine point Hero 616 and they write surprisingly like a pencil. This may be desirable under some conditions; here's a photo:



I purposely pressed a bit hard when drawing with the 0.7 mm pencil for the picture; my normal writing is a bit lighter with the lead hardnesses I like to use. The Sailor Gray is just a bit lighter than my pencil work; the Lexington Gray is just a bit darker. Both inks appear to be waterproof in my informal tests, so I would use either for long-term documentation. Interestingly, both the pencil and the pen marks measure to be 0.40 mm wide (both highly magnified on the screen and with a Micro-mike on the paper), although the pencil line appears to my unaided eye to be slightly wider. This is probably some well-known optical illusion related to the density of the line -- I had to measure multiple times to convince myself they were the same.

Typical inks are \$8 to \$15 per bottle (more expensive inks can be \$20-\$35 per bottle) and there are many hundreds (maybe thousands) of inks to choose from. There is a huge selection of colors available (non-inkaholics would say a disgusting number ☺). Two advantages to 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. If you want to get an idea of how many inks are or have been out there, take a look at the Fountain Pen Network's section on [ink reviews](#).

There are numerous brands. Some of the brands I've used are Sheaffer, Parker, Private Reserve, Diamine, Noodler's, Herbin (French; pronounced air-bahn), Rohrer & Klingner, and Waterman. There are many others.

I have a fundamental rule: all my ink stuff must fit into a shoebox. It's too easy to collect a bunch of inks, so I have to toss it out or give it away if I don't have room for it<sup>5</sup>. That should indicate how easy it is to collect lots of inks. In the last 30+ years, I've only purchased a three fountain pen inks -- the rest came from trading stuff that was given to me by kind friends or relatives.

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.

---

5 In a moment of weakness I might get a larger shoebox...



Some inks are touted as fast drying. This can 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 (Noodler's made the ink for Swisher's, so there is probably something currently available that works as well).

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. Probably the most famous of these 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<sup>6</sup> 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 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.

A thing a bit hard to internalize for newcomers to fountain pens is that 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 careful records, you'll find what works well for you.

You may be surprised by some inks. For example, one of the inks I purchased locally was a Pelikan red. When I got it home, I was a bit surprised to find that it was a weak red, almost like looking at Mercurochrome<sup>7</sup> (if you are old enough to remember that stinging red liquid mothers put on their kids' cuts). After writing with it, it was a plain orange-colored red on the page with no shading. While certainly a readable ink, I was disappointed with it after a few uses and no longer use it. I've read other people's comments on it and they like it, so don't construe this as saying that Pelikan red is a bad ink. It just didn't suit my tastes compared to some of the other red inks I have -- our preferences for certain inks is often largely subjective.

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 (<http://www.judikins.com/firsts/microglaze.html>) 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<sup>8</sup>). 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, 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

---

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

7 It is no longer used in the US because it contains mercury. Its often called Merbromin; this name also indicates that it contains bromine.

8 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.

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. Also note that, perhaps contrary to intuition, a good pencil mark can provide quite good archival qualities as long as it isn't erased.

If you have access to black walnut trees, you can make your own black walnut ink from the husks of the nuts. But these inks should be used with a dip pen, not a fountain pen. You can also make ink from oak galls. Search the web for more information if you're interested.

When using inks, don't be hesitant to try some experiments, especially with dilution with water (but start with small quantities in separate containers so you don't ruin a bottle of ink). For example, people have suggested diluting Noodler's black ink by 10:1 with water to get a gray ink. I dilute Private Reserve DC Supershow Blue 50:50 to use in a Parker pen I like writing with -- and to my eye it looks better than the undiluted ink.

I would hazard a guess that the majority of ink that is purchased doesn't get used. Many ink aficionados buy a bottle, try it out, then move on to new bottles in search of the perfect ink. I know with the shoebox of inks that I have, it will take me a decade or more of writing to use up all the ink I have.

## 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.

Since my cleaning of a pen includes flushing it with water until it runs clear, I don't have the worry about mixing some previous ink with the new dose. Of course, there are probably miniscule remnants still getting mixed, but I consider that ignorable. This practice has worked fine for me for many years.

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. I think this is a great idea if you don't want to put your inks back in the original bottle.

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. Resist the temptation of putting a blob of warm wax or putty over the hole, as that will potentially leave material behind and it will get into the pen. 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". Of course, 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, and pH-neutrality to avoid damaging paper over long periods of time.

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, but the horse is long gone from the barn. The time to think about permanency is when you're doing the writing or before.

For fountain pens, there are two types of inks that can be considered for permanency. The first type is the "bulletproof" or "eternal" types of inks sold by Noodler's. These are formulated with a cellulose-reactive component that chemically bonds with the cellulose in the paper. Thus, clearly, the ink must get into the fibers of the paper to do this, so a paper with lots of sizing, a coated paper, or a plastic "paper" may not exhibit this permanency. The bulletproof inks also are touted as being resistant to UV fading. Private Reserve is now selling inks such as their Invincible Black that appears to aim at permanency -- at least by name. Unfortunately, the ink companies appear to be uniformly poor at describing their inks on their websites<sup>9</sup>, so I can't tell for sure.

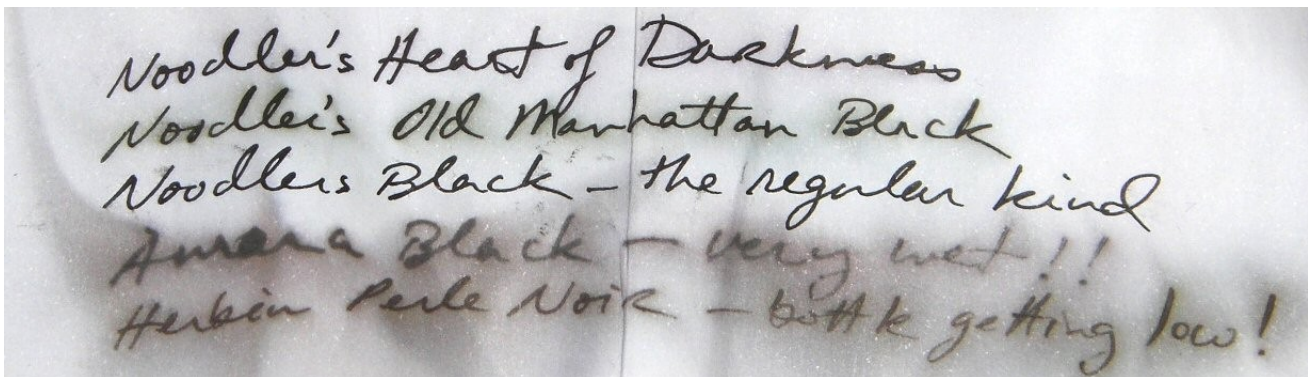
The second type of fountain pen ink for permanency is iron gall ink. Diamine's Registrar's Ink is an example. You'll want to be careful about using such an ink in your pen because its pH might not be friendly to your pen. The pH problem is lessened by using gold nibs, as gold is more resistant to corrosion problems. You'll also want to research as to whether the iron gall ink you're using is pH-safe for long-term archival storage of the document.

You can test waterproofness by soaking a piece of paper with writing in the ink(s) of interest in water. I usually soak the paper overnight, but you can also try things like spilling some water and wiping off immediately, simulating a spill you might make. Or, spray the writing with a mist from a spray bottle to simulate it getting wet in the rain. When I first started doing such tests with Noodler's bulletproof inks, I'd also test the ink by boiling it in water for a while, but then realized that that isn't a terribly useful test, at least in simulating the kinds of things that can go wrong. The overnight soak in water is more than sufficient for my needs, as the non-waterproof inks are usually completely gone or illegible after the soaking. I also tried various solvents (acetone, MEK, alcohols, etc.) from the shop and bleach to learn more about how resistant to attack these inks were.

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

---

<sup>9</sup> Or I'm uniformly poor at reading. ☺



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. This test shows the result after soaking in water for about 10 hours. The Noodler's Heart of Darkness and Black inks showed no change at all. The Old Manhattan Black has a slight yellowish tinge to the writing (I'm assuming this was due to a small amount of some component lifting off the paper). 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. However, Heart of Darkness is my favorite black ink and I use it for writing that I want to be absolutely permanent -- for example, I use it in a particular notebook where I keep results of experiments. Since these experiments can take a lot of effort, I want the written results to be permanent so that a spilled glass of water won't make something illegible down the road. The only time I have problems with Heart of Darkness is on some cheap index cards because it feathers; if I need to do a lot of writing on such cards, I'll switch to Noodler's black, which is a very well-behaved black. Since other folks in the eternal pursuit of the "blackest black" have different opinions, I encourage you to do your own such tests. [black] is a useful post at FPN concerning black inks. And, a warning: there is no "blackest black". Once you think you've found it, experimentation with the inks on different papers and in different pens will likely give you different results.

There's a third type of permanency that has to do with forgery. You've probably seen or heard about how ballpoint pen inks can be easily washed from paper by solvents like acetone. Some of the inks being sold are claimed to be very resistant to the attacks like this that a forger might use. I have no real experience with this aspect of ink usage, so I can't give any further advice -- except that it's pretty easy to test whether an ink is resistant to being attacked from things like acetone and other solvents, bleach, hydrogen peroxide, etc. The appearance of some inks on paper may be modified by such treatments, but still legible. Personally, that would be my choice of an ink because I could tell that it had been attacked, but the writing would still be visible and usable.

I've also tested some roller ball inks and found a few to be as waterproof in my tests as some of the fountain pen inks. I hesitate to give any of my data here, as it's always possible an ink formulation can change over time -- thus, it's best if you do some simple testing yourself on the inks you have to ensure things behave as you expect (or research things on the web). Remember that an ink that's touted as waterproof may permanently stain something you accidentally get it on. Because of this, I do my ink mixing and filling in one of our bathrooms with a sink that doesn't stain (at least it hasn't yet ☺) and a linoleum floor. My wife would undoubtedly kill me and get off Scott-free with a jury of her peers if I spilled some of my waterproof inks on the carpet.

The small ink sample bottles can work conveniently for small waterproof tests; here's a picture of a sample that was tested overnight in water with the ink on newsprint:



## Are expensive inks worth the cost?

This is a common question and can really only be answered by your own testing. However, the question has been asked on FPN in various forms over the years and I thought I'd copy the opinions I gave in answer to one such question:

- ◆ There is no relationship between the cost of the inks I've used and their performance. Just like pens, the marketers use the principle that many people think "Oh, if it costs more, it must be better". Yeah, right -- occasionally in life it actually is true. Rather, it's a rabbit hole into which many of us go down, never to return.
- ◆ Ink performance is largely a subjective topic and, thus, up to the discrimination of the user. In other words, you define whether that ink works well for you or not. I hate inks that others love and vice versa.
- ◆ You know that ink review/blog/whatever you saw that made your mouth water for a particular ink? Guess what? When you use that ink in your pen(s) on the paper(s) that you like to use, you're virtually certain to see a different result. You may be ecstatic or crestfallen -- or somewhere in between.
- ◆ When you find an ink you fall in love with, hold off on taking it to the altar. First, try it on a large variety of papers with the pens that you will likely use -- I have numerous times found a "perfect" ink only to find out later that it didn't work well with some pens or papers.
- ◆ Because of the ridiculous number of ink choices now on the market, I suspect many people continually search for the "perfect" ink. Because of this searching, I would hazard a guess that most ink purchased goes unused.

## 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. If you used such an ink, you might be able to avoid a damaged pen because of the expansion causing e.g. cracking if a normal ink should chance to freeze in the pen.

There are scented inks on the market -- J. Herbin comes to mind. The scents they offer are rose, orange, lavender, apple and violets. I've not tried them, but some folks like using them. If I could find an ink scented like my favorite Ma Po Tofu, then I'd probably use it. ☺

Noodler's makes an ink called Blue Ghost that writes invisibly in room light, but fluoresces under UV and blue<sup>10</sup> 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. Blue Ghost is invisible on your hand in regular light, but lights up nicely under UV light (it also fluoresces nicely under LEDs with 405 nm wavelength). I don't know if it's safe to put on your skin, however.

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.

## Ink bottles

All the bottles of ink I've ever gotten 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. 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.

A favorite bottle for many folks for many decades was the familiar Sheaffer Skrip ink bottle:



The thing that made this bottle handy for filling pens was the well you see to the left; it could be filled

---

<sup>10</sup> I've seen it fluorescing under LEDs that I have measured that have a peak wavelength of 405 nm.

with ink by tipping the bottle and this gave you a place to dip your nib into for filling your pen. It also works well with an artist's dip pen.

Other people like Mont Blanc's "shoe" design:



There's an "instep" in the bottle that helps ink pool in the right-hand side, helping your fill your pen. As I never really cared for the black ink that I got in this bottle, I poured the ink down the sink. But I'll reuse the bottle with some other ink.

Other manufacturer's bottles might not be so friendly for filling pens. They can have small necks or be troublesome getting the last bit of ink into your pen. If you think about it from a design standpoint, it's not obvious what the best design for a bottle is because pens come in so many different styles. Some bottles come with plastic inserts that can make it easier to fill your pen.

When you use ink from a bottle, you can face the unpleasant situation of being away from the bottle and running 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 a glass bottle might not travel well, as it can be prone to breaking. If you're willing to spend \$60-\$80, you can buy a Visconti ink pot. You probably have suitable bottles at home that you can scavenge for this task (e.g., an old small bottle that used to contain contact cleaning solution). Another tip is to look in the phone book for a local supplier of bottles (where I live, we have a wholesale outlet that will also sell to walk-ins -- it's a convenient place with lots of interesting stuff).

There are various places (check the classifieds on FPN) that sell little sample bottles for ink (the bottles are about 17 mm diameter by 50 mm long and hold a little over 8 ml):

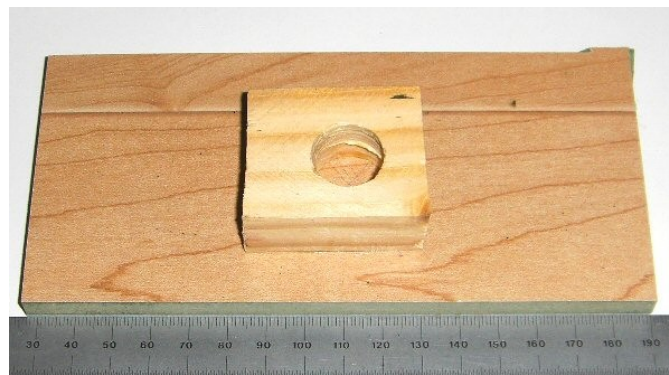


With the lids screwed on tight, they conveniently hold 5-6 ml and can easily be mailed in a padded envelope. This turned out to be the method of choice for me and netted me, in fact, too many inks to try -- I still have numerous samples to try. Here's another bottle design available:



These bottles are a bit nicer, as they have volume graduations and a tapered bottom, probably intended for pipettes. Both of these types of bottles have lids that seal well enough to let the bottle be sent through the mail. I've never had one leak that was securely tightened.

If you get sample bottles similar to these, 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.

That also reminds me: you'll probably read stories of people accidentally knocking a bottle of ink over while filling a pen. A good dodge against this happening could be a device similar to the above ink sample bottle holder, but scaled up to hold an ink bottle. Glue some rubber to the bottom so it's hard to slide while using and you'll be a bit more protected against a spill. Since I have been using those little sample bottles so much, I use that holder every time and I've never had an accident. I'm also quickly reaching the opinion that these little sample bottles will be my main storage for ink. I'll just fill them occasionally from a bottle using a syringe. Then, should an accident occur (excluding filling from the larger bottle), the damage should be a bit more contained. In addition, the sample bottle can slip into a pocket if I need ink on the road.

## 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 sells an ink mixing kit; that might be worth trying if you're keen on mixing a variety of colors. Private Reserve sells a mixing kit with bottles and mixing syringes.

Many people find they enjoy mixing their own inks because this can give you colors that you can't buy. Here's an example of ink mixes someone posted on FPN years ago (I'd credit the author, but I



don't know who it is):

	YELLOW	YELLOW-ORANGE	ORANGE	RED-ORANGE	RED (MAGENTA)	RED-VIOLET	VIOLET	BLUE-VIOLET	BLUE (CYAN)	BLUE-GREEN	GREEN	YELLOW-GREEN
<b>HUE</b> PURE COLOR												
	Noodler's Yellow	1 Shah's Rose, 3 Yellow	5 Shah's Rose, 2 Yellow	7 Shah's Rose, 1 Yellow	Noodler's Shah's Rose	1 Navajo Turq, 7 Shah's Rose	2 Navajo Turq, 5 Shah's Rose	2 Navajo Turq, 1 Shah's Rose	Noodler's Navajo Turquoise	5 Navajo Turq, 1 Yellow	3 Navajo Turq, 2 Yellow	1 Navajo Turq, 5 Yellow
<b>TINT</b> HUE + WHITE												
	1 Yellow, 6 White Whale	1 Yellow-Orange, 6 White Whale	1 Orange, 6 White Whale	1 Red-Orange, 6 White Whale	1 Red, 6 White Whale	1 Red-Violet, 6 White Whale	1 Violet, 6 White Whale	1 Blue-Violet, 6 White Whale	1 Blue, 6 White Whale	1 Blue-Green, 6 White Whale	1 Green, 6 White Whale	1 Yellow-Green, 6 White Whale
<b>TOPE</b> HUE + COMPLI- MENTARY HUE												
	3 Yellow, 1 Violet	9 Yellow-Orange, 1 Blue-Violet	6 Orange, 1 Blue	6 Red-Orange, 1 Blue-Green	5 Red, 1 Green	3 Red-Violet, 1 Yellow-Green	3 Violet, 1 Yellow	14 Blue-Violet, 1 Yellow-Orange	2 Blue, 1 Orange	6 Blue-Green, 1 Red-Orange	3 Green, 2 Red	3 Yellow-Green, 1 Red-Violet
<b>SHADE 1</b> HUE + BLACK												
	9 Yellow, 1 Black	9 Yellow-Orange, 1 Black	9 Orange, 1 Black	9 Red-Orange, 1 Black	9 RED, 1 BLACK	9 Red-Violet, 1 BLACK	9 Violet, 1 BLACK	9 Blue-Violet, 1 BLACK	9 Blue, 1 BLACK	9 Blue-Green, 1 BLACK	9 Green, 1 BLACK	9 Yellow-Green, 1 BLACK
<b>SHADE 2</b> HUE + BLACK												
	3 Yellow, 2 Black	3 Yellow-Orange, 2 Black	3 ORANGE, 2 BLACK	3 RED-ORANGE, 2 BLACK	3 RED, 2 BLACK	3 RED-VIOLET, 2 BLACK	3 VIOLET, 2 BLACK	3 BLUE-VIOLET, 2 BLACK	3 BLUE, 2 BLACK	3 BLUE-GREEN, 2 BLACK	3 GREEN, 2 BLACK	3 YELLOW-GREEN, 2 BLACK

Here's another mixing color chart:

		HUE PURE COLOR	TINT 1 PART HUE 3 PARTS WATER	tone 1 6:1 6 PARTS HUE 1 PART Complement	tone 2 3:2 3 PARTS HUE 2 PART Complement	SHADE 1 9:1 9 PARTS HUE 1 PART BLACK	SHADE 2 3:2 3 PARTS HUE 2 PARTS BLACK
1	<b>YELLOW</b> Noodler's Yellow			Y+V			
2	<b>YellowYellowOrange</b> 1 part Shah's Rose 15 parts Yellow			YYO+VBV			
3	<b>YELLOW-ORANGE</b> 1 part Shah's Rose 3 parts Yellow			YO+BV			
4	<b>OrangeYellowOrange</b> 3 parts Shah's Rose 5 parts Yellow			OYO+BBV			
5	<b>ORANGE</b> 5 parts Shah's Rose 2 parts Yellow			O+B			
6	<b>Orange Red-Orange</b> 4 parts Shah's Rose 1 part Yellow			ORO+BBG			
7	<b>RED-ORANGE</b> 7 parts Shah's Rose 1 part Yellow			RO+BG			
8	<b>Red Red-Orange</b> 12 parts Shah's Rose 1 part Yellow			RRO+GBG			
9	<b>RED (MAGENTA)</b> Noodler's Shah's Rose			R+G			
10	<b>Red Red-Violet</b> 1 part Navajo Turq. 40 parts Shah's Rose			RRV+GYG			
11	<b>RED-VIOLET</b> 1 part Navajo Turq. 15 parts Shah's Rose			RV+YG			
12	<b>Violet Red-Violet</b> 1 part Navajo Turq. 7 parts Shah's Rose			VRV+YYG			
13	<b>VIOLET</b> 2 parts Navajo Turq. 5 parts Shah's Rose			V+Y			
14	<b>Violet Blue-Violet</b> 2 parts Navajo Turq. 1 part Shah's Rose			VBV+YYO			
15	<b>BLUE-VIOLET</b> 4 parts Navajo Turq. 1 part Shah's Rose			BV+YO			
16	<b>Blue Blue-Violet</b> 10 parts Navajo Turq. 1 part Shah's Rose			BBV+OYO			
17	<b>BLUE (CYAN)</b> Noodler's Navajo Turquoise			B+O			
18	<b>Blue Blue-Green</b> 20 parts Navajo Turq. 1 part Yellow			BBG+ORO			
19	<b>BLUE-GREEN</b> 10 parts Navajo Turq. 1 part Yellow			BG+RO			
20	<b>Green Blue-Green</b> 5 parts Navajo Turq. 1 part Yellow			GBG+RRO			
21	<b>GREEN</b> 3 parts Navajo Turq. 2 parts Yellow			G+R			
22	<b>Green Yellow-Green</b> 1 part Navajo Turq. 2 parts Yellow			GYG+RRV			
23	<b>YELLOW-GREEN</b> 1 part Navajo Turq. 6 parts Yellow			YG+RV			
24	<b>Yellow Yellow-Green</b> 1 part Navajo Turq. 30 parts Yellow			YYG+VRV			



I'd love to credit the person(s) who did this rather amazing amount of work, but I don't have their name (I believe I found the picture on FPN, but I'm not sure). The four colors used were Noodler's Navajo Turquoise (cyan), Shah's Rose (magenta), Yellow, and Black. The file name I have for this file is color\_wheel1.jpg; if you're the author and you want me to properly credit the work (or remove it if it is copyrighted), please email me at the address at the beginning of this paper.

Here are the colors in a little more readable form:

<b>YELLOW</b> 1 Noodler's Yellow Complementary Hue: Violet (V)	<b>RED (Magenta)</b> 9 Noodler's Shah's Rose Complementary Hue: Green (G)	<b>BLUE (Cyan)</b> 17 Noodler's Navajo Turquoise Complementary Hue: Orange (O)
<b>Yellow Yellow-Orange</b> 2 1 part Shah's Rose 15 parts Yellow Complementary Hue: Violet Blue-Violet (VBV)	<b>Red Red-Violet</b> 10 1 part Navajo Turquoise 40 parts Shah's Rose Complementary Hue: Green Yellow-Green (GYG)	<b>Blue Blue-Green</b> 18 20 parts Navajo Turquoise 1 part Yellow Complementary Hue: Orange Red-Orange (ORO)
<b>Yellow-Orange</b> 3 1 part Shah's Rose 3 parts Yellow Complementary Hue: Blue-Violet (BV)	<b>Red-Violet</b> 11 1 part Navajo Turquoise 15 parts Shah's Rose Complementary Hue: Yellow-Green (YG)	<b>Blue-Green</b> 19 10 parts Navajo Turquoise 1 part Yellow Complementary Hue: Red-Orange (RO)
<b>Orange Yellow-Orange</b> 4 3 parts Shah's Rose 5 parts Yellow Complementary Hue: Blue Blue-Violet (BBV)	<b>Violet Red-Violet</b> 12 1 part Navajo Turquoise 7 parts Shah's Rose Complementary Hue: Yellow Yellow-Green (YYG)	<b>Green Blue-Green</b> 20 5 parts Navajo Turquoise 1 part Yellow Complementary Hue: Red Red-Orange (RRO)
<b>Orange</b> 5 5 parts Shah's Rose 2 parts Yellow Complementary Hue: Blue (B)	<b>Violet</b> 13 2 parts Navajo Turquoise 5 parts Shah's Rose Complementary Hue: Yellow (Y)	<b>Green</b> 21 3 parts Navajo Turquoise 2 parts Yellow Complementary Hue: Red (R)
<b>Orange Red-Orange</b> 6 4 parts Shah's Rose 1 part Yellow Complementary Hue: Blue Blue-Green (BBG)	<b>Violet Blue-Violet</b> 14 2 parts Navajo Turquoise 1 part Shah's Rose Complementary Hue: Yellow Yellow-Orange (YYO)	<b>Green Yellow-Green</b> 22 1 part Navajo Turquoise 2 parts Yellow Complementary Hue: Red Red-Violet (RRV)
<b>Red-Orange</b> 7 7 parts Shah's Rose 1 part Yellow Complementary Hue: Blue-Green (BG)	<b>Blue-Violet</b> 15 4 parts Navajo Turquoise 1 part Shah's Rose Complementary Hue: Yellow-Orange (YO)	<b>Yellow-Green</b> 23 1 part Navajo Turquoise 6 parts Yellow Complementary Hue: Red-Violet (RV)
<b>Red Red-Orange</b> 8 12 parts Shah's Rose 1 part Yellow Complementary Hue: Green Blue-Green (GBG)	<b>Blue Blue-Violet</b> 16 10 parts Navajo Turquoise 1 part Shah's Rose Complementary Hue: Orange Yellow-Orange (OYO)	<b>Yellow Yellow-Green</b> 24 1 part Navajo Turquoise 30 parts Yellow Complementary Hue: Violet Red-Violet (VRV)

Assuming these three primary colors and the black mix together without problems and assuming the mixed ink performed well on paper and in your pens, you could probably make almost any shade of ink you wanted from these four.

For experimenting, it's probably best to use a small syringe (say, 1 to 3 ml total) and use it to mix measured portions 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. One blue ink I like to use is Private Reserve's DC Supershow Blue. I often dilute it 50-50 with water and it's a nice medium blue with turquoise undertones.

## 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 3/8" diameter (about 10 mm) 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. Here's an example with some blue inks I have:

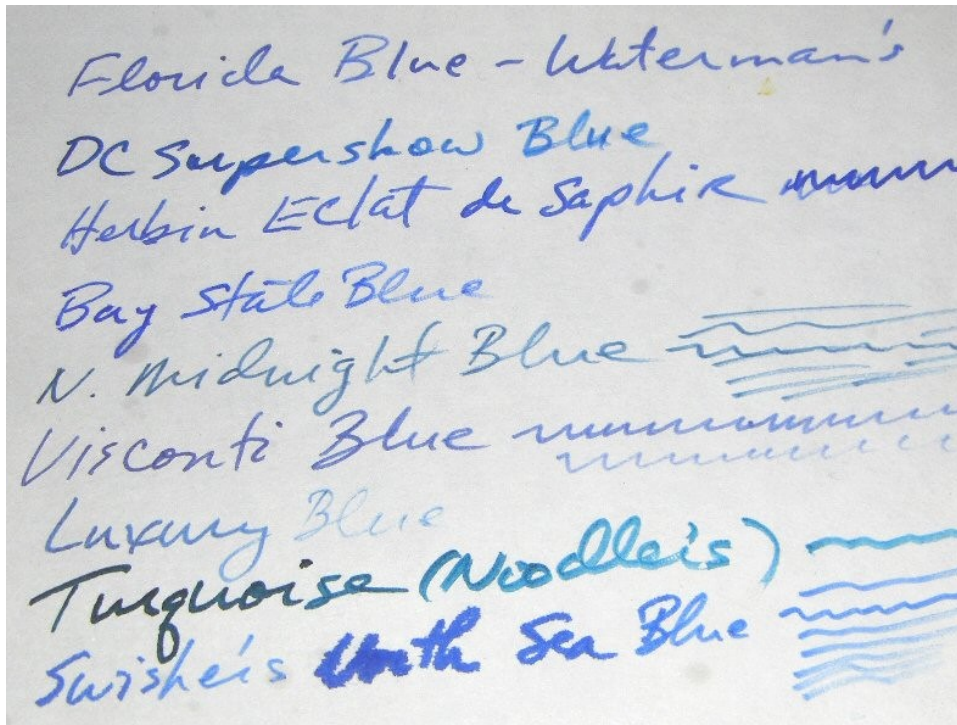
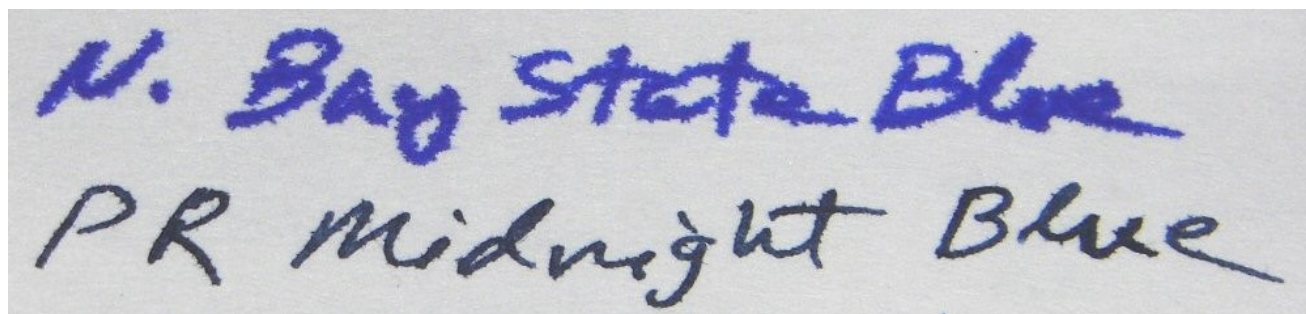


Figure 1

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 spectrum of behavior.** Of course, you'll probably only see one of those particular behaviors with a specific pen and paper.

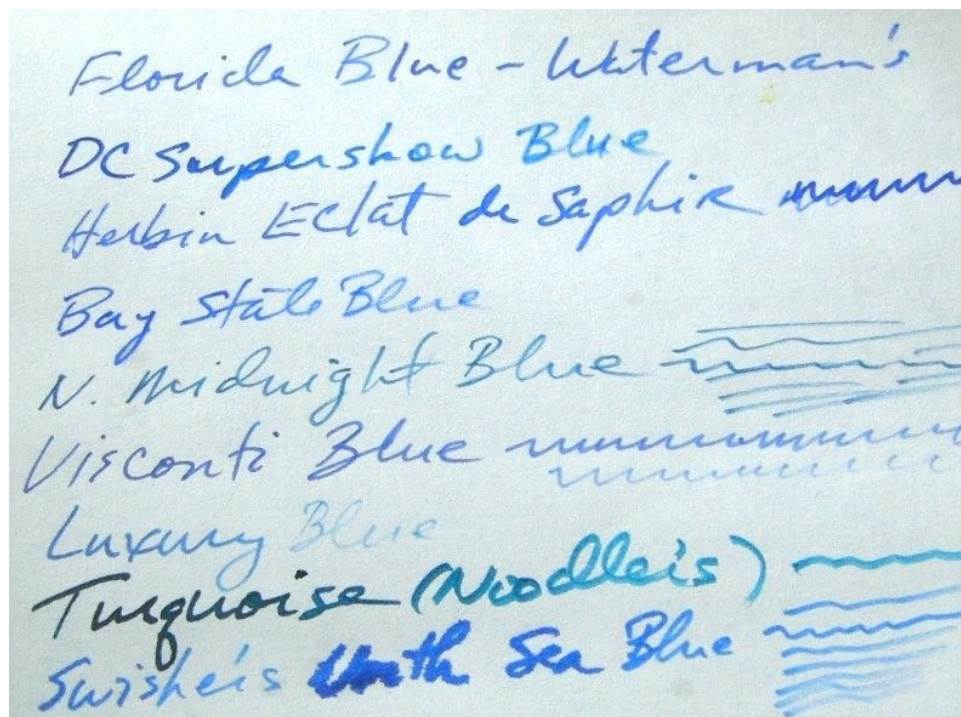


The word North in the above photo shows both feathering and spreading. Here's an example of feathering (written with a Hunt 512 nib on cheap and crummy 3x5 white cardstock):



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

Here's a point about photographing your inks on paper. The picture in Figure 1 above was taken with a flash and had to be lightened up a few times, but the color balance was fine. The following picture is the same subject, but was taken solely with an indirect late-afternoon north exposure light and has no color correction:



The blue cast from the blue sky in the north is obvious -- just be aware of the differences that can occur. You can include a neutral gray card (purchase in any photography store or make one) in the picture; this can help you correct the color balance of the photo.

Regardless of what you do, you can't control the monitor of the viewer who looks at your digital picture, so always remember that the pictures you provide or see are only rough indications of the real color.

Finally, here's a bit of advice about testing inks. A common question asked on FPN 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.

## 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). As an interesting tidbit, chromatography was used in the famous [Urey-Miller experiments](#) in the early 1950's (and hundreds of follow-up experiments) to show that a primitive reducing atmosphere on Earth could produce a number of the organic chemicals that make up life when exposed to energy forms like lightning and UV light.

## 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. When stored at normal room temperatures out of the light, fountain pen ink should have an indefinite 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 -- I know from first-hand experience that all of the inks I have work well after a few years to a number of decades of storage. Most people with experience will probably tell you as I have -- **most inks probably have indefinite shelf lives if stored in innocuous conditions**. Here, "innocuous" means out of the light, tightly capped, and around 20 °C.

## Eradicator

In the 1970's and before, bottled ink eradicator was common and cheap. This was a liquid (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 (here's an example <http://www.esnarf.com/5282k.htm>). 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 I used to use). This product appears to have disappeared completely. I don't know whether it was because of some governmental ban on the chemicals or the market just dried up and manufacturers quit selling it.

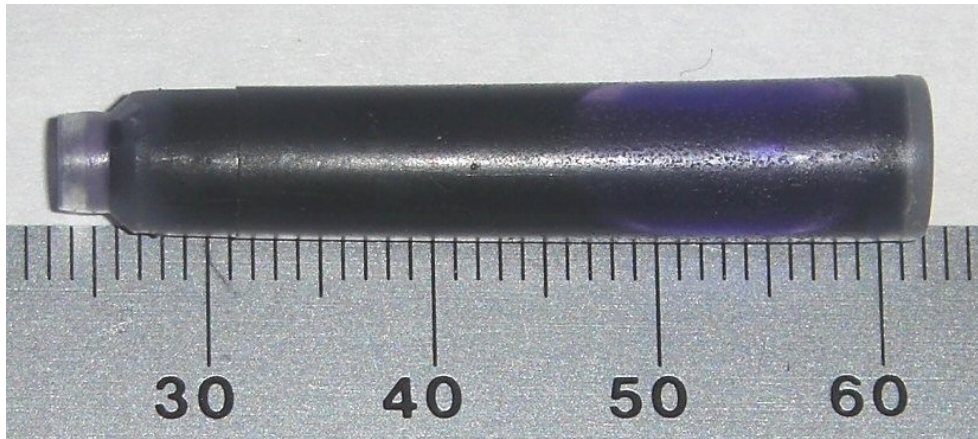
Pelikan makes a Pirat ink eradicator pen, but I've read it only works well with Pelikan's blue ink<sup>11</sup>. I've not used it, so I can't recommend it. Staedtler makes an eradicator, but it's for their pens with their blue ink: [http://www.staedtler.com/ink\\_eradicator](http://www.staedtler.com/ink_eradicator). If the ability to correct your writing is important to you, this probably means you need to buy one of these specialty products.

## International cartridges

International cartridges are a standard size and convenient because they are available from a number of vendors. Here's a picture of a short international cartridge:

---

<sup>11</sup> I've also read it will eradicate Waterman Florida Blue, but this hasn't been verified.



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 0.75 ml and the long cartridge's is about 1.45 ml. Some international cartridges are sealed with a small glass or plastic ball (this cartridge is from Private Reserve and is in Sherwood Green):



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.

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

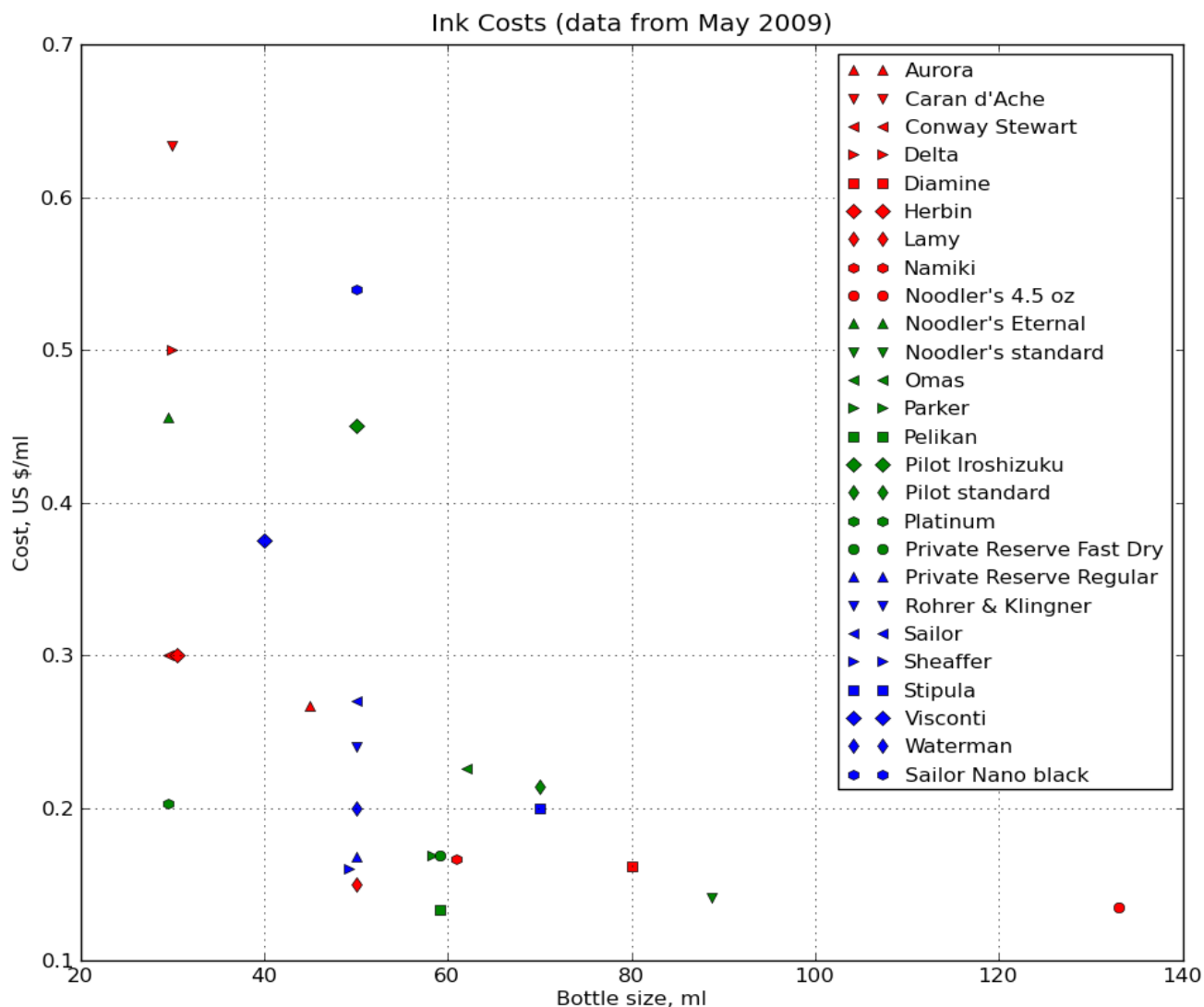
You can save your empty cartridges rather than throwing them out. This will let you refill those empty cartridges with ink from a bottle (use a syringe with a blunt needle) and they can continue to provide service. You can also cut the large end off and use it to cap a partially-used cartridge (I've



read about this but I haven't tried it -- it supposedly works with the international cartridges)

## 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.

Unfortunately, as businesses try to save money, they usually scrimp on the paper they buy -- so they typically 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.

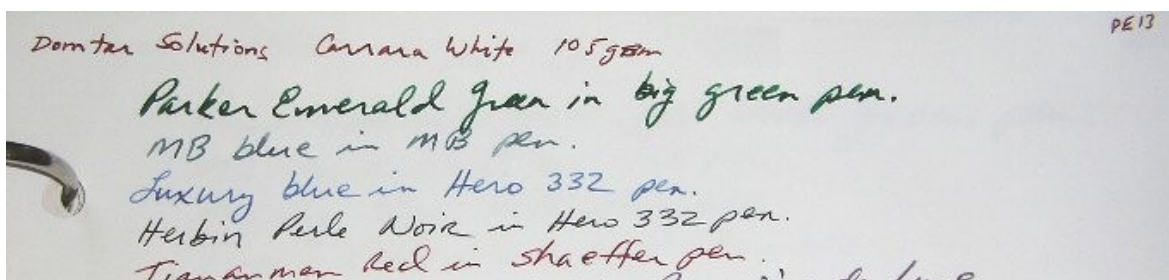
I'm lucky in that I have a local store that sells many types of paper. After trying 25-30 different papers, I found a paper that is a favorite to write on with fountain pens: Domtar Solutions 105 g/m<sup>2</sup> in Carrara white. It cost approximately 4 cents per ANSI A size sheet and worked very well with all the fountain pens and inks I tried. Alas, Domtar discontinued this paper, so my stock will have to last.

A popular paper with many fountain pen users is HP's Premium Choice LaserJet paper in 120 g/m<sup>2</sup>. Executives and marketing people like to use the HP paper for their reports and sales presentations and, of course, it works well in laser printers.

Two popular papers for fountain pen users that are made in France are Clairfontaine and Rhodia. The US distributor is Exaclair in NYC ([http://www.exaclair.com/brands\\_clairfontaine.shtml](http://www.exaclair.com/brands_clairfontaine.shtml)) and they are nice folks (they also distribute Herbin inks). Exaclair's VP of marketing once sent me a whole bunch of free stuff just to try out their papers -- I was a bit take aback by her generosity (it included a beautiful year-long daily journal book with wonderful paper). I've seen some great behavior from the folks at Exaclair and I wouldn't hesitate to give them my business.

Personally, I tend to shy away a bit 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 excellent papers and if drying time isn't an issue for you, definitely give them a try.

A few years ago I spent some time evaluating papers (I was considering a business idea and was doing some marketing research). This involved writing with numerous fountain pens and inks on each type of paper and evaluating the results<sup>12</sup>. This is what led me to the Domtar Solutions paper. This search resulted in a binder containing the evaluations of all the different papers. This was a useful thing to do because now I have samples of numerous papers and writing with the different pens and inks:



If possible, I recommend you avoid using the screwball US-customary paper weights -- you'll just be in for confusion unless you have a table handy. You'll even come across conflicting definitions. For measuring the areal mass density of paper, I recommend measuring 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<sup>2</sup>, often abbreviated as "gsm". Typical office copier paper is around 80 g/m<sup>2</sup>.

If you must use the US system, the paper weight is usually given in pounds per ream of 500 sheets (and, to make sure it's an officially screwball system, sometimes in 1000 sheets or other quantities). Typical office copier paper is around 18 to 20 lb; the HP paper I mentioned above is 32 lb and the Domtar paper mentioned above is 28 lb. US ANSI-sized papers are multiples of 8.5 inch by 11 inch paper, which is commonly referred to as letter size. B, C, and D sizes are multiples of this basic size -- this is similar to the more sensible ISO paper sizes (but the ISO aspect ratio is  $\sqrt{2}$  and the ANSI aspect ratios are larger).

---

<sup>12</sup> I have the luxury that my local paper store has open stock that is sold by weight, so I can select a few sheets of each type of paper.

Check your fountain pen on cheap copier paper used everywhere in offices. These papers are formulated to work well in copiers and laser printers and will probably work OK with your pens and inks -- but test first to make sure, as some inks/pens can feather horribly.

You will no doubt 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. This is all part of the game and helps give fountain pen writing its character (and sometimes its frustration).

I've heard many people complain about the paper used in Moleskine journals when using fountain pens -- they sometimes get feathering and show-through and it can be objectionable enough to stop using the Moleskine journals<sup>13</sup>. I don't use Moleskine journals, but I've used other notebooks and had pretty good luck with them, although some notebooks like the Moleskine types tend to have thin paper, so show-through is difficult to avoid with any ink. The only way to be sure is to get one and try it out -- but don't be disappointed if it doesn't work for you. 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). One ink you might consider using is a gray ink. It might sound a bit strange to use a gray ink, but it can work well -- and it can look like writing with a pencil.

One of the first things to try writing on with your pen is 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. Newsprint usually gives a big blob; better papers won't. 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. Of course, if you don't write on newsprint, this isn't an issue.

One area where fountain pen ink can have problems is in papers that have smooth finishes and more sizing than the average paper (sizing is a compound used in the paper's manufacturing to change the paper's absorbency and/or its finish). Sometimes these heavily-treated 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 will always happen is on the Mylar "paper" used for drafting -- your ink will just sit on the surface and probably will smudge (indeed, if it even writes at all). This is why drawing inks and India inks have shellac in them -- the shellac hardens to help the ink pigments stay put.

One paper you might like looking for is a 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 vellums in pads I bought in the 1970's and my fountain pens write on it nicely with no feathering. It's called "100% rag tracing vellum" (back then, I worked in companies that did a lot of drafting with pencil on such vellums to make blueprints, but their vellums were just so-so with fountain pens). My local paper store had heavier vellums that were even better to write on -- they'd make some distinctive letters to someone. A particularly heavy one was quite nice at around 25 cents per sheet (Nov 2008 prices). For someone with excellent handwriting or good at calligraphy, this type of paper would be great for some snazzy and personal marketing materials.

I have some old paper stocks that I occasionally use. One is Eaton Corrasable Bond typing paper (it is probably around 30 years old and sold for \$3.39 for 80 sheets). It just sucks the ink out of the pen and makes a fine point write like a medium point. It's quite pleasant to write on and makes a wonderful fountain pen paper, as there's no feathering at all -- it reminds me of a vellum. Another

---

13 The inconsistent paper quality of Moleskine journals appears to be well-known to fountain pen users.

nice paper is Crane's Thesis paper; this paper has a coating that my green ink turns a slight red in reflected light at an appropriate angle (probably an interference effect); it's quite attractive and makes a nice paper for writing Christmas notes. Southworth's Exceptional Résumé Paper also works nicely with fountain pens -- but the writing looks distinctly different than the other papers I've mentioned. Thus, it may be worth your time scouting around for old papers from Mom & Dad or in antique or second-hand stores. Keep an open mind -- you may find a treasure<sup>14</sup>.

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.

## 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. For example, an open source tool is Open Office's Drawing program. If you're a programmer, you can write suitable programs in languages like Postscript or use a python library (e.g., [ps]) to generate Postscript output.

You may also be surprised to find out how easy it is to make your own little notebooks. This can be done with papers you know to work well with the pens and inks you like to use. Here's how I make mine (my wife loves these little booklets and always has one in her purse):

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). With the number of sheets that I use and the type of paper I like, these little booklets wind up with a material cost of under 10¢ for each booklet. The page size winds up being 7 cm by nearly 11 cm 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 (see e.g. [ms]). When carefully made, sewn booklets can last longer than stapled booklets, but the advantage of the stapled booklets is that they are made so 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, but you won't win any fashion awards with it. Another good tape is clear packing tape.

For US letter-size paper, the next larger size booklet I make requires cutting a small amount of paper off to get a pleasing resulting size. I cut the 8.5" x 11" page in half so that I wind up with pieces 8.5" by 5.5". Then I trim off about 1.5" from the 8.5" dimension; this results in a booklet about 3.5" by 5.5" (8.9 cm by 14 cm, a little smaller than A6). The ISO paper sizes have an aspect ratio (length divided by width) of  $\sqrt{2}$ ; I prefer an aspect ratio of around 1.6, probably because I'm accustomed to US paper sizes.

## Accessories

There are many accessories that are sold for use with fountain pens. I will mention a few, but you

---

<sup>14</sup> A hallmark of an addicted fountain pen user is a person who starts expeditions to find the perfect writing paper (this, of course, is also done while in the search for the perfect ink and pen).

can find lots more with a web search.

## Carrying devices

There are a number of fountain pen carrying cases available; I'll let you search the web for the conventional "cigar" style holders, pen carriers, and zippered pen cases. One I'd like to show a picture of is one I will make for myself one day; it is a Japanese holder I found on the web a few years ago and I liked the design:

It is a simple design and shouldn't be too hard to make from leather or a stiff Cordura nylon.



Here's a simple pen holder you can make for no cost:



Go to your optometrist and ask if you can have a few old glasses cases. About 10 years ago I did this and got a huge bag full of cases -- and she'd have given me more if I wanted them. I just cut out some foam and jammed it in to fit. Those blue marks are Sharpie pen marks that show where I used a rotary ball burr to cut out recesses for the two pens. These surplus glasses cases also work great to hold 1/4" hex bits in your toolbox and other small shop tools.

Another place to find useful things (at least to us males who don't know much about women's stuff) is to visit a cosmetics counter at a store. There are small zippered cases that women use for



cosmetics and other stuff that can be adapted for use as pen cases. If you've raised a daughter or two, ask them, as they probably have suitable stuff they're ready to throw out.

If you sew, you can make yourself a pen wrap -- or buy one from someone on the web. While I have no direct experience with her, I like the looks of the products by Elizabeth at <http://www.exbpens.com/store/index.html> and I like that she makes the things as a cottage industry by recycling vintage and reclaimed fabrics. She'll also make you something if you can describe it by email. Here's an example of one of her creations (I thank Elizabeth for giving me permission to duplicate her picture):



## Pen holder

Here's my deluxe fountain pen holder at my desk that I've used for quite a few years:



It's just a steel food can. I mention it because it just shows that you may not need anything fancy. Note the red tape on the Hero 332 pen's cap -- it tells me a red ink is in that pen.

For a bit more care of some expensive pens, you might consider a test tube rack to help keep them separated. Such a thing would be easy to make in the shop with two flat wood pieces, four dowels, and some glue. There are many found items that can be used: (tobacco) pipe holders, glass frogs used for floral arrangements, plastic inserts from rifle cartridge boxes, toothbrush holders, etc. Browsing an antique or second-hand store will no doubt turn up many more useful things.

Some people who collect fountain pens will make or purchase beautiful wooden cases for their pens. Here's my storage device, an old silverware organizer (and it will probably make the collectors cringe):



This isn't a good storage method for expensive pens, but my pens are just working devices, so I

don't mind if their exteriors get a bit scratched. And yes, these pens all do get used; I rotate each of them into my working set over time.

Here's a nice do-it-yourself pen carrier that allows you to carry your pen on a belt [fpnlb]:



It is just a strip of material with some relatively simple sewing, so could be made by most anyone.

## Blotter

In the "old days", blotters were common and often given away by businesses. They are an absorbent piece of paper that is put over some fountain pen writing to absorb the excess ink so it won't smear. Here's a popular design of a blotter holder that is held by the knob and rolled over the ink to be blotted (this design goes back centuries):



This would be straightforward for a woodworker to make<sup>15</sup>. The knob could be a cabinet knob and a hanger screw would go into the cylindrical piece. When the knob is screwed on tight, the top board holds the blotting paper in place (you can see the tucked paper end).

The poor-man's blotter is a Kleenex pressed against the ink. ☺ Well, that's what I use.

## Using a fountain pen

### New pen

If your pen is brand-new or freshly-cleaned, then using it for the first time should be pretty straightforward. Basically, you 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 eyedropper or 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. Make sure you

---

<sup>15</sup> Except perhaps for the convex surface; I'd make it for a one-off project by bandsawing and sanding. If you wanted to make a bunch of them, it would be easy with a router fixture.

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. In fact, this is one technique of making a dry-writing pen put a little more ink onto the paper: mix a small amount of detergent in with the ink (this is usually called a "surfactant" in industry), which helps reduce the surface tension. 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.

Cartridge pens are the easiest to use: unscrew the barrel, drop in a cartridge, screw the barrel back on, and start writing. Well, that's the principle, but it may take some time for the ink to make its way to the nib's tip. I usually reduce this time by unscrewing the barrel and giving the cartridge a squeeze so that a drop of ink bulges slightly from the feed. This ensures that the nib will get ink through capillary action 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.

A pen with a sac needs to have the sac filled with ink. This is done by dipping the feed into a bottle of ink and compressing the sac to expel the air and suck ink into the sac. This also has the advantage of simultaneously wetting 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.

If you are using a pen with a converter, you have two choices of filling the converter. First, you can keep the converter attached to the pen and fill the pen by dipping the nib into the ink and operating the converter's piston. The second method is to remove the converter and fill it from the ink bottle. With the second method, if the pen is clean, you'll want to attach the converter and have the piston push a little ink into the feed to fill the feed with ink. I usually do this just like when I'm filling a sac pen: I wait to see a drop of ink bulge from the feed. I then retract the piston slightly to remove the bulge. Since this uses up some of the converter's ink supply, you can refill the converter if you want to have a maximum ink load in the pen. 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.

Since I don't use eyedropper or piston pens, I can't authoritatively discuss their operation. I'll assume their operation is obvious and straightforward. The piston pen is essentially topologically equivalent to a pen with a converter, so the same principles apply (except you must fill the pen by dipping the nib into the ink). The details of operating the piston assembly may differ amongst pens, so consult the instructions that came with the pen or do research on the web. Filling an eyedropper pen should be straightforward with an eyedropper or syringe. The only worry I'd have is making sure there was a good seal when the barrel is reattached to the section, as a leak could get lots of ink on things.

There are pens with other filling nuances (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 hard with a fountain pen. This can be a bit of a challenge if you have written mostly with a ball point pen. A good fountain pen should essentially require 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. A good piece of advice is that 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" (for obvious reasons).



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 immediately 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 of course you risk a splat of ink coming from the pen if you do this -- so if you must try it, do it over a wastebasket or scrap piece of paper. If the pen has a cartridge or converter, I instead squeeze the cartridge or manipulate the converter to get a blob of ink on the feed to get things started again.

You will find that 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.

Some people say some fountain pens need "breaking in". This may or may not be true (I have no direct evidence, so I tend to discount the advice), so consult with the nibmeisters if appropriate. Certainly a pen that is used in the same fashion for years by the same person will slowly modify the nib's shape because of wear, but I haven't experienced this. Besides, a hard tip is going to take years of constant use to wear, so I think the comment is specious.

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. A common feature of virtually all fountain pens I've used is that you can rotate the pen 180 degrees about its longitudinal axis and write with the nib upside down. This usually results in a substantially finer line. For example, in my relative's pen, 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 -- and demonstrates the versatility of a fountain pen over a roller ball or ball point pen. You'll also find that some pens respond differently to various rotations of the nib<sup>16</sup>. For example, with my relative's pen, a slight rotation widens the line a little and puts more ink on the page; I find this desirable.

## 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 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 [da book].

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. Plus, some of the in-demand pros can have long turn-around times because of their backlogs -- many months is not unusual.

---

<sup>16</sup> By this rotation, I mean the following: consider the longitudinal axis of the pen the z axis of a Cartesian coordinate system. Then the rotation axis is the z axis and the rotation angle is the polar angle of cylindrical or spherical coordinates.



Problem	Possible cause and/or fix to try
Pen writes for a while, then dries out.	<ul style="list-style-type: none"> <li>◆ Running low on ink: fill pen or converter or switch to new cartridge.</li> <li>◆ Balky converter: clean or replace.</li> <li>◆ Dirty pen: clean (dismantle and clean section if possible).</li> <li>◆ Plugged vent: send to a pro if you can't find and fix it yourself.</li> </ul>
Pen won't write at all	<ul style="list-style-type: none"> <li>◆ No ink: fill pen.</li> <li>◆ 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.</li> <li>◆ Plugged vent: unplug if you know how and where; otherwise send to a pro.</li> <li>◆ Not capping pen and letting it dry out: put cap on sooner.</li> </ul>
Damaged or incorrectly adjusted nib	<ul style="list-style-type: none"> <li>◆ Fix if you really know what you're doing and have the tools; otherwise, send to a pro.</li> </ul>
Poor starting (pen won't write immediately after you start writing, but will after a bit)	<ul style="list-style-type: none"> <li>◆ May be endemic to pen (you can try different inks; if that doesn't work, consider sending the pen to a pro for repair).</li> <li>◆ 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.</li> <li>◆ Change angle at which you use the pen.</li> <li>◆ Wrong point for your style of writing.</li> <li>◆ 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.</li> </ul>
Skipping	<ul style="list-style-type: none"> <li>◆ Air bubble in converter or cartridge: squeeze cartridge or screw down converter. Refill if possible.</li> <li>◆ Nib problem: tines too close together or too far apart -- probably should send to a pro for fixing.</li> <li>◆ 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).</li> </ul>
Emits blob of ink when writing	<ul style="list-style-type: none"> <li>◆ Pen could be low on ink: fill the pen.</li> <li>◆ 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.</li> </ul>
Pen dries out too quickly with the cap off	<ul style="list-style-type: none"> <li>◆ Put the cap on, Luke. 😊</li> <li>◆ Try a different ink.</li> </ul>
Pen dries out too quickly when left to sit with cap on for a period of time	<ul style="list-style-type: none"> <li>◆ The cap might not be sealing well enough with the pen (send it to a pen tech).</li> <li>◆ 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</li> </ul>

Problem	Possible cause and/or fix to try
	the shellac inside the cap over the places where hardware penetrates the cap. See the comments below.
Excess ink in cap or pen body	<ul style="list-style-type: none"> <li>◆ You're handling the pen too roughly: change your habits.</li> <li>◆ Try capping the pen gently with the nib pointing up.</li> <li>◆ 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.</li> </ul>
Pen writes too wet (too much ink on paper)	<ul style="list-style-type: none"> <li>◆ Needs nib adjustment: send to a pro.</li> <li>◆ Switch to a drier ink (search web or FPN for advice or ask a pro).</li> </ul>
Pen writes too dry (too little ink on paper)	<ul style="list-style-type: none"> <li>◆ Needs nib adjustment: send to a pro.</li> <li>◆ 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).</li> </ul>
Scratchy writing	<ul style="list-style-type: none"> <li>◆ 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).</li> <li>◆ Some pens (crow quills, cheap pens) are naturally scratchy.</li> </ul>

I'm not absolutely convinced that my advice about an air-tight cap is good advice. The reason I say this is because my Pilot Varsity pen does not have an air-tight cap, yet it can write well after sitting for a while. This leak is clearly there by design, maybe to help keep the pressure equilibrated during altitude changes like when you fly on a plane. Thus, you may have to establish what works for you. Personally, I like my pen caps to be air-tight if possible.

## Other problems

### ***Evaporated water***

If an ink bottle's cap isn't sealed well, you may have the water evaporate. Ideally, just add some water to make up for the losses. A manufacturer would probably used distilled water, but I just use regular tap water. Our water is on a well and has numerous dissolved minerals, but no chlorine. Considering that the bottle of ink cost probably you \$5-\$30, it probably makes sense to use distilled water if possible.

It's conceivable that if all the water dried up, it may be difficult to reconstitute the ink. Since the bottle is ruined otherwise, you probably have nothing to lose by trying. To help things dissolve, you can consider adding e.g. a drop of ammonia, but go lightly. I haven't faced this situation, so I don't have much practical advice. If it happened to me, I would try reconstituting the ink, then writing with it using a cheap pen. If I didn't get perfect behavior, I'd throw the ink out and clean the pen.

As I mentioned elsewhere, long-term (decades) storage of plastic cartridges can result in the loss of water. These cartridges can still be used; put them in the pen to puncture them, then add distilled water with a syringe and blunt needle to make up the lost water and it should work fine.

### ***Stuck ink bottle lid***

This can happen with a bottle (typically glass) that gets ink on the threads. The ink dries and glues the lid to the bottle. I've had bottles that I couldn't get the lid off even using one of those rubber strap/handle devices to provide extra leverage. Turn the bottle upside down in a small container and fill the container to just over the top of the cap. Let it soak, preferably in warm tap water. This may loosen the cap enough to get it off (but it has never worked for me).

If the previous method doesn't work, take it to your shop and grab the bottle gently but firmly with a vise. If it's a glass bottle, put some rubber or soft urethane between the vise jaws and bottle to avoid breaking the glass. Then gently grab the cap with pliers and you should be able to loosen the cap. I

like to use Knipex Cobra pliers for this task, as they seem to grab the best. 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. Thus, 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.

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 toilet paper to wipe off bottle and cap threads before closing the bottle. These are the little things that cause normal people to reject the idea of using a fountain pen because they're too much maintenance.

### ***Ink on fingers***

If you use bottled ink, you're going to get ink on your fingers -- it's only a matter of time. If this is objectionable to you, you can get finger cots<sup>17</sup> or rubber gloves to protect your fingers and hands. Personally, I don't bother, as the ink will come off in a day or two and I don't mind being branded as a fountain pen user. There are also products that you can buy that are touted to remove ink stains readily from your skin (Ink Nix) and fabrics (Amodex). I can't comment on them, as I haven't tried them. If I have a stain on my skin I want to remove, I go to my shop's sink, wet the stain, and rub it with Lava soap -- it usually comes off with a little rubbing; I've read that automatic dishwasher soap or shampoo work in a similar fashion. I haven't got any ink on my clothes -- or, if I have, it was a dark blue or black ink on my dark blue shorts and my wife never noticed (she'd be on the warpath if I stained my good clothes).

### **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; [da book] is one place to start. Simple tasks can be done with easily-acquired tools. Check out <http://www.tryphon.it/catalogo.htm> 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).
- ◆ The same goes for shellac -- just go to a local paint store and buy a small container of shellac flakes and dissolve them in denatured alcohol.
- ◆ You can get alligator forceps at Harbor Freight (or at least you used to be able to, as that's where I got mine; yes, they are cheaply-made ones).
- ◆ 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<sup>18</sup> and cut out a

---

<sup>17</sup> Many people are not aware of finger cots, but they're used a lot in the vacuum and semiconductor industries. They look like miniature condoms and are unrolled on your fingers. They're convenient and inexpensive.

<sup>18</sup> Stop by a tire shop and they might have one they're about to throw out. A truck inner tube will give you lots of rubber.

chunk. Clean off any powder (give it a good wash in the sink with a detergent) and you'll have a useful tool. You can also use those rubber grid mats they sell for the bottom of tool box drawers; they grip well too.

I always use safety glasses when in my shop or working on things that might get in my eyes. Go to your local safety outlet (welding supply places often have lots of safety stuff). You can get nice polycarbonate wrap-around safety glasses for roughly \$5-\$20. If you think that's too expensive, compare it to a trip to the emergency room. If you've ever had a cut in your cornea, you'll find it can shut down all activity for a day or two and make you sit in a dark room with dark glasses on and suffer with constant pain -- then those safety glasses will look downright cheap.

Here's a link with some useful basic information:

<http://munsonpens.wordpress.com/category/fountain-pen-tools/>. They recommend a Dremel tool, but I've read many complaints from people about the stuff that Dremel now sells. My beloved Dremel tool of 30 years of use got left out on the patio and rusted one winter; but because of all the negative information floating around about Dremel's poor quality and cheap products, I'll never buy another Dremel tool. This makes me thankful I bought a commercial Foredom tool a couple of decades ago. This quality degradation is sad, as Dremel used to make reasonably good stuff (it still wasn't commercial quality though).

A knockout block is used to help knock the feeds out of the sections. One of these would be easy to make with a drill press. You can also look for a machinist's bench block:



Here's another site with lots of information: [http://www.vintagepens.com/pen\\_repair.shtml](http://www.vintagepens.com/pen_repair.shtml). Also see Binder's site, mentioned near the beginning. Here's another: <http://www.penpractice.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.

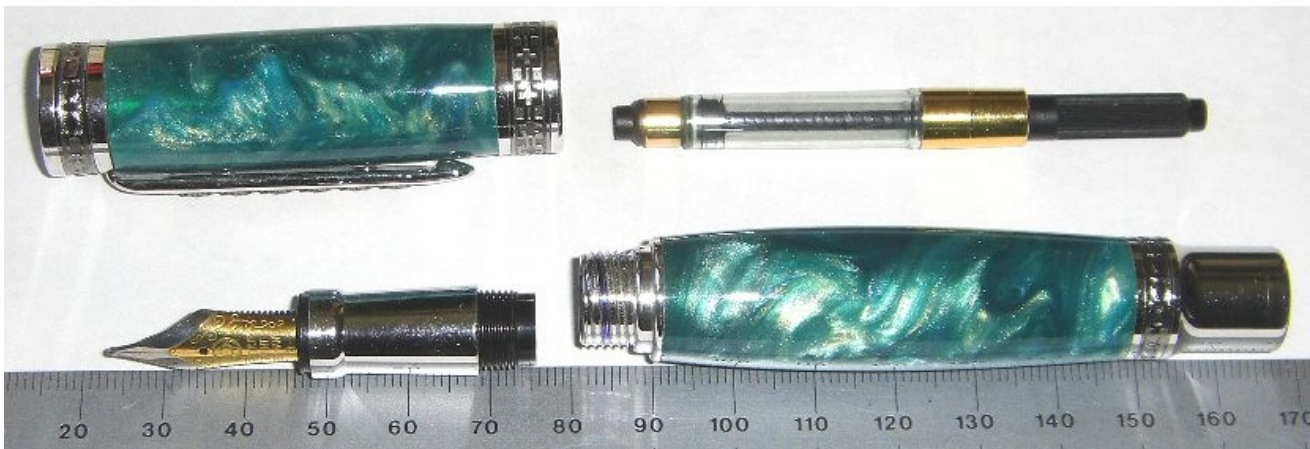
A pro will likely disassemble the pen and inspect all the parts and replace any that need replacing. I don't recommend doing this unless you know how the pen is constructed and you have any required tools. Note that you may break some seals or void a warranty on an expensive pen, so know what



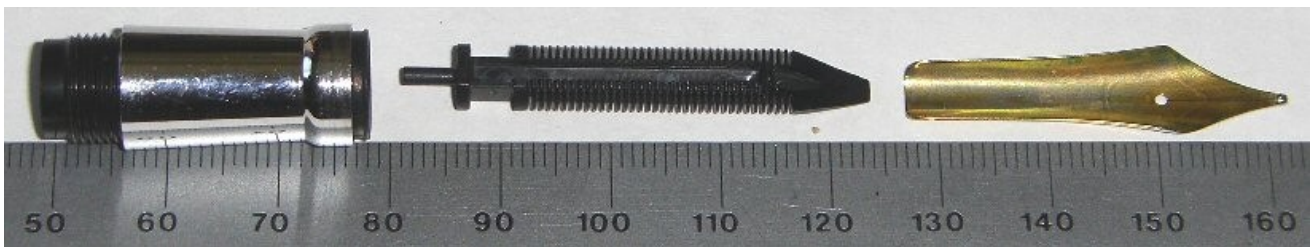
you're doing before you do it -- in fact, don't do anything unless you know it's OK to do. But many pens are basically pretty simple and can be dismantled for cleaning when needed. I'll show an example using a custom-made large pen (I'm not implying that all pens are constructed this way):



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 somewhat 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 for a really encrusted pen, but this is a bit too strong for my tastes -- I've never needed such a strong ammonia solution). This is especially helpful for soaking pens with sacs that have dried inks in them. You can be patient and let the pens 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. You'll find that this means things are quite clean -- for a demonstration, put a drop of ink in a few hundred ml of water and you'll see that it colors the water rather well. Thus, if 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 its 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). If you do use soap or a cleaner, make sure you rinse things out thoroughly with plain, clean water. What you don't want is to leave residues behind that may affect ink flow or pen behavior. Personally, I virtually never use soap -- I've been able to clean all my pens with just water and a few drops of ammonia. This includes my relative's 50+ year-old Parker pen -- it just required a good soaking and numerous flushings over a period of a few days.

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. Any 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. The discolored toilet paper will prove to you that water was removed from the pen. Some people have made a similar tool from those mechanical devices used for spinning lettuce to get the water out of it. A lab geek would use a centrifuge. An over-the-top fountain pen user would strap the pen to the blade of a lawnmower. ☺

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.

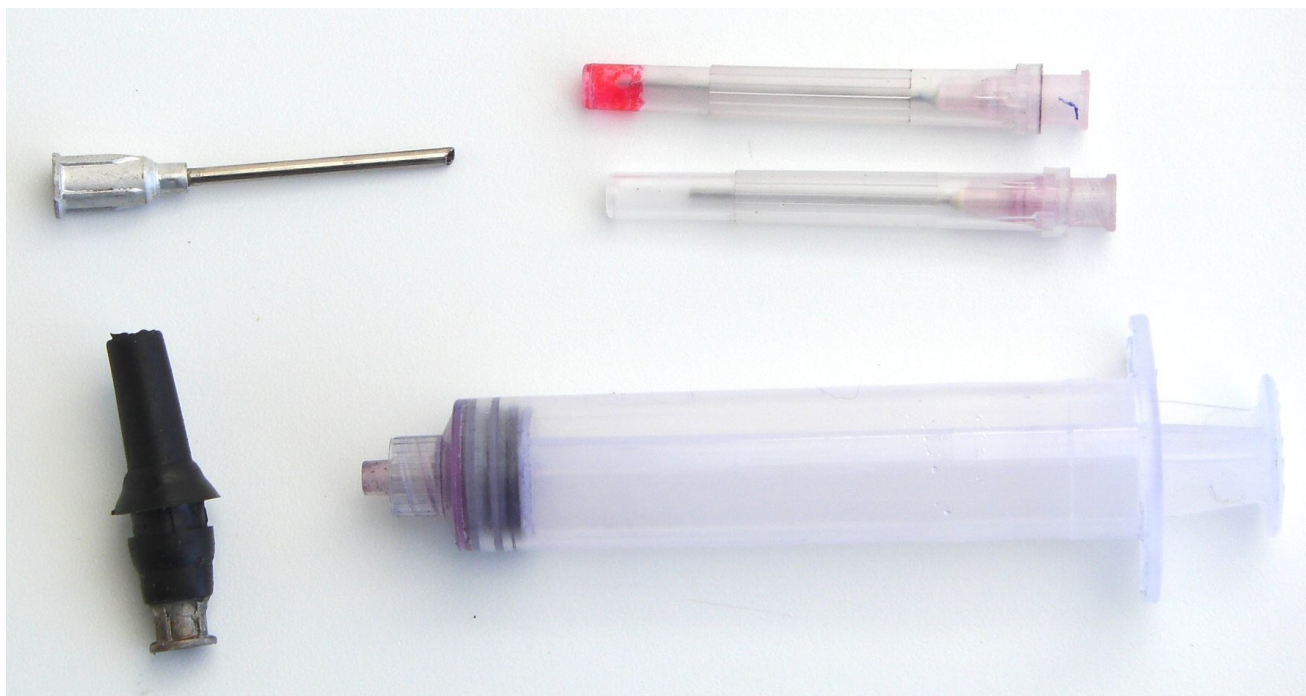
If your pen occasionally drips ink into the cap, you may want to occasionally flush the cap out too (or soak it if this is appropriate). I've found the some pens can accumulate quite a bit of ink in the cap (especially if the pen gets dropped), so such a cleaning is appropriate and may avoid a messy 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. I prefer the Luer-lock style of syringes; this has a thread outside of the Luer taper that holds the needle body onto the syringe until it's deliberately removed. For reference, here are the nominal sizes of these needles:

Gauge	OD, mm	ID, mm	Wall, mm	OD, in.	ID, in.	Wall, in.
14	2.11	1.60	0.25	0.0830	0.0630	0.0100
18	1.27	0.84	0.22	0.0500	0.0330	0.0085
21	0.82	0.52	0.15	0.0323	0.0203	0.0060

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. Before I had such a tool, I would occasionally flush some pens with a mouthful of water, but this can leave saliva in the pen and isn't the best idea (and is guaranteed to pop your eardrums ☺). You can use an ear-cleaning syringe found at the drugstore for this task, but the tool shown here is nearly ideal -- and you can make it from scrap. A suitable chunk of rubber tubing from the auto supply store could probably also be made to work. If it's not the right size, you can whittle it to size with a sharp knife.

If you don't have a syringe to do this type of cleaning, you can instead use a clean converter filled with water. It will be much 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 (i.e., they can mysteriously hold the needle inside the cartridge). I only use the sharp needle to puncture holes in new cartridges that I want to extract the ink from (see below).

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. Years ago, we had a horse that was sick and I needed to give her many injections, so I accumulated lots of syringes and needles. And the horse's vet once let me take a handful of 14 gauge needles from a bucket of used needles in his truck -- so I'm set for life. I just grind the sharp tips of the needles off on my shop grinder. There are places on the web that will sell you syringes and blunt needles; you should be able to find them with a web search.

### **Syringe shop tip**

This is off the topic of fountain pens, but since others might be do-it-yourselfers like me, you may find the following information handy.

One of the most frequently-used things in my shop is, surprisingly, a 10 ml syringe filled with petroleum jelly (e.g., Vaseline or petrolatum) with a blunt 14 gauge needle. I use it to put Vaseline exactly where I want it. Vaseline melts at about 38 °C (100 °F) and has a specific gravity of 0.9. It makes an effective lightweight grease (but it's not a true grease) for light duty tasks; it's cheap and easily available.

When you fill the syringe with Vaseline, you want to get the air bubbles out. The method I've used is to use a Popsicle stick to force a bunch of Vaseline into the syringe's barrel. Then I heat up the Vaseline in the syringe to melt it; this can be done with steam from a teakettle or just set the thing outside in the summer sun. When it's melted, insert the plunger, turn it so the needle faces up, and press the plunger to get rid of the air. You could also melt the Vaseline over a double boiler and pour it into the syringe. In the winter, the syringe is hard to press to get the Vaseline out, so you might want to dilute it a little bit of a solvent like mineral oil or naphtha (lighter fluid) to help things flow better (but this may be a bit runny in the summer).

Some things I use Vaseline for are:

- ◆ Apply a small amount of Vaseline on threads, door hinges, kitchen drawer rollers, etc. to make them work more smoothly. Don't use things like WD-40 for lubricating things because it's basically just kerosene and mineral oil and has no staying power (but it's great for what it was designed for: displacing water). Oh, and NEVER put Vaseline or any oil in a lock mechanism -- it will eventually gum it up.
- ◆ Put a small amount on your finger and wipe it on the striker plate and lock plunger of each door around your house -- the doors will close a little more easily.
- ◆ It will gently dissolve some things, such as gum in your child's hair.
- ◆ Hides scratches in an LCD screen (like on your computer). This brings up a 100-year-old tip that many people don't know. Get a Tibet Almond Stick (see <http://zcwinc.com/>) and rub it on small scratches in wood -- the scratches will disappear. These sticks can last a long time -- my wife is still using one I bought in the 1970's. These sticks were invented in the early 1900's as a replacement for rubbing almond meat on a scratch (a tip that was well-known to woodworkers). If you don't have the Tibet Almond Stick, try a tiny amount of Vaseline to cover up a scratch.
- ◆ Prevent epoxy or glues from sticking to a surface.
- ◆ Inject it into a hole you're about to tap.
- ◆ Before painting or working on the car, coat your hands with Vaseline and they should clean up easier when you're finished.
- ◆ After cleaning your car's battery terminals of corrosion, coat them with Vaseline to reduce

subsequent corrosion.

- ◆ Coat the threads of a screw-top can like that used for PVC cement and you won't need pliers to get the top off later -- and the can will seal better. Many women know to put Vaseline on the screw threads of their nail polish bottles to make them easier to take off later.
- ◆ When you're finished with using a small amount of stuff from a tube of silicone sealant (RTV), caulking, etc., put a dab of Vaseline on your finger and smear it into the hole in the tube and also on the threads, then cap it. Next time you use it, squeeze a small amount of the tube's material onto a rag to "clear" the Vaseline. This way, the material in the tube won't harden. This also works well with the tubes of stuff used in caulking guns. I only thought of this use a few years ago, but I now have a flatter forehead from slapping myself thinking how many partial tubes of stuff I had to throw out over the decades because the stuff dried out.

When you need to get some lubrication into a metal object (say, the joint of a pair of pliers), set them in the sun to get them warm (or gently heat with a torch) and then squirt some Vaseline onto the joint; it will melt and wick into the joint. Vaseline will typically last longer as a lubricant in that joint than things like oil lubricants (and the oils dry out over time and become gummy).

OK, now back to the regularly-scheduled fountain pen stuff.

### ***Getting ink from a sealed cartridge***

About the only use I have for the sharp needle on a syringe in my pen cleaning kit is to get the ink out of a sealed cartridge. This is a potentially messy task, so if you're going to attempt it, I recommend you wear gloves and old clothes (guess how I know). You might be smart to do it outside the house or inside of a cardboard box, as it's possible to spray ink.

There are two ways: one hole and two holes.

The one hole method is the easiest but problematic. The reason is that you just can't insert the needle into the cartridge and start pulling out the ink because you'll draw a vacuum, which will stop the ink flow. Here's the procedure (if you've ever filled a syringe from a sealed medicine bottle, this procedure will be familiar):

1. Put a sharp needle on the syringe (be careful not to stab yourself).
2. Pull the syringe's plunger so it's about 20% open.
3. Puncture the cartridge with the needle.
4. Hold with syringe pointing up.
5. Slightly pressurize the cartridge by pressing the plunger.
6. Relax the pressure on the plunger and some ink should flow into the syringe.
7. Repeat as the previous two steps as needed.

**Do not remove the needle from the cartridge while it is pressurized** -- you'll have ink spray around. Pull a bit of a vacuum when you want to remove the needle so that the ink stays in the cartridge.

With two holes, the second hole provides air to replace the removed liquid. Thus, the hole you puncture with the needle needs to be large enough (and stay open) to supply the needed air. Puncture the top of the cartridge first. Then, holding the punctured top vertically, push the needle into the cartridge from the bottom of the cartridge. Once in, you should be able to suck out the ink. To get all of the ink, it may be easiest to invert the cartridge (put a piece of tissue paper over the first hole so it won't leak), then put the needle at the bottom and pull the syringe plunger.

You want to avoid slipping and stabbing yourself with the needle. It certainly wouldn't hurt to use some heavy leather gloves. Even better, get two pieces of wood that fit together tightly and clamp them together with a piece of card stock between them. Drill a hole through the wood the size of the outside diameter of the cartridge and centered on the card stock. Clamp the cartridge in between

the two pieces of wood using some Vise-grips, a C-clamp, or a machinist's clamp. The card stock separated the wood pieces just enough to let the pieces clamp the cartridge. Then your fingers don't need to be near the cartridge when you puncture it.

The advantage of the one hole method is that you could conceivably rinse out the cartridge and fill it with a different ink (this seems to me to be a lot of work to get a cartridge of ink). But you'd have to insert the cartridge into a pen and start using it unless you had an air-tight cap to put over the cartridge (or see below for some other sealing ideas).

### ***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 a straightforward thing to do if you have a needle that will fit inside the hole made by the pen 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 with a number of refills; last time I did this, I got at least 15-20 refills before the cartridge leaked. This is because eventually the hole in the cartridge becomes too big to seal around the nipple from the feed. The first clue I had about this problem was blue ink all over my hand. ☺

If you're not going to use the cartridge right away, it needs to be sealed to avoid evaporation and leaking. Personally, I don't do this because I have no need for it, but here are some suggestions that came from FPN:

- ◆ Find small tapered rubber stoppers or corks for the hole. One suggestion was that suitable plugs may be in inkjet cartridge refilling kits or candle mold kits.
- ◆ Put a drop of silicone sealant over the hole and let it dry. Peel it off before use.
- ◆ Put a drop of hot-melt glue over the hole and peel it off before use. Or, put on a disk of material by starting at the outside and spiraling in towards the center; leave a tab so you can get your fingernail under the tab to pop the plug off.
- ◆ Wrap a plastic [film](#) (e.g., Saran Wrap, part of a plastic bag, Glad Press'n Seal, etc.) around the cartridge and secure it with a rubber band or tape. Another suggestion was Parafilm®, which is plastic film coated with paraffin and often used in the lab.
- ◆ Use a ball for sealing from another cartridge.
- ◆ For international cartridges, cut a cap off the opposite end from another cartridge. Alternative caps suggested come from Lego sets.
- ◆ Put a drop of candle wax or sealing wax on the hole. Personally, I don't like this suggestion (or similar ones for sticky materials) because it could mean that wax could get into your pen's nipple or feed and cause problems. However, if the wax can be peeled off without remnants, then it's a viable method.
- ◆ Put a rubber band over the length of the cartridge; if it's the right size, it should seal the hole. A corollary is to use a small plastic or steel ball under the rubber band to seal the hole.
- ◆ If you have a lathe, make a suitable plug from a metal or plastic.
- ◆ In a pinch, some chewed chewing gum might work. Again, I don't recommend something that

might leave some residue behind that could get into your pen.

It appears that the hot melt glue seal seems to be the most popular method.

If you'll be carrying the cartridges for use later, it would be wise to keep them in a sealed plastic bag or old prescription bottle to contain the ink if one of the cartridges leaks. If you're away from home where there is the possibility of an ink leak, it might be wise to carry a paper towel or two to help with the clean-up should a leak happen. This is an example of the "overhead" involved with fountain pen use.

## Glossary

For an extensive glossary, consult Richard Binder's website's glossary:

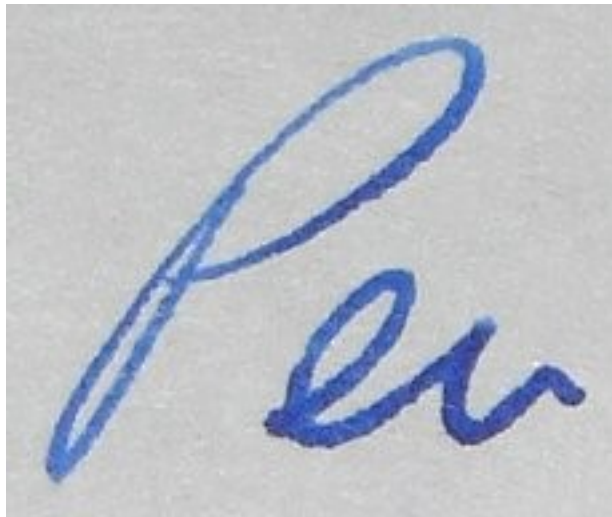
[http://www.richardspens.com/?page=ref\\_info/glossary/A.htm](http://www.richardspens.com/?page=ref_info/glossary/A.htm).

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). This is useful for archival and anti-forgery purposes.
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. Most people strongly object to feathering. For examples of feathering, see the word "North" in Figure 1 on page 30 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 density per unit area of paper. 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. I believe they were bleach-based products and usually worked quite well on blue and black inks. They seem to have completely disappeared from the marketplace. Pelikan sells a Pirat Pen that has an eradicator for their blue ink, but it apparently doesn't work with other inks.
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 <a href="#">here</a> .
nibmeister	A person who is recognized as being expert at modifying and repairing fountain pen nibs. It can require quite a bit of skill and experience.
permanent	A somewhat imprecise term describing inks. It was used decades ago to describe whether inks could be washed out ("permanent" vs. "washable") from fabrics. It



doesn't have a sharp meaning in my mind.

- saturation A measure of how strong the color of an ink is. As the saturation approaches 1, the ink approaches a pure color. As the saturation decreases towards zero, the color washes out and becomes a gray color. When speaking of an ink's saturation, the saturated inks' colors stand out from the page and are noticeable; less saturated inks don't "snap" out at you. 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. A scratchy nib is caused by too much sharpness or misalignment. Some people fix this themselves with careful grinding/polishing (search the web for details and be aware that you can ruin a nib by doing this) or send it to a nibmeister.
- 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 (written with my relative's Parker pen with Private Reserve DC Supershow Blue diluted 50%):



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" (and that can be a euphemism for the real meaning ☺). 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 (such as Noodler's bulletproof inks or some roller ball inks) are not changed at all by soaking or boiling.

## Recommendations

### Pens

If you've never used a fountain pen before, I recommend you buy a Pilot Varsity disposable fountain pen for a few dollars to try one out and get familiar with writing with a fountain pen. You'll find it's a well-behaved inexpensive pen and it will introduce you to the fun of writing with a fountain pen -- and you won't have to worry about buying ink or filling a pen. You may find it's all the pen you need, but you won't know that until you've gone down the rabbit hole and tried a bunch of different pens. **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 hold a lot of ink and will write for quite a while. They are a convenience for a small amount of money and you're not going to be terribly put out if you lose it.

The Pilot Varsity isn't the only choice of an inexpensive fountain pen; it's just one that I have personal experience with. A second recommendation is the Platinum Preppy pen, although I have never used one. These are intended to be used with ink cartridges, but they can be converted easily to eyedropper pens with an o-ring and some silicone grease. Some bottles of Noodler's ink include these pens as a "free" pen (of course, they're not free -- just do the arithmetic and you'll see that you're paying for the pen too), so that might be a good way to get started. These can introduce you to the slightly more maintenance-intensive tasks of cleaning and filling a pen. You can also purchase an adapter for the Platinum Preppy that allows it to be used with the short international cartridges -- this is nice, as there are many vendors of these cartridges.

Another popular beginning pen is the Lamy Safari for around \$35. This is a cartridge pen that can be used with a converter. I haven't tried any of the Lamy pens, so I can't comment on them. The Lamy cartridges are proprietary, so you'll need to buy Lamy cartridges unless you use a converter.

There are also inexpensive Hero pens that can make good first writers (and my black ink daily writer is a favorite Hero 616 pen). You can e.g. buy a package of ten Hero pens from China for under \$20. 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 dive down the rabbit hole and try more expensive pens. I won't recommend anything because it's a journey you'll have to take yourself -- a lot will depend on how much money you want to spend and what features you find most important. Only you can define your needs.

### Inks

I recommend you buy a bottle of Waterman Florida Blue and use it as your first ink. This will set a standard for future comparisons. However, note that Florida Blue is not a permanent ink. Waterman's Florida Blue ink is almost universally-recommended as a good ink to try if you're having trouble with a pen. If you can't get the pen to work well with Florida Blue, there's probably something wrong with the pen.

If you want a 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. The most important piece of advice I can give based on my own experience is that 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 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 pen(s).

I'll also repeat the warning: **never use India ink, drawing ink, or any inks with pigments in them in your fountain pens.** You're sure to clog and maybe destroy your fountain pen. Use only inks made for fountain pens.

## Appendix: measuring

I discuss some of the tools I use for measuring things in this section.

### Length

The fundamental tool for length measurement is a good rule. I keep an Omega rule at my desk that is graduated in inches on one side and mm on the other. It's about 8" long; I cut it from the normal 18" rule that Omega sold. I know this rule is accurate because I've checked it against my machinist rules and my high-quality drafting rules (my machinist and drafting rules were made to high standards). There is nothing worse than finding out you've been making measurement errors with a rule that is just slightly off (I have found some of the cheaper plastic drafting rules have measurable errors in their graduations).

A magnifier with a reticule can be useful. There are many brands to choose from; one I have is an Edscorp-branded one (sold by Edmund Scientific) and is graduated in 0.1 mm divisions. My favorite is a 20X Dumaurier Micro-Mike, which can be clipped into a pocket and is a robust design with no moving parts to break. They are aluminum tubes about 125 mm long and 12 mm in diameter. The 20X has a field of view of a little over 4 mm in diameter and has 0.1 mm graduations on the reticule; I consider it a nearly perfect tool (I often use it with an LED flashlight for illumination). Dumaurier went out of business, but Micro-mikes are still apparently being made (<http://www.micro-mike.com/>).



I've had that one for around 30 years and it works great. The blue band is to identify it as my 20X unit; I also have a 50X unit that I use much less. The scale of the 20X unit is 4 mm long and has 0.1 mm graduations (you can easily measure to 0.05 mm and I usually interpolate to 0.1 mm).

This 20X Micro-mike is just about perfect for measuring pen line widths, nib widths, wire diameters, etc. You'll want to have a flashlight handy, as you often need extra light.

### Mass & volume

If you experiment with inks, etc., you may want to make measurements to document what you did and be able to repeat what you did in the future. In dealing with liquids like inks, you have two methods to measure them: by volume or by mass.

I tend to prefer measurements of mass when possible. A rugged mechanical scale like an Ohaus triple beam balance can make measurements up to a kg or more and resolve to 0.1 g (the name "triple beam" comes from the fact that there are three beams with counterbalance sliders on them):



These scales can be found used for roughly \$50 or so and, with care, will last longer than you do. Electronic scales are also available and have the nice feature of being able to tare out the container you're measuring things in. I tend to prefer purely mechanical and time-tested solutions like the Ohaus mechanical balance -- mine has been knocked off the window sill a few times by curious cats and it still functions just fine (some sensitive electronic scales won't survive such handling). Another good choice of a mechanical scale could be a Harvard trip balance -- as long as you had a suitable set of mass standards (and good ones aren't cheap!).

Still, it's hard to argue with the convenience and price of the inexpensive electronic scales made today (I've seen them as inexpensive as \$10-\$15). I haven't tried one, so I can't say anything about their accuracy or repeatability (I've read the inexpensive ones can have weaknesses; caveat emptor).

My Ohaus triple beam balance will measure the mass of my coffee mug at 109.8 g, then noticeably respond to a change in mass from two drops of water from an eyedropper. Adjusting the scale slider tells me this addition was slightly less than 0.1 g, so those drops are roughly 0.05 ml. Such a tool would then let me make up a dilute soap solution to use as a surfactant. I might put in a drop of dishwashing liquid into 50 ml of water, then use that solution to dilute inks; I'd put a drop in at a time and test the effect. I also have an RCBS 10-10 reloading scale (also made by Ohaus) that has a resolution of 0.1 grains which is 6.5 mg; however, I can interpolate to 0.5 grains or about 3.2 mg.

If you have access to the analytical scales used e.g. in chemistry labs, those instruments will measure to the nearest 1 mg or 0.1 mg. This can let you do more careful experimentation, but these scales can cost thousands of dollars, so the average bear in the woods (e.g., me) isn't going to have one of these.

If you can get your hands on small mass standards in the microgram range (not an easy task), you can make very sensitive electronic balances from old analog meters. See the fascinating article [mb]. I made one of these from a superb 1960's HP analog meter and the thing was capable of measuring masses up to around 30 mg with a resolution of around 5  $\mu\text{g}$  (both estimated). This meter was fun to play with; I could do things like dip a small piece of thread into my tea, then watch the thing lose mass by water evaporation. One of the problems with measuring such low masses is the things you're weighing are small and can be hard to see -- and the real problem is that an errant breath can make the thing disappear (and electrostatic forces can drive you crazy). If one was interested, such a microbalance could be used to measure the amount of ink deposited on a small piece of paper with a pen, then watch the water evaporate and measure the mass remnant that was left. This is more work than I want to do at the moment, however. ☺

If you want to measure by volumes, then you'll need a suitable container. For smaller volumes (on the order of 1 ml to 10 ml), syringes or pipettes can be good tools. The Mohr style pipettes made from glass can be purchased inexpensively and can resolve to 0.1 ml. More expensive volumetric pipettes can be purchased (e.g., Cole-Parmer sells a package of ten 5 ml pipettes for around \$110;



Grainger sells similar things about half that price). You can buy disposable polyethylene pipettes in e.g. 1 ml and 3 ml sizes; these would be good for measuring small volumes for ink mixing. Here's some helpful information on using a pipette:

<http://www.csudh.edu/oliver/demos/pipetuse/pipetuse.htm>.

## **Loupe**

One of the most-used tools I have is my Bausch and Lomb 4X Jeweler's loupe. It is just about perfect for all my needs; I only occasionally need more magnification. It is a 25 mm diameter converging lens with a 63 mm focal length. I also have a B&L 10X loupe, but it is usually too much magnification with too small of a field (i.e., the area that is in focus at one time). These are simple devices that, with care, should last a lifetime. I find my 4X loupe handy for use with my digital camera as an impromptu macro lens, although it can take a bit of juggling to hold the loupe steady and get the camera aligned properly. Another popular choice is a 7X Hastings triplet magnifier; these can be found by going to web sites that cater to geologists or biologists. A piece of advice I can offer from experience is to avoid buying too much magnification.

## **Appendix: density of ink**

In this appendix, I show how I measured the density of an ink. It's a somewhat crude measurement because I don't have access to expensive scientific tools. I measured the masses with an RCBS 10-10 reloading scale. The volume was measured by the graduations on the side of a plastic bottle. Without better tools I can't quantify the uncertainties of these measurements, so I mostly used my judgment to estimate them.

The ink whose density I measured was Pilot Iroshizuku Syo-ro. The scale measures mass in grains (1 grain is 1/7000th of a pound or 0.0647989 g). I'll abbreviate grams with g. I use g/cc (grams per cubic centimeter, same as g/ml) for density; to get the SI value in kg/m<sup>3</sup>, multiply by 1000. The density of water at room temperature is nominally 1 g/cc.

Mass of empty 6 ml bottle with cap = 57.0 grains

Volume of ink added to bottle: 3.27 ml. I accidentally got some small amounts of ink on the side of the bottle (these add to the mass, but not the volume, thus causing a systematic error). Here's a picture of the ink after adding it to the bottle:



Using a rule, I measured the distance between the 1 ml marks in the picture as 24 mm on my computer's screen. Then the bottom of the meniscus to the left of the numbers is 6.5 mm from where the 3 ml mark would be. This means the bottom of the meniscus represents  $6.5/24 = 0.27$  ml. I estimate that the standard deviation of this volume measurement is 0.2 ml.

The mass of this 3.27 ml of ink plus the bottle was 102.2 grains. I estimate the standard deviation of the mass measurement as 0.1 grains, which is the scale's resolution. I can actually discriminate a bit better than this, perhaps to 0.05 grains. Since I don't have any mass standards, I don't know if there's any systematic error. The scale's statistical standard deviation for repeated measurements is less than 0.1 grains<sup>19</sup>.

Thus, the mass of ink in the bottle was  $102.2 - 57.0$  grains = 45.2 grains = 2.93 g.

I used the following python script to calculate the measured density and its standard deviation:

```
'''
Calculate the density of the Iroshizuku syo-ro ink along with an estimate
of its standard deviation. The component standard deviations are my
estimates, not measured values.
'''

from uncertainties import ufloat

grains_to_grams = 0.0647989
```

---

<sup>19</sup> I measured 10 different bullets once from a manufactured box; the mean was 148.0 grains and the standard deviation was 0.11 grains.

```

def P(unc, sfm=3, sfsd=2):
    '''Return a string representing the uncertain value.  unc is a ufloat.
    sfm represents the desired number of significant figures in the mean;
    sfsd represents the desired number of significant figures in the
    standard deviation.
    '''
    m = "%. *g" % (sfm, unc.nominal_value)
    s = "%. *g" % (sfsd, unc.std_dev())
    cov = " (COV%% = %.1g)" % (100*unc.std_dev()/unc.nominal_value)
    return m + " +/- " + s + cov

# Measured values with estimated standard deviations.  Mass is in grams,
# volume is in ml == cc.
m_container = ufloat((57, 0.1))*grains_to_grams
m_ink_and_container = ufloat((102.2, 0.1))*grains_to_grams
ink_volume = ufloat((3.27, 0.2))

# The density is in g/cc
density = (m_ink_and_container - m_container)/ink_volume

print "Container mass in g      =", P(m_container)
print "Ink + container mass in g =", P(m_ink_and_container)
print "Mass of ink in g          =", P(m_ink_and_container - m_container)
print "Volume of ink in cc       =", P(ink_volume)
print "Density in g/cc          =", P(density)

```

This script depends on the uncertainties module [unc].

The results were:

```

Container mass in g      = 3.69 +/- 0.0065 (COV% = 0.2)
Ink + container mass in g = 6.62 +/- 0.0065 (COV% = 0.1)
Mass of ink in g        = 2.93 +/- 0.0092 (COV% = 0.3)
Volume of ink in cc     = 3.27 +/- 0.2 (COV% = 6)
Density in g/cc        = 0.896 +/- 0.055 (COV% = 6)

```

Thus, the density of this ink is about 10% less than water and the measurement method gives a standard deviation of about 6% of the measured value. The COV% number is the coefficient of variation (standard deviation divided by the mean) in percent; this number gives you an idea of the size of the standard deviation relative to the mean. You can see that basically all the uncertainty in the density comes from the uncertainty of the volume; this is why better tools such as [pycnometers](#) are used to measure density. While I don't have a pycnometer (and I couldn't justify the expense of one), a better tool than what I used would be a glass pipette intended for volume measurements.

## References

If you're interested in finding places to buy fountain pens or inks, type "fountain pen seller" into a web search engine and you'll be inundated. Here's one link containing lots of links:

<http://www.abdn.ac.uk/~pec187/penpage.htm>.

- [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.
- [da book] Frank Dubiel, *Fountain Pens: Complete Guide to Repair and Restoration* (it's a spiral-bound book that can be found on the web). I've not seen this book, but virtually everyone recommends it and calls it "da book"). Pendemonium sells some other books you may want to think about: <http://www.pendemonium.com/books.htm#repair>.
- [eb] <http://www.1911encyclopedia.org/Pen> 11th edition of the *Encyclopedia Britannica*.
- [fpnir] FPN ink reviews; the index is <http://www.fountainpennetwork.com/forum/index.php?/topic/160612-index-of-ink-reviews/>. Newcomers beware: there are many more inks than you probably think

there are...

- [fpnlb] [http://www.fountainpennnetwork.com/forum/index.php?/topic/183466-women-how-do-you-carry-your-pens/page\\_\\_p\\_\\_1849802#entry1849802](http://www.fountainpennnetwork.com/forum/index.php?/topic/183466-women-how-do-you-carry-your-pens/page__p__1849802#entry1849802) Simple but elegant design from Lorna Berger, FPN member; I thank her for the permission to use her photo.
- [gp] Goulet pens, <http://www.gouletpens.com/cindex.asp>. The fountain-pen-enthusiastic owner is Brian Goulet and it's a relatively new store. He and his wife have put a lot of work into their website and it shows -- I consider it one of the nicest shopping websites I've come across.
- [mb] Shawn Carlson, *Homemade Microgram Electrobances*, The Amateur Scientist column in Scientific American, June 1996. A copy can be found here: [http://www.erowid.org/psychoactives/hardware/hardware\\_info1.shtml](http://www.erowid.org/psychoactives/hardware/hardware_info1.shtml). Here's another reference: <http://www.sci-spot.com/Mechanical/balance.htm>. Here's a 1917 article on building your own balance that can measure to mg levels: <http://www.lindsaybks.com/arch/bal/index.htm>.
- [ms] <http://michaelshannon.us/makeabook/>
- [pd] Pendemonium, <http://www.pendemonium.com/> A well-known store.
- [ps] <http://code.google.com/p/pygraphicsps/> A python graphical library that outputs Postscript.
- [unc] <http://pypi.python.org/pypi/uncertainties/> This is a python library to help you properly calculate uncertainty propagation with the usual linear model. It can also handle correlated uncertainties if you know the correlation matrix. For more details on uncertainty propagation, consult the GUM (<http://www.bipm.org/en/publications/guides/gum.html>).