

# THE MAGICAL LAND

## EQUESTRIA AND ITS ENVIRONS AN EXAMINATION OF WORLD-BUILDING

by Dave Bryant

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THE SHOW PRESENTS the ponies' country as a picturesque, fantastical land of magic. However, instead of a storybook rendition of the Middle Ages, with knights in shining armor, castles, and wizards in towers, the ponies seem to be in the middle of their version of the Industrial Revolution—which in real history took place mostly during the nineteenth century. How can one tell, though? The program isn't very consistent about the kinds of technology it shows, after all.

There are lots of examples throughout this part of the rulebook, but one technology in particular pins down the time period pretty well: The steam locomotive entered commercial service in the 1820s, and diesel locomotives started to replace steam in the 1920s. To narrow things even more, the style of locomotive shown in the program is similar to designs used in the United States during the 1860s to the 1880s. So the focus will be on the century of the steam locomotive, with special attention to the middle three decades. This should provide some historical context as well as specific information to help in deciding just what to include or leave out.

As much as possible, information about the show's setting is based on the episodes, but some came out of comments by, interviews of, or question-and-answer sessions with people working on the show. That includes the show's creator, who's warned that since she isn't with the show any more, things may have changed. Still, it's useful to know what she was thinking when she did the original creative work.

### Why Is the Show's Technology So Inconsistent?

The show's supervising director has commented that technology looks so strange because the show's staff try to write about and show things that are familiar to a modern audience—especially younger viewers—even if some of them otherwise might look out of place. Moreover, the show's mostly a comedy, and the writers seem willing to stretch things for a good laugh.

The staff is trying for a fairy-tale feel, but it's possible that, even if or when they want to stay “in period”, there's not much time for research or double-checking things they put in the scripts. Some of the gaps can be explained by assuming the ponies are better at, say, entertainment technology, because they don't spend as much time and energy on other things like war. (Of course, they obviously know what war is, since the main character asks if her future self has come back in time from an “epic pony war in the distant future”, a joke based on many science-fiction movies and video games.)

Even leaving aside the most obvious *anachronisms*—things that are out of place for a given time period—it can be tough to nail down a specific date. There isn't much sign of telephones, which showed up in the 1870s, but there *are* cash registers and linotype machines, which came later, in the 1880s. Color photographs and disk phonographs are products of the 1900s, yet everyone uses quill pens instead of the fountain pens that began to replace them even before the 1850s. The toys based on the show especially can be way out of the time period, since they include things like pick-up trucks and microwave ovens!

Still and all, it's a show for children about brightly colored magical ponies, so it shouldn't be taken *too* seriously. This information is presented simply to get people to ask questions and look up answers as far as they're comfortable doing. \*

FARMING AND KEEPING LIVESTOCK are well developed on the show. Family farms raise a wide variety of crops and other plants, including apples, carrots, celery, corn, and many different kinds of flowers. Farmers' markets and neighborhood stores sell the produce of the country's farms and orchards. It seems safe to guess that the ponies raise just about any food crop there is, no matter where in the world it comes from, as long as there's someplace with the right climate and soil for it.

Tea and chocolate seem to be popular, and coffee has been seen and mentioned. All three are from the tropics, but it isn't clear whether the ponies have to import them from other lands or they can be grown somewhere in the country.

The apple cider shown in one episode had foam “heads” when poured, which is more like beer than cider. Alcohol is a preservative and antiseptic, which is necessary where water may not be safe to drink without treatment. Beer, cider, and wine also contain some vitamins and other nutrients. If one wants to include alcohol, that means vineyards and wine casks, beer breweries, cider mills, and distilleries—as well as pubs and taverns. Incidentally, the idea of a “drinking age” is very recent, arising during the twentieth century where safe drinking water had become commonplace.

Most natural fabrics seem to be available for clothes, banners, and flags. There probably are cotton plantations and sheep ranches, sheep-shears and shearing sheds, cotton gins, spinning jennies and Jacquard looms, and other machines and industries needed to turn fibers into thread and cloth.

The ponies keep other animals too: cattle for milk, chickens for eggs, and pigs for less obvious reasons. The show's creator, when asked why ponies kept pigs (raised for meat in the real world), answered that the ponies really like truffles—certain kinds of mushrooms—which pigs can be trained to sniff out. Boar hair also was used to make paintbrushes, toothbrushes, and hairbrushes, though modern plastics mostly (but not entirely) took their place in the mid-twentieth century. Manure from animals might be used in fertilizers.

Earth ponies have a magical connection to the land and to living things, but they also seem to understand scientific methods and techniques. Crop rotation, including letting land lie *fallow* (temporarily unplanted) to “rest” and renew its ability to grow plants, is the most important. Absolute control over the seasons and weather, thanks to the pegasus ponies, would make crop failures and bad harvests rare. Ponies probably don't go hungry much, and even the poorest ones can afford a decent diet. Only the holiday pageants retelling the story of the country's founding would remind ponies what could happen if things went badly wrong.

Tools used on the farm include pony-drawn plows and other devices, as well as hoes, shovels and spades, rakes, and bare hooves. Heavier equipment hasn't been shown, but portable steam engines came around in the 1820s. They were powerful, but big and expensive, so organizations of local farmers would get together to buy or lease them, and move them from farm to farm as they were needed. Steam tractors appeared in the 1850s, but the ponies can do their own pulling, so they may not be very interested in that kind of invention. \*

WINDMILLS AND WATER WHEELS dot the landscape, particularly in the small town where most of the show takes place. The ponies probably have been building them for centuries—but what about more advanced sources of power?

### **Muscle, Water, and Wind**

Thanks to powerful muscles, the ponies themselves are a reliable source of energy. They probably are masters of building and using mechanisms to turn their own efforts into power for threshing, winnowing, grinding, hauling, and a lot of other agricultural and industrial tasks.

Windmills and water wheels have been around in the real world for some two thousand years, so these too probably are things the ponies understand very well. They're limited to providing mechanical power right next door, though, which means they have to be built where there's good water or wind power, not where it would be most convenient for whatever industries are using them.

### **Steam**

The first high-pressure steam engines were invented at the beginning of the nineteenth century. Much more powerful than earlier designs, they helped to make the Industrial Revolution possible, and led directly to the world we know today.

Early steam engines were fueled with wood or coal; the classic steam locomotive with its coal car is well-known even now. For most of the nineteenth century, the mechanism used by a steam engine was *reciprocating*, using back-and-forth motions, which usually meant big pistons and cylinders. Oil-fired steam turbines arrived in the 1880s, and saw their first widespread use in steamships; they mostly replaced reciprocating steam engines through the early part of the twentieth century.

A big problem with burning wood or especially coal is air pollution. The infamous “London fog” of the nineteenth century killed untold numbers of people and made noon as gloomy as night. The ponies probably wouldn't put up with that kind of problem getting out of hand (or hoof). Pegasus ponies may use their flight and cloud-working to deal with smoke, earth ponies may create new inventions to filter and trap it, and unicorn ponies may contribute magical solutions.

### **Other Power Sources**

The earliest internal-combustion engines showed up in the 1820s, with improved versions coming around in the 1860s. However, they weren't reliable enough or powerful enough for use in motor vehicles until the 1890s, which is a big reason why automobiles appeared at that time. For a while steam competed with gasoline, but it lost out because there isn't much else that packs as much energy into a pound of fuel as gasoline does—and is as easy to burn and use.

Most other power sources familiar to people today were introduced during the twentieth century, especially after the Second World War, so it's almost certain that they wouldn't be available to the ponies at all.

### **Electricity**

The show's creator has said that the ponies don't have—or at least aren't *supposed* to have—electricity. That means their technology probably isn't much more advanced than the 1880s, when electricity started to be more than just a novelty.

Hydroelectric and wind turbines were early sources of electric power starting in the 1870s, but until big electrical grids developed in the early and mid-twentieth century, they were limited to supplying nearby buildings or towns. Most hydroelectric power comes from big dams and reservoirs; a dam with hydro plant has shown up, only to burst and threaten the town with flooding. That episode was full of funny movie clichés, though, so taking it with a grain of salt may be wise.

### **Cooking, Lighting, and Heating**

A traditional wood- or charcoal-burning brick bakery oven might be so large that the whole building would be constructed around it. Nineteenth-century ovens and stoves were made of iron, and most of them burned wood. Gas-burning appliances went on the market in the 1830s. The electric gadgets that fill kitchen counters today didn't exist; everything was done with muscle-power, and it was hard work.

Gas lighting started to replace oil lamps early in the nineteenth century, but during the 1850s it got to be pretty widespread. Many television episodes use the sound effect of a light switch being flipped, probably so a modern audience would recognize it, but a gas light going on makes a *whoosh* sound (kind of like a gas stove burner being lit) and wouldn't light up a room as suddenly or as brightly as an electric light.

At the beginning of the nineteenth century, heat came mostly from fireplaces and wood-burning stoves. Radiators, first using hot water and later steam, were invented in the 1850s. Gas heaters were invented at about the same time, and improved versions came out in the 1880s.

### **Magic**

As part of the comment about electricity mentioned earlier, the creator added that she consoled herself with the idea that unicorn inventors might make enchanted appliances, explaining the existence of “electrical” devices. At least one episode has taken this idea and run with it. Still, being cautious about using it probably is a good idea.

Unicorn magic mostly seems to be limited to a scale not far from what an individual pony can do by more ordinary means. (Remember that the main character of the show is considered to be unusually strong magically!) That limited scale may be to keep the unicorn ponies from being more powerful than the other kinds of ponies and to prevent the earth ponies in particular from being overshadowed. Think about this: if enchanting things is easy, why bother using technology at all?

That said, it may be possible for clever ponies to come up with inventions that can make use of unicorn magic. It's easy to imagine, for instance, a smithy or machine shop run by a partnership of earth ponies for most of the inventing, designing, and heavy labor, and unicorn ponies for fine work using levitation and spell-casting for tricky or troublesome tasks. \*

ALL THE CLASSICAL substances seem to be available to the Ponies—wood, stone, brick, glass, metals known since ancient times, and natural fibers such as cotton, wool, and silk. Whether the ponies use animal products such as leather and ivory is an open question; as herbivores, they may not like the idea, and such things are controversial even in the real world, so the writers may not want to bring it up.

### Construction

The town where most of the show takes place is built mostly of thatched half-timbered buildings, like old European villages; a lot of Europe's forests disappeared gradually during the Middle Ages, so wood wasn't available for roofing. Much of the capital city is built of stone, like larger European towns and cities that have been around a long time. In the first season, the country's biggest city was shown to use lots of brick, and houses, streets, and stores looked like photos of New York in the late nineteenth century—though in later episodes it's looked more like the mid-twentieth century.

Not only does that show what the ponies use to build things with, it also shows that different towns or neighborhoods are built from different materials. A creator can use that when describing or showing places, to help give the audience a vivid mental picture, and one who's really interested can decide what's used in a town or city by figuring out what's available because of trade or local mines and industries.

### Glass

The ponies make telescopes, eyeglasses, and even sunglasses, and every window is *glazed* (covered with glass). Most of these uses were well-developed during the nineteenth century. Sunglasses using smoky quartz for the lenses were known even to the ancient Chinese, but it wasn't until the early twentieth century that they became widely popular. The “designer shades” on some episodes are very modern-looking, possibly so the audience would recognize them as being trendy and up-to-date, rather than see them as old-fashioned.

### Metals

Along with precious metals like gold and silver, metals known since the ancient world include copper, iron, and their alloys. In the case of copper, those alloys are brass—copper and zinc—and bronze—copper and (usually) tin. In the case of iron, those alloys are steel, using different additives to get different kinds. Large-scale production of high-quality steel came along in the 1850s with the Bessemer process.

Other metals such as aluminum were being discovered, but were very hard to get, because ways of separating the pure metals from raw ores hadn't been developed yet. Aluminum was as valuable as silver! It was only in the 1880s that the Hall-Héroult process began producing aluminum in quantity, making it much cheaper.

The ponies probably make much use of brass, bronze, and iron, and probably steel, as well as gold and silver for jewelry and other specialized purposes. They may have aluminum, but probably not titanium or other exotic metals.

*The Magical Land by Dave Bryant*

### Rubber and Plastics

Rubber in its natural state is sticky, brittle when cold, and doesn't keep its shape when warm. *Vulcanization* solved those problems in the 1850s and made rubber practical for all sorts of uses. In the twentieth century, especially since the Second World War, plastics replaced vulcanized rubber for many of those uses. It's *very* likely the ponies don't have those plastics at all. The only plastic they're likely to have is celluloid, which in real history came out in the 1870s; it was used in movie film and as a substitute for ivory, horn, and other animal products, which were much more expensive. However, it's also kind of fragile and very flammable, which is why in the early twentieth century other materials like Bakelite replaced it.

### Fabrics

Natural fibers include cotton, flax, hemp, linen, jute, sisal, wool, and silk, among others. Most have been known since ancient times, and as noted in the section on agriculture, the ponies probably are able to produce most of them, and may trade for the rest. Silk comes from butterfly cocoons and wool comes from sheep; the rest are plant products.

There may be thriving industries for spinning raw fibers into thread, weaving thread into cloth, and coloring thread and cloth with dyes. All of them are hard work, and unless there are strict work-safety laws, they can do pretty nasty things to the people working in them. It's probably safe to assume the ponies have such laws!

Artificial fibers didn't appear until the twentieth century. A few of them were invented in the early part of the century, but most were invented in the 1940s and later. The ponies probably don't have any of them.

### Pigments and Dyes

The stuff that gives paint its color is called *pigment*. Most natural pigments are mineral—ground-up soil or rock. It's not hard to guess that many are poisonous and expensive. A few natural pigments did come from plants or animals, often outside the West. *Synthetic* (man-made) pigments began to appear in the eighteenth and the first half of the nineteenth century. As chemistry advanced in the late nineteenth century and into the twentieth, most of the old pigments were replaced with cheaper and safer synthetics, and many can't be found today.

The show features very bright colors, even (or especially) on buildings and in art painted by ponies. Part of that is artistic license, to make the animation pretty and appealing, of course. Some of it may be that mineral pigments are unusually easy for the ponies to find or to get. Magic may play a role in prospecting, among other things; one episode featured a spell to detect nearby gemstones, for instance.

Before the twentieth century, most *dyes* came from plants, and many weren't very vivid; the few that could make bright colors were rare and valuable. The dyes weren't *color-fast*, meaning they didn't stick well to the fibers, so washing tended to rinse dyes right out of fabric. (Underwear was invented to keep sweat from getting into clothing, so it didn't need to be washed as much.) Even today, a lot of washing can make dyes fade, which is why so many advertisements for laundry detergents make a big deal about how bright colors are after using them. \*



CARTS, WAGONS, AND CARRIAGES ARE the most common vehicles shown, all of them pulled by ponies. The only mechanical vehicles seen so far are steam-powered railroad locomotives and, occasionally, airships propelled by fanciful fans.

### Railroads

The earliest known railroads date back to ancient Greece, and they began to reappear in medieval Europe. Through the sixteenth and seventeenth centuries they gradually improved and by 1800 they were pretty well-developed. Trains really were drawn by horses until steam locomotives started appearing in the 1820s. Steel rails started to replace iron in the 1850s. Electrified trains arrived in the 1880s and diesel locomotives began to displace steam in the 1920s.

Most of the locomotives shown on the program are typical of the United States in the 1860s, aside from a “crystal” locomotive. The *rolling stock* (train cars, as a group) is smaller than most US designs, and looks more like what was seen in Britain, where railways often use tighter curves and smaller tunnels. That’s probably for good cartoon (and toy) appeal.

Oddly, one first-season episode shows a team of ponies hauling what seems to be a perfectly functional locomotive for no apparent reason, before a herd of bison try to stop the train. Nobody’s given an official explanation, but it may have been a last-minute script change to make the scene seem less violent. Bumping shoulders with a pony teamster is one thing; derailing a locomotive is a lot more serious!

What the episode calls a “private sleeper car” actually is a *caboose*, a car used as an office and sleeping space for the train’s crew, as well as a place to keep a look-out for hazards and problems with the train or tracks. Usually it was added to the train’s back end. Modern trains don’t use cabooses—technology reduced crew sizes and made it easier to watch for problems.

An episode in the second season shows a simplified caboose, and calls one of the crew a *conductor*, but that actually was the *engineer*. A conductor deals with the passengers, taking tickets, answering questions, shouting “all aboard!” at stations, and so on. An engineer keeps the engine running and controls the train’s speed and operation.

Railroads have been around in the real world for centuries. In the show they run from the capital through the small town where the main cast live, and even out to a small frontier town. Railroads seem to serve much of the country—but probably not all of it. Roads and waterways would make up the rest of the network.

### Roads

In cities, cobblestone streets seem to be common. Highways may be built like Roman roads—some of which still are used today, centuries after they were built—or *macadam* roads, which arose in the 1770s and 1780s and were the first designed using modern scientific methods. Concrete also would be available, but it’s more likely to be used on bridges and city streets than on country roads; large blocks of concrete are hard to maintain or repair if they crack or crumble.

Tarmac and asphalt roads historically showed up in the 1920s, when automobile traffic got heavy enough to raise lots of dust and to wear out macadam roads must more quickly. Since pony technology originally was intended by the show’s creator to predate the twentieth century, they probably aren’t able to build, and (without automobiles) really don’t need, roads of this kind.

Carts, wagons, and carriages seem to be well-designed and well-built. Leaf-spring suspensions, iron-strapped spoke wheels, full collars and breastcollars, and whippletrees all date back to the Middle Ages. The ponies plainly have developed all these devices to as near perfection as their technology allows.

### Seafaring

Believe it or not, the most energy-efficient form of transportation ever invented is the mule-drawn canal barge! Canals and rivers even today remain important “roads”, and before good roads and good railroads became common in the nineteenth century, they often were the *only* way to get large cargoes around. Since ponies usually provide their own power, it’s easy to imagine single ponies or teams towing barges the same way they do trains and wagons.

The show hasn’t touched on the ocean, though a couple of comic-book issues have, so someone who wants to do so mostly has to rely on real-world history as a guide. In the 1850s, iron started to replace wood for building hulls, at first in warships, then gradually in other kinds of ships. (War is, perhaps lamentably, the real world’s biggest source of invention.) Steel started to replace iron in the 1870s.

The first paddlewheel steamboats and steamships appeared in the late eighteenth century, primarily for river and canal use. Screw propulsion appeared in the 1840s, mostly on ocean-going ships—especially warships. Screws are more efficient than paddlewheels, but paddlewheels can work in much shallower water.

The age of sail wasn’t over quite yet, though. Clipper ships and full-rigged ships served at least from the late eighteenth century through most of the nineteenth. The windjammer with its iron (or, later, steel) hull and scientific design started to take over from them in the 1870s; it could compete with early steamships, and the last windjammers didn’t retire from commercial service until after the Second World War, when diesel-powered container ships started to appear.

### Aviation

The ponies apparently use hot-air balloons and airships a lot, and one episode shows an early form of glider; both look like designs dating to the late nineteenth century. A late-twentieth-century hang-glider is shown once, mostly as a sight gag. Powered aircraft are completely absent, other than very cartoony pedal-driven gyrocopter-like gadgets in a couple of episodes.

Airplanes probably aren’t a priority for ponies, since pegasus ponies already can fly and can draw chariots and wagons through the air. The ponies seem to understand the science of flying, which is why they can build gliders, but they don’t have the powerful engines needed for aviation—steam plants aren’t very efficient for use on heavier-than-air aircraft. ★

MANY OF THE WILDEST inconsistencies on the show are in information technology. Books and phonograph recordings are important media, as they really were in the later part of the nineteenth century. On the other hand, a brainwave monitor, a dual-turntable DJ deck, and a heart-monitor cutie mark have been shown, all based on electronic technology that didn't exist before the 1970s.

### Print

The oldest mass medium got its start with movable lead type and the printing press. It revolutionized how information was stored and moved and made education and literacy enormously easier to get. Still, aside from minor improvements, it didn't change much for several centuries.

In the nineteenth century printing was getting faster and more effective thanks to steam power, but it wasn't keeping up with growing demand. New high-speed rotary presses came out in the 1840s, giving print houses the ability to churn out mountains of books, newspapers, and magazines. The existence of a large library owned by or at least available to a young student, and of a public library in a small town, argue that books are common and inexpensive for the ponies.

Newspapers probably are the main source of news. Every large or important city would have at least one daily paper. Most large towns may have dailies and certainly would have weekly papers. Smaller towns and villages may have weeklies or may depend on nearby larger urban centers for newspapers.

The episode about a school newspaper showed a couple of cartoony *linotype machines*, which appeared in the 1880s. These made it possible for newspapers to expand beyond eight pages and sparked an explosion in magazine publishing. There probably are scores or hundreds of magazines across the country, on every subject under the sun (or moon, if one prefers).

### Photography

Both a bellows camera and single-lens reflex (SLR) cameras are shown on the same episode. Bellows cameras have existed since the 1850s, but SLR cameras came out in the 1950s—another case of the artists using a familiar device for the audience's benefit. Practical color film started to appear at the beginning of the twentieth century, and digital cameras started to appear at the end of the twentieth century. Silent movies started showing in the 1890s and sound was added in the 1920s.

### Sound

Wind-up phonographs invented in the 1870s played scratchy, tinny *monaural* (not stereo) sound recordings on waxed cylinders. In the 1900s, new models played recordings on flat shellac disks; vinyl came later, in the 1950s. Compact discs appeared in the 1980s, but vinyl records still are made because some people like their sound better. Other pieces of audio equipment that have been shown are the previously mentioned DJ deck, modern headsets, and 1930s-style microphones, which are obvious examples of the animators using devices familiar to a modern audience to set the right kind of tone for a specific scene.

### Computing Devices

Various forms of abacus have been around for thousands of years. Adding machines first appeared in the 1640s and became widespread in the mid-nineteenth century. Charles Babbage in the 1830s designed and tried to build giant mechanical calculating machines, but never got enough money or cooperation to finish any. Electromechanical computers were used on warships during the Second World War. Electronic computers weren't invented until the middle of the twentieth century.

### Writing and Signage

In early episodes the ponies' written language was shown as pictographic, using symbols from their everyday lives and possibly influenced by cutie marks. Later it's shown as vaguely like the Latin alphabet used by English and other European languages, but smudged so it doesn't look exactly like any real language. A writer or artist probably free to decide what she wants it to look like. Signs hanging outside shops are pictorial, without any writing, which is how almost all signs looked before literacy became common in the nineteenth century.

### Mail and Telecommunications

The electric telegraph made its commercial debut in the 1830s; telegraph lines often were laid alongside the railroads that were expanding rapidly during the same time period. People experimented with telephones all through the nineteenth century, but practical devices didn't appear until the 1870s. Radio began to appear in the 1890s and television is a product of the mid-twentieth century.

The only telephone shown was a mid-twentieth-century handset on a desk, part of a sight gag based on a popular television series set in the 1960s. It's easy to understand why no other phones are seen—making a quick call doesn't have nearly as much old-fashioned charm as sending a telegram or a letter.

Some episodes have featured telegrams, so there probably is a telegraph network across the country. However, the ponies probably communicate mostly through a really good postal service, just as people used before all those newfangled inventions came along. For packages and cheap postage, earth ponies probably haul large *vans* (enclosed wagons) from town to town. For faster but still inexpensive rates, earth ponies and some unicorn ponies may gallop with saddlebags. More expensive express mail could be sent by pegasus pony. (The obvious puns about "pony express" and "air mail" come to mind.)

Deliveries might come twice a day—morning and afternoon—seven days a week, and city ponies might even send letters or postcards across town. Cities may be divided into numbered postal districts, but national systems of postal or ZIP (Zone Improvement Program) codes were introduced in the 1930s and '40s and became widespread in the 1950s and '60s.

Sending mail by magic probably would be rarest, fastest, and of course most expensive, unless a pony happens to have an advantage like a live-in dragon. Speaking of said live-in dragon, after he was hatched by the show's main character, the older princess reared him and taught him the spells for sending and receiving letters. Later he was reunited with the show's main character because the princess thought the pony who hatched him should be a part of his life. ★

IN THE EIGHTEENTH CENTURY, medicine was turning from an art into a science. By the beginning of the nineteenth century, this medical revolution was well under way. The “wild card” for pony medicine is magic, which may affect it more than anything else except possibly agriculture.

### General Health Care

Medical care probably isn't hard for ponies to get; they live in a wealthy, peaceful country, and many of them may be diligent about getting check-ups and preventive care, a good example to follow. Still, they apparently don't have universal health care; a goal mentioned by one of the show's main characters is saving up to get a replacement hip joint for her grandmother. Of course, joint replacements didn't come around in the real world until after the Second World War, so this may be another case of the writers stretching things for the sake of a good joke.

It's sad but true that infant mortality was the biggest reason populations didn't grow quickly before modern medicine—too many children didn't make it past their first couple of birthdays. Since the ponies live in a fairy-tale land, they may not have had as much trouble with that in their history. Besides, they probably consider prenatal and postnatal care of both *dam* (mother) and foal to be really important. In another century the land may be covered with ponies!

### Pharmaceuticals

Germ theory evolved through the early part of the nineteenth century, and in the 1870s and later matured into its modern form. Inoculation against disease was introduced to the West in the eighteenth century, but in the 1880s and after vaccinations improved in effectiveness, technique, and the number of diseases covered.

In the 1890s, aspirin was derived from willow bark, a traditional painkiller sometimes applied by brewing it into tea. Antibiotics and other antibacterial drugs started to show up in the early twentieth century. It's possible, though, that the magical nature of the ponies' world may give them some advantages in discovering and making pharmaceutical remedies sooner than in the real world.

Not only do the ponies have all the plants of the real world, grown by them or imported from other lands, but there seem to be lots of magical plants, such as the blue plant that plays pranks on unlucky creatures who touch it. Anyone is as free as the writers to think up new ones, especially ones important to the story.

Alert viewers may wonder how the ponies can dismiss curses and ghosts as superstition, yet accept magic as a fact of their lives. How can a cure for the blue plant's pranks be “natural”? In the ponies' world, that plant *is* natural. The cure for it would be natural too. Magic works by laws that can be discovered and written down. Curses, ghosts, and other products of superstition can't be explained the same way; there's no way for them to work under the laws of science—and to the ponies, magic is a science too. It's as natural as physics, chemistry, or biology.

### Surgery and Dental Care

Surgery, including dental surgery, is very old; there's evidence of it happening even in prehistoric times. Still, it wasn't until the nineteenth century that surgery started getting less horrible and more reliable. A big reason was a better understanding of the body and how it's put together, but a lot of other factors contributed too.

Early anesthetics were around in the early nineteenth century, and better ones, along with better ways of using them, began to show up in the 1840s. Sterilization started preventing infection in the 1860s. Primitive blood transfusions appeared in the 1810s, with improvements like blood typing in the 1900s.

Toothbrushes also are ancient, but by the nineteenth century they were starting to look like modern ones, and early in the century the first toothpastes were showing up. Dental floss made of silk was invented at about the same time, but didn't go on the market until the 1880s. (Today it's made of nylon, which was invented in the 1930s.)

### Food Safety and Preservation

Canning was invented in the 1810s, but older ways to preserve foods, including salting, drying, pickling, and candying, have been around for centuries or millennia. Pasteurization, a product of the 1860s, cut down on food poisoning.

The icebox, invented at the beginning of the nineteenth century, kept food cool—but a block of ice had to be put in it to do the job. The ice gradually melted, of course, and had to be replaced every so often; the meltwater had to be drained, too. A whole industry grew up around collecting, storing, and delivering ice.

Large-scale refrigeration came about in the 1850s, at first for use in warehouses by brewers, butchers, and other businesses, including ice houses, which supplied ice for iceboxes. Refrigeration wasn't scaled down for household use until the 1920s, after electrification became common across the industrialized world.

### Magic

Earth-pony magic is centered on the land, living things, and the arts (both creative and mechanical). Medicine, both for ponies and for other creatures, clearly is a part of that. Consider that the nurses shown on several episodes are earth ponies. Some unicorns apparently have spell talents related to medicine, too.

Earth magic probably allows a pony to sense where an injury or illness is in a patient, and may guide the pony in choosing a treatment. It might be a subtle thing: something “feels right” to do. Even so, it's likely the ponies study medicine as a science; if nothing else, they probably want to learn why and how their magic guides them, to double-check what they do and to avoid making mistakes.

Spell magic is more spectacular and obvious, but it can't work miracles. A unicorn pony almost certainly can't heal a patient all at once. Instead, what a spell can do probably is similar to a physical exam or a surgical operation, or a treatment of about that level of effort. If it were able to do much more than that, it wouldn't be a spell, it would be a super-power. ★

AT FIRST, THE PROGRAM didn't deal much with the military, other than to show occasional guards in ceremonial armor. That began to change gradually starting with the second season, though like information technology, the handling of military affairs has been extremely inconsistent.

### The Royal Guard

The modern soldiery seen most often is the Royal Guard. Its primary role appears to be guarding the royal sisters, their palace, and the capital. It also carries out important royal errands, such as conveying the protégée of the sun princess, and her dragon sidekick, to the small town that would become their new home. The show's creator said that guardsponies are paid for their service and hinted that the guard is a volunteer force.

Guard *barding* (equine armor) looks to be gold-plated and decorative but functional. Its design borrows from *lorica segmentata*—the armor worn by Roman legionaries—and from barding worn by *destriers*, the warhorses of medieval European knights. The *helm* (helmet) is modeled loosely on the Roman *galea* (GAY-lee-ah) with ceremonial crest. The design may have come from the ancient pegasus tribe, which used similar armor.

The guards' uniform appearance isn't limited to their barding; most are shown with gray coats and white tails or white coats with blue tails. The real reason probably is to make life easier for the animators, who can duplicate one ready-made model as many times as they need for a scene.

Maybe the armor's enchanted to change the way its wearer looks, and when a guard takes it off, he changes back to his normal appearance. This enchantment would help fulfill the role of a uniform, which reinforces a sense of group identity and belonging for every member of a military force. Note that the barding covers a guard's cutie mark; perhaps the magic of a cutie mark is strong enough to overcome such an enchantment!

### The EUP Guard and the Princess's Flying Squadron

After the moon princess was banished, her sister realized "protective forces" were needed; within a year, the EUP (Earth-Unicorn-Pegasus) Guard was formed. Whether its mission was to protect her or to protect the country isn't clear. Also, whether it and the Royal Guard are the same organization or are separate forces hasn't been revealed, according to one of the show's directors.

At the celebration of the first anniversary of peace, an elite EUPG team of pegasus "aerial performers" impressed the audience enough to establish a permanent identity for themselves. They also became the princess's own "official flying squadron". Usually that squadron is presented as being like the US Navy's Blue Angels aerobatic team, down to a similar *livery* (color and design scheme) of blue trimmed with gold. Whether the squadron also has other duties isn't completely clear.

A third-season episode took place at the academy where candidates for the squadron are trained, though the script seems to be influenced more by Hollywood movies than real military academies. The major character starring in the episode seems very young to be a cadet; the show's creator has said the main characters probably are in their teens.

A possible explanation is that her class is part of a junior training course similar to the US military's JROTC (Junior Reserve Officer Training Corps) for high schoolers. If so, young ponies who pass the junior course would be on a "fast track" to promotion after graduating from the real training program.

### The Citizenry

On several episodes characters get together to deal with a threat to part or all of the country—in some cases because of a royal summons. Before the twentieth century, many countries kept small standing armies (because armies are expensive) and called up citizens in time of trouble, and the ponies seem to have a similar *militia* tradition. An *unorganized* militia is made up of anyone who responds to the call. An *organized* militia, like a volunteer fire department, has official members and support from the government, but it's a part-time organization.

### Equipment

The ponies have fireworks, and bullets and cannon are mentioned, but spears are the only military weapons shown. That makes sense for a children's program, and it's tough to figure out how ponies would use the spears, or any other weapons, for that matter. Still, it's possible they can make and use firearms or other weapons that were around in the nineteenth century.

One character's pet tortoise is named "Tank", after the heaviest type of armored fighting vehicle—but tanks were invented, in Britain, during the First World War in the 1910s! Calling them "tanks" may seem odd, but to keep the real goal secret, the government said they were going to be "mobile water tanks" to carry water for the troops, and the name stuck.

### Ranks, Grades, and Rates

The show called the ancient pegasus tribe's leader a *commander*, but that's a modern navy rank. It's a common mix-up because a similar term, *commanding officer*, means an officer of any rank in charge of a military unit. A better one-word rank for a military dictator would be *general*. Also, a fourth-season episode outlining the origins of the EUP Guard used real officer ranks, but mixed up army and navy ranks willy-nilly.

For those who want more consistency, tables of officer and enlisted ranks, based on the British and US armies and navies in the late nineteenth century, are provided. Marine corps ranks tend to be similar to army ranks, but may be slightly different here and there.

**Commissioned officers** receive their authority directly from their sovereign government through formal documents called *commissions*. The sister princesses probably issue the officers' commissions for the Royal Guard and EUP Guard.

*General ranks* as a group don't have a special name. Colonel, lieutenant colonel, and major are *field ranks* because they usually are in the field (while generals may be at headquarters planning strategy). Captain and lieutenant ranks are *company ranks* because they are in company-size units or smaller.

Commodores and admirals used special flags to show what ships they were on, so these ranks are called *flag ranks* (and the ships are called *flagships*). Captain, commander, and lieutenant commander are *senior ranks*. Sublieutenant/lieutenant (junior grade) and midshipman/ensign are *junior ranks*. ♦



General and flag officers tend to be at least in their forties, and usually are older. Field and senior officers tend to be at least in their twenties, and usually thirties or forties. Company and junior officers tend to be in their thirties or younger.

<i>Army</i>	Commissioned officer ranks	<i>Navy</i>
Field Marshal* [UK] <i>or</i> General of the Army* [US]	Admiral of the Fleet* [UK] <i>or</i> Fleet Admiral* [US]	
General	Admiral	
Lieutenant general	Vice admiral	
Major general	Rear admiral	
Brigadier general	Commodore	
Colonel	Captain	
Lieutenant colonel	Commander	
Major	Lieutenant commander	
Captain	Lieutenant	
Lieutenant [UK] <i>or</i> first lieutenant [US]	Sublieutenant [UK] <i>or</i> lieutenant (junior grade) [US]	
Ensign/cornet† [UK] <i>or</i> second lieutenant [US]	Midshipman [UK] <i>or</i> ensign [US]	

\* Used only in wartime † Ensign in infantry, cornet in cavalry

**Enlisted:** A corporal, sergeant, or petty officer is a *non-commissioned officer* (NCO). NCOs assist officers, help teach new officers and privates or seamen, and generally act as the “glue” holding together a military force. In Britain enlisted ranks used to be called “other ranks”.

The terms *grade* (army) or *rate* (navy) may be used in place of “rank” for enlisted personnel. Navies use another word, *rating*, for an NCO’s job specialty; example ratings are boatswain’s mate or *bos’n*, quartermaster, gunner’s mate, master at arms, cook, armorer, and *coxswain* (senior NCO in charge of a boat)

<i>Army grades</i>	Enlisted ranks	<i>Navy rates</i>
Sergeant major	Chief petty officer	
First sergeant	Petty officer first class	
Staff sergeant	Petty officer second class	
Sergeant	Petty officer third class	
Corporal	Leading seaman	
Private	Able seaman	

## Organization

Along with everything else in society, the Industrial Revolution changed military forces radically during the nineteenth century. Organization and equipment evolved as traditions, technology, and force sizes changed and developed.

**Armies** at that time had three basic branches: infantry, cavalry, and artillery. Infantry was an army’s main strength. Cavalry was fast and mobile. Artillery was hard-hitting at a distance, but if an enemy got close, it was vulnerable.

*The Magical Land by Dave Bryant*

An army (or marine) unit contains two to eight, or sometimes more, units of the next smaller level, depending on what kind of organization’s used. A large unit, usually company or bigger, also may have a small “headquarters” unit made up of the commanding officer, his staff, some guards, and others such as couriers and clerks. Units may be lettered, numbered, or (regiments or larger) named. Confusingly, a big enough national army may contain several units called “armies”!

Up to a certain level—possibly regiment—each pony unit may be made up mostly or completely of one tribe. A flying unit, for instance, wouldn’t be much good if it isn’t all pegasus ponies! Strong, tough earth ponies probably are most common in infantry units, fast-flying pegasus ponies would be the equivalent of cavalry, and unicorns may be most common in artillery.

The EUP Guard also seems to be called the “Protective Pony Platoons”, but that may be a nickname thanks to its *alliteration* (words starting with the same letter). In the real world, the *platoon* was introduced during the seventeenth century.

Infantry	Cavalry	Artillery	Personnel	Led by
Army (contains all branches)			80,000–200,000	General
Corps (contains all branches)			20,000–45,000	Lt. gen.
Division	Division	Division	10,000–15,000	Mjr. gen.
Brigade	Brigade	Brigade	3000–5000	Brig. gen.
Regiment	Regiment	Regiment	1500–3000	Colonel
Battalion	Squadron	Battalion	300–1300	Lt. col.
Company	Troop	Battery	80–255 (4–8 guns)	Cap./mjr.
Platoon	Platoon	—	26–55	Lieut.
Section	Section	Section	8–13 (2–4 guns)	Cpl./sgt.
Squad	Squad	—	8–13	Cpl./sgt.

**Navies** in the late nineteenth century were starting to change quickly. Sails and wooden hulls were giving way to steam and iron or steel hulls. New types of warships needed new names and new organizations. Things wouldn’t start to settle down again until after the First World War.

A sailing warship was a *man-of-war*; a commercial ship was a *merchantman*. The British Royal Navy classified men-of-war by *rates*—first to third rate for *ships* (larger men-of-war) and fourth to sixth rate for *frigates* (smaller men-of-war)—based on how many cannon they carried in their *broad-sides*. Men-of-war that didn’t fit neatly were *unrated*, with names depending on their designs: brig, sloop, corvette, cutter, and so on.

Usually, bigger men-of-war were organized into *squadrons*, but smaller men-of-war were organized into *flotillas*. A *cruiser* operated on its own, not assigned to a squadron or flotilla. ★

Navy unit	Men-of-war	Led by
Fleet	Several sqdns./flots.	Admiral
Sqdrn./flotilla	4–8	Commodore/r. adm.
Division	2–4	Sr. capt./commodore
Half-division	1–2	Most senior captain

WHAT MAKES THE SHOW so attractive to so many people is the obvious effort the creator and the staff put into inventing lovable, believable characters and building an interesting world for them to live in. The company that owns the show had their own ideas, but they had the wisdom to take the best parts from both and, with some exceptions, the courage to give the writers a surprisingly free hand in telling the stories.

Because the ponies live in a land of magic, many fairy-tale ideas are used. The country is ruled by princesses (royalty) and may have a *peerage* (nobility). More recent ideas from fantasy fiction also were adopted, such as moving the background from the Middle Ages to around the Industrial Revolution.

The show rightly focuses mostly on the seven main characters and the princesses. As a result, though, unless some piece of information is important to one of the episodes, it usually doesn't get mentioned and may not even be developed. Once in a while, one episode might contradict another. A creator will have to decide whether to worry about contradictions and, if she does take them into account, how to resolve them.

### The Royalty

In the original planning for the show, the country was going to be ruled by a queen. The title was changed to "princess" out of a belief expressed by company executives that animated movies over the last few decades have associated queens with villains, and princesses with heroines, in people's minds. (Note that the changelings are ruled by a queen, which only reinforces this odd idea!) After her return, the moon princess became co-ruler, working at night while her sister works during the day.

Only members of a country's ruling family are royalty. The royal sisters have no other siblings. They do, or did, have parents, but almost nothing's been said about those parents. The bride in the royal wedding is a niece of the sisters, and also is a princess herself. The show's creator, who was no longer on the staff when those episodes aired, expressed surprise that the character "had wings". Her plan originally was that only the show's main character would gain wings (and earth pony strength), and that she would succeed to the throne as queen.

She has mentioned a *very* distant nephew of the princesses' mother, who was going to be a duke (a noble), but ended up being a prince (a royal). This was changed because of a concern that, in places where people aren't familiar with European titles of nobility, nobody would know what a duke is. It's a good point — after all, explaining those titles is part of why this section was written!

### The Nobility

Below the royalty are the *nobility*, families who — usually but not always — have their own *fiefs* (lands they hold). A noble might owe allegiance, called *fealty*, to a higher-ranking noble, and so on, up to a noble who would be directly under the crown. A *vassal* is anyone who owes fealty to someone else, who in turn is called the vassal's *lord*. Relationships among noble families, and between noble and royal families, got pretty confusing in the thousand years between the end of the Western Roman Empire and the start of the modern world.

Titles of nobility (and royalty) usually are *hereditary*, passed down from parent to child, except for so-called *life titles*. Life titles might be granted as rewards or, historically, sold to raise funds for the royal government, though polite people didn't say that in so many words. Such titles might or might not have lands attached to them, but the bearers generally weren't eligible for membership in the upper house of parliament or other legislative body, as hereditary nobles would be.

The show hasn't mentioned a parliament, but the creator meant for the ponies to have a nobility. The program's growing popularity apparently has given the writers the freedom to include a peerage (among other elements), though what role it has in the governing and day-to-day life of the country still isn't clear. Fan-written stories have come up with a whole variety of guesses at how the government works, and a creator, too, may have to figure out answers that suit her.

### Styles and Dignities

To keep things simple, the table of ranks lists only the most common verbal *style*, or form of address; different styles might be used in letters or on envelopes, among other places. A *dignity* is the title itself, separate from properties or territories that may go with the title; both of those are listed too. There are many other ranks that aren't listed because they were rare or used only in small areas. Most titles are pronounced in English as one might expect — but *viscount* is pronounced *vye-count*.

Originally, the word "gentle" literally meant "noble". That's why today the polite way to address a crowd of people is as "ladies and gentlemen"; once upon a time, that phrase actually meant "noblewomen and noblemen". Calling a commoner a "lady" or "gentleman" wasn't a good idea, and even worse was failing to pay proper respect to a noble or royal, which often was a crime and still is considered terribly rude.

Through the nineteenth and twentieth centuries, society got more relaxed about styles and *obeisances* (gestures of respect such as bows or curtsies). It may be enough to call a noble or royal "sir" or "ma'am" after using the proper style at least once when meeting that person during an event.

A pony might address one of the sisters first as "Your Royal Highness" and after that as "Ma'am". Addressing her first as "Princess" or "Your Highness" would be quite informal, though a student or close friend might be allowed to do it. For the new princesses, who might not rank quite as high, one idea is to use old European styles of "Serene Highness" and "Illustrious Highness", with just plain "Highness" being lower still.

A prince/princess or duke/duchess may or may not rule a *sovereign* (independent) country. A sovereign prince or princess rules a *principality*; a sovereign duke or duchess rules a *duchy*. A non-sovereign prince or princess usually is the son or daughter of a king or queen, and a non-sovereign duke or duchess is a noble. The sister princesses, of course, are sovereign and technically rule a principality. Whether the crystal city is a separate sovereign state, or part of the larger principality, isn't clear.

If a country has one ruler, which usually was the case in real history, that ruler is a *monarch*, from Greek *monos* (one) and *archon* (ruler), ruling a monarchy. There are a few historical cases, though, of two rulers, like the royal sisters; each of the rulers would be a *diarch*, ruling a diarchy, instead. ♦

## Knighthoods

A knight or dame belongs to a *chivalric order* (association of knights). A country may have several different orders, each with centuries of history behind it. Some orders may have special privileges or duties, handed down over generations from times gone by. They might be open only to certain kinds of people—maybe only women can be *dubbed* (inducted) into one of them, and only people who’ve distinguished themselves in battle can be dubbed into another. Often there are ranks within an order; a new knight may start at the lowest and may be rewarded later with higher rank if he or she has done something new that deserves recognition. Knighthoods aren’t hereditary, though, and knights technically are high-ranking commoners.

A writer can use her imagination to create orders and invent their histories, ranks, privileges, and duties. A flowing title like “Dame Commander of the Order of the Golden Sun” or “Knight Grand Cross of the Order of Harmony” can add a lot of color to a character, especially if there’s a story behind it.

## The Commons

Anyone who isn’t royalty or nobility is a *commoner*. In a modern society like the ponies have, this includes the poor and the working class, rich merchants and landowners, and the middle class in between. As in Britain during the late nineteenth century, some ponies apparently are interested in finding ways into the nobility (or the royalty). Most ponies seem happy with the way things are, though, and they show a reverence and genuine affection for the princesses, who clearly love their little ponies in return. They’ve built a wealthy, peaceful country, and the princesses help make sure it stays that way.

## Cutie Marks

This unique aspect of the ponies has been a great way for the writers to talk about growing up. It’s central to pony society, and writers and artists should keep that in mind. Much is made on the show of how a mark’s supposed to reflect a pony’s talents, but a look at various marks shows that some are kind of abstract, and for others it’s a stretch to make the connection. One probably doesn’t have to be too fussy about a pony’s mark, and a mark that isn’t obvious can be something to build a story around: “But . . . what does it *mean*?”

## Money

The ponies have a *cash economy*, using money rather than barter for most business. Their currency’s called the *bit*, likely based on “two bits”, a nickname for the US quarter: In the eighteenth century, a popular Spanish coin called the *real* could be broken into eight parts, so two bits were a quarter of a coin; that’s also the source of the phrase “pieces of eight”. The bit seems to be a small, thick gold coin, and there’s been no sign of paper bills. “Cents”, from Latin *centum* meaning “hundred”, are mentioned on one episode, so there probably are 100 cents in a bit.

They may have checks (or cheques) and letters of credit, banks, and perhaps even stock markets. They probably don’t have credit cards, charge cards, or other forms of cards; those were invented in the mid-twentieth century and later.

They *do* have income tax. In an early episode, a pony offers to “do” the main character’s taxes for one of her ball tickets!

## Cuisine

Since the ponies are *herbivores*, eating mostly plant materials, their foods don’t include any meats, though they do use dairy products and eggs. They cook some dishes, such as soups, but others are eaten raw, such as salads. Sandwiches seem to be popular. More than anything else, though, baking seems to be the central pillar of pony cuisine. Not all baking is sweet—calzones, for instance, are savory—so whole meals might be baked goods. As with building materials, an attentive writer or artist can make a place come alive partly by describing local differences in foods and cooking.

Preserving foods by pickling and salting have been around thousands of years. Canning was invented in the early nineteenth century; iceboxes and large refrigerators were invented mid-century, but household refrigerators came in the 1920s.

## Music

The nineteenth century was a period of transition. The formal kinds of music that people today lump together as “classical” gradually gave way to popular music such as ragtime and jazz, which arose from minstrel music and other sources as sheet music became widely available and audio recording became possible. Rock and roll developed out of jazz in the 1950s. Popular music existed before the nineteenth century, and “classical” music still is written today; it’s just that they switched places in terms of how well-known they are. ♣

Rank (male or female)	Class	Most Common Verbal Style	Dignity	Territory
Emperor <i>or</i> empress	Imperial	His/Her/Your Imperial Majesty (HIM)	—	Empire
King <i>or</i> queen	Royalty	His/Her/Your Majesty (HM)	Kingdom <i>or</i> queendom	Kingdom
Prince <i>or</i> princess	Royalty	His/Her/Your Royal Highness (HRH)	Princedom	(Principality)
Duke <i>or</i> duchess	Nobility	His/Her/Your Grace	Dukedom	Duchy
Marquess <i>or</i> marchioness	Nobility	My Lord/Lady, Your Lordship/Ladyship	Marquessate <i>or</i> marquissate	March
Earl/count <i>or</i> countess	Nobility	My Lord/Lady, Your Lordship/Ladyship	Earldom	Earldom <i>or</i> county
Viscount <i>or</i> viscountess	Nobility	My Lord/Lady, Your Lordship/Ladyship	Viscountship	Viscounty
Baron <i>or</i> baroness	Nobility	My Lord/Lady, Your Lordship/Ladyship	Barony	Barony
Baronet <i>or</i> baronetess	Gentry	Sir <i>or</i> Dame [First or Full Name]	—	—
Knight <i>or</i> dame	Gentry	Sir <i>or</i> Dame [First or Full Name]	—	—

## Education and Apprenticeship

Foals go to school. That might seem trivial, but it's important. A government-supported universal education system was rare before the eighteenth century. Even in the nineteenth century many children only got a few years of schooling, especially those who helped out on family farms (which was most of them). It's no coincidence the growth of such schools happened during and after the Industrial Revolution.

Before industrialization, societies depended mostly on agriculture and on "cottage industries"—small businesses such as smithies, shops, and other establishments run by individuals or families. Many boys (and even some girls) learned by doing, through *apprenticeships*, helping out and being taught by the masters of the businesses. Once they were ready they became *journeymen*, wandering, working, and learning more about their trades from other masters. Eventually, if they were able, they would try to pass exams before committees of local masters to become masters themselves, and set up their own workshops and businesses.

There were universities, but they mostly taught things like law, theology, and other esoteric subjects, and mostly were attended by the wealthy. In a lot of fantasy fiction, magic usually qualifies as an esoteric subject, with its own special schools or *colleges*, either independent or as part of universities. The princess's school for gifted unicorns follows that literary tradition. Universities started taking their current form during the early modern period in the seventeenth century.

As the Industrial Revolution went on, the need to educate people beyond what they could learn in apprenticeships got more and more urgent, especially the need to teach basic literacy, the ability to read and write. Finally the apprenticeship system as the primary way to educate young people collapsed, and only traces of it remain. An organized system of formal education in schools developed to take its place, and that's what most people go through today.

One of the main characters helps run a family farm. Another is a clothing designer who seems to have earned her mastery and runs a boutique. (One episode shows her as a filly sewing in the same boutique, so maybe she was an apprentice there.) Yet another works at a bakery. Two others may be in public service. The show's central character is a student, possibly on a royal stipend, and may be the town librarian. That much responsibility suggests the characters are in their early twenties, but the show's creator described their maturity as being in the range of twelve to eighteen: young enough to learn the show's lessons, but old enough to do adult things, so writers wouldn't be limited to stories about school or family.

All this indicates a society in the midst of changing from *agrarian* (mostly agricultural) to industrial, which fits the nineteenth-century feel the writers seem to want. Teens were viewed as junior adults rather than as "senior children", the way they often are regarded today. They had more freedom of movement—and a lot more responsibility to go along with it. Important themes of the show, besides the value of friendship, seem to be that being able to stand on one's own feet (hooves) is something to strive for and that healthy ambition is a good thing for anyone to have. ★

## ~ *Mini-Essays* ~

THESE SHORT COMMENTARIES, some by other writers, are intended to inform and inspire. Some of them take closer looks at the subjects outlined in the previous sections, both to bring up points that may not be obvious at first glance and to suggest ways the information can be used. Others discuss topics that might not show up in any episodes, but still could be useful.

### **The Grapes of Bein' Kinda Upset** (*guest contribution*)

The ponies' nation is, at its heart, an agricultural land. Thanks to pegasus weather control and the ability of earth ponies to coax the best possible crop yields from the ground, only a relatively small part of the population needs to be involved in food production. This leaves the rest of the population free to pursue other things, to urbanize, and to have plenty of leisure time. Excess food production is the basis of trade with the outside world. The backbone of the realm is its farmers.

But this means that when trouble *does* strike the fields, it's serious business. Even a minor failure in the managed ecology looms large and warrants high-level attention. The famine that led to the Great Migration of the three tribes, and the very founding of the nation they joined together to create, is one of the most important stories the ponies pass down through the generations. The system is more fragile than most think, subject to interference in many different ways.

Shady characters are attracted to wealth, and the wealth of this land is in its homesteads and plantations. And what of the other lands that aren't so lucky as to have fully controlled skies and magically enhanced farms? When the ponies have plenty but neighboring countries do not . . . morality and treaties mean nothing to parents watching their children grow thin. Prosperity brings burdens and tensions that must be solved, and the infrastructure—transportation, magical support, education of young farmers—requires constant vigilance lest disasters both natural and intentional lay bare the fields.

### **What's This Thing Made of?** (*guest contribution*)

Materials science is one of the most important aspects of a culture and its technology. It's also one of the greatest hazards to the culture's well-being.

History shows that when a new technology starts making heavy use of a natural resource, a crisis follows. The great shipbuilding boom of the seventeenth century that created the British Empire cost England nearly all of her old-growth oaks. The advent of glassmaking in Scotland demanded huge amounts of fuel, which denuded the northern forests. Cheap coal led to pollution. And this is just a single island.

Taking an invention from a curiosity to the mass market often comes at a huge price, and in a carefully managed nation like the ponies', this causes tensions between those who want the item and those who don't want to exhaust the resources needed for it. That can lead to bootlegging, poaching, and buying materials from other nations—"let *them* suffer the consequences while *we* keep our land pristine!" ♦



Complex chemistry is just starting to operate at a large scale. Individual laboratories and alchemists still mostly would ply their trades in small amounts, making reagents rare, prized, and costly. (Pegasus smugglers, anyone?) As well, a lot of materials taken for granted in the modern world won't exist among the ponies, or will be much more expensive. Consider also toxic by-products and what to do about them; the princesses will have little sympathy for a polluter, even on a modest scale.

So far, there's been no sign on the show of mass production, which has a certain charm—but also means that anything complex will be expensive and hoof-built. Maintenance requires artisans and craftsponies, not mere “parts changers”, as spare parts may not fit without individual modification. Construction may be as much art as science, and anything that needs to last will be extremely overbuilt.

Imagine the turmoil when a factory brings in a new technology that promises to improve efficiency. In fairness, historically such a factory owner usually increased production (to try making more money) rather than cut down on work force, but the workers didn't know that or didn't want to believe it if they were told, since they had families to support!

The ponies are working their way through an Industrial Revolution, but while their path is markedly different than the real world's, it'll no less chaotic.

### **Turn Your Head and Cough** (*guest contribution*)

Medicine's a tricky subject; historically it's been surrounded by superstition, taboo, and outright quackery. The sad truth is, it also tends to be driven by terrible things: war and epidemics.

Through the nineteenth century, several important factors were coming together in Western medicine. Most clustered around germ theory, including pasteurization, antiseptics, and vaccination. Other discoveries, such as anæsthetics, made surgery much less brutal, and X-rays allowed diagnosis of internal injuries. Treatment of traumatic injuries advanced dramatically, though unfortunately it took the carnage of the American Civil War for that to happen.

By its nature, the ponies' country is a much cleaner place to live than the real world, and its populace isn't subject to warfare. It also doesn't have cultural habits that interfere with medicine and science. Most ponies aren't geniuses—but they also aren't resistant to accepting ideas from those who are. Once a discovery's made, it often seems to be adopted amazingly quickly, especially if the word of royalty backs it up.

All that being said, medicine still would have its adventures. Dealing with an epidemic outbreak requires learning how it spreads; that in turn leads to the desperate search for “patient zero”, the first case from which the epidemic springs. Quacks, charlatans, and snake-oil sellers prey on the gullible, and ponies can be pretty gullible.

A small group of ponies might find itself dispatched to locations in remote corners of the nation, or beyond, to offer relief in time of trouble. Disasters, natural or otherwise, leave in their wake hard decisions in *triage* (pronounced *tree-ahzh*), the process of choosing whom to treat and in what order, with limited time and resources—and who has to be left untreated because they can't be saved. Such decisions could be very rough on the ponies, who are compassionate and empathic by nature.

And there is always Mad Science! “*It's alive!*” invariably is gleefully proclaimed by someone with the title of “Doctor”. . . . There may be no zombie ponies, but are there Frankenfoals?

### **Back in the Old Days . . .**

Everything can and probably will change in a thousand years. When the moon princess was banished, most ponies apparently lived in thatched huts and fenced yards, according to the book illustrations on the first episode. The population may have been one-third or one-fourth as large back then. There might not have been many cities or large towns, and most would be small by modern standards. Most ponies might have lived in the countryside or in small villages and hamlets every few miles along the few dirt roads winding across the land.

Now she's back, using a “Hollywood” version of medieval speech. English itself isn't a thousand years old, so that's the only way the writers can get across the idea of old-fashioned talk. But it also could mean that pony society doesn't move as fast as real history did; there aren't as many wars, famines, or plagues to push things along. The princess's style of talking is associated with the High Middle Ages, so it's a reasonable rule of thumb to double the amount of time for historical things, like inventions and fashions, to happen. What was going on, say, five hundred years before the nineteenth century? That could be what the magical land looked like when the royal sisters battled and, presumably, destroyed their castle-palace.

### **Earthshaking Changes**

Today we're used to society and technology changing constantly, yet it's easy to forget that, not so long ago, people just didn't have some device or process we take for granted now. In the nineteenth century, though, people struggled with the notion that, fairly suddenly, ideas and ways of doing things that had been around for hundreds or even *thousands* of years weren't working any more. In the Middle Ages a man or woman might do things much the same way as an ancestor of a century before; during the Industrial Revolution a living grandparent might be able to remember a completely different world.

Train locomotives started moving people and cargoes faster than horses. Telegraphy began to move information faster than letters. Huge new factories used mass production and interchangeable parts to churn out consumer goods. Cities became even more important, drawing in ever larger numbers of people seeking work. Big new machines needed far more energy than muscles, water wheels, or windmills could provide.

All of this was happening at once, and nothing like it *ever* had happened before in history, so there wasn't any kind of guide to figure out what to do about it. The social upheavals were gigantic, and it's almost impossible to describe easily how big an effect they had on people at the time—much greater than we see today, even with all the advances in electronics.

There seems to be less uncertainty and bafflement in the ways ponies are coping with these changes. Of course, those wouldn't be the best things to put into a children's television show, for a lot of reasons, but this also could be seen as more evidence that pony society isn't moving at the same meteoric speed that real history has. Ponies, being herd creatures, also may be more cooperative and may find it easier to get along. ♦

## City-State, Principality, Empire

An *empire* is a diverse collection of countries or peoples joined together under an overall monarchy or *oligarchy* (small ruling group). Since it seems to include exactly the sort of varied lands and tribes that an empire should have, the pony principality seems to be more of a true empire than the land of the crystal ponies that actually is called an empire in the program.

If the crystal ponies' country isn't really an empire, then, what is it? It doesn't seem to be very big and, probably to be more familiar to a young television audience, it looks more like a twentieth-century suburb than an medieval city that disappeared a thousand years ago. More than anything else, then, it appears to be a *city-state*, a tiny country consisting mostly of a central city with maybe a small amount of land around it, possibly including some farmland, villages, or both. Perhaps it should be called the Crystal City instead—but trademarking that name to use on toys and other products might have turned out to be too difficult or even impossible.

Going farther back, one might ask how the ancient pony tribes were governed. The unicorns plainly had a *feudal monarchy*, with a king who ruled directly and maybe a nobility. Equally clearly, the pegasus tribe was a *military dictatorship* ruled by a high-ranking officer, set up as if the whole society were one big army. It isn't as clear how the earth tribe was governed, though. Perhaps it was a sort of early *republic*, either democratic (in which individuals vote on everything) or representative (in which officials are elected to act on behalf of the citizens).

## Consorting With Rulers

An empire is ruled by an emperor (if male) or empress (if female)—yet the ponies are ruled by princesses. The real reasons that was done for the show already have been explained, but how can a writer or artist justify it?

Perhaps the sun and moon princesses aren't comfortable with the title of empress and avoid using it in favor of "princess". It could be the pony population or other nations who don't care for the idea of "empresses", so the princesses are being tactful. More simple still, maybe the ponies just don't think of it as an empire, and so don't call it one even if it *technically* is.

**The title of prince** (or princess) originally just meant "ruler" in general, and could be applied to an emperor, king, duke, or any other monarch; plenty of old phrases and sayings still use that meaning. Possibly by accident, that also is kind of how the show uses the word to describe the special ponies who include all three tribes. Five have been shown so far: the sun and moon princesses, the ruler of the crystal ponies, the main character of the show—and the princess in the storybook who took the "love poison".

**Marrying into royalty** can create confusion, since the royal spouse would gain a "courtesy" title but wouldn't be a ruler. If it's necessary to tell them apart, the word *regnant* (from the same root as the word *reign*) is added to a ruling royal's title, while the word *consort* is added to the title of a ruling royal's spouse. For example, the ruler of the crystal ponies is a *princess regnant*, while her husband, the main character's brother, is a *prince consort*. The husband of a ruling queen or empress also is called a prince consort, an old custom dating from the days when prince was a more general term.

*The Magical Land by Dave Bryant*

## About (Non-Magical) Ponies

For the first time in history, more human beings around the world live in cities than in the country. Because of that, fewer and fewer of them get to meet many animals face-to-face, other than dogs, cats, a few other kinds kept as pets, zoo exhibits, and—if they keep their eyes open—some wild animals that make their homes in human neighborhoods. Since motor vehicles replaced most horses, ponies, and other draft animals in the middle of the twentieth century, fewer and fewer people get to meet them at all. For folks who might not have had much chance to learn about the animals on which the magical ponies are based, here's a little background on them.

The difference between a horse and a pony is supposed to be size. An adult horse stands more than fourteen hands, two inches tall at the shoulder. (A hand is four inches, so that would be fifty-eight inches, or about 147 centimeters.) In theory, a full-grown pony is no taller than 14.2 hh (14 hands 2 inches). Of course, in reality it's more complicated than that. Stocky body shape and proportions often are considered part of what makes a pony different from a horse, but sometimes it depends more on who's talking, what part of the horse world they're interested in, and a lot of other sometimes confusing things like tradition or occupation.

Ponies are very strong for their size, which makes them surprisingly heavy, thanks to all those muscles, and they're very smart and friendly, if they're trained properly to deal with people. They developed in out-of-the-way places with harsh climates, where being small but strong, and being able to live on food of less than ideal quality, were real advantages to the people who used them as draft animals. Even today in a few places they still are used for work on farms, to pull carts or wagons on roads, and for riding. Pony sports are as popular as events for larger horses, and in some cases horses and ponies might compete in the same events.

The lips of ponies and horses are very mobile, able to do amazingly delicate things like pick up and handle objects. There is one case known to the author of a bored horse using his lips to help unfasten the door of his trailer so he could go wandering around a local park. Even human lips, which are mobile enough to help make the complex sounds of language, aren't as good at manipulating things. Since the magical ponies combine the two abilities, using their lips to do things like write with pencils is quite plausible, and of course teeth and tongue could be used to help in some cases. (Keeping things clean would be a big priority, since a magical pony never knows when she might have to put something in her mouth.)

**Ponies don't have fur, exactly.** Like cattle, deer, and other related animals, ponies and horses have *bides* of *hair* rather than pelts of fur. Furred skin grows two or three different kinds of hairs. *Ground* hairs are short and frizzy to insulate an animal against cold. *Guard* hairs are longer, straighter, and sturdier, to protect the other hairs from damage. *Awn* hairs, if an animal has them, are in between the other two kinds. Hide, on the other hand, has only one kind of hair—and sweat glands, which help cool down an animal after exercise. (That usually means running away from predators.) The ponies in the show sometimes are shown to sweat, and occasionally mention it in dialog, which means they probably have hides. \*

## ~ Archaic Units of Measure ~

IN 1824, THE UNITED KINGDOM passed the Weights and Measures Act to regularize a hodgepodge of ancient English measurement units; the new technologies coming out of the Industrial Revolution demanded standardization and precision. Earlier, in 1799, a movement to create a whole new “metric system” got its start in France, for similar social and industrial reasons. In the middle of the twentieth century, both systems were overhauled again, and it’s those, or related systems, that are used today.

The tables on this page show many, but not all, of the obsolete English units. They didn’t disappear overnight—older people still tended to use them for many years after 1824, lots of records and objects were based on them, and some stuck around in the United States, which was already independent. The ponies may be going through a similar transition, and farmers especially may use old units. Some of the units listed were based on the human body; the ponies may use units based on their own bodies or on the body of the immortal sun princess. \*

Length	Equal to
Poppyseed	about ¼ barleycorn
Line	¼ barleycorn
Barleycorn	⅓ inch
Digit	¾ inch
Finger	⅞ inch
Inch	3 barleycorns
Nail	3 digits
Palm	3 inches
Hand	4 inches
Shaftment	6 inches
Link	7.92 in. (⅓ <sub>100</sub> chain)
Span	3 palms (9"; outstretched hand)
Foot	modern US foot; 30.48 cm
Cubit	18 inches (fingertips to elbow)
Yard	modern US yard; 0.9144 m
Ell	45 inches (mostly for cloth)
Fathom	6 feet (outstretched arms)
Rod	5 ½ yards (for surveying)
Chain	4 rods; about 20.12 m
Furlong	40 rods (one plow-furrow long)
Mile	modern US mile; about 1.6 km
League	3 miles (one hour’s walk)

Area	Equal to
Perch	1 square rod; 272 ¼ square feet or about 25.3 square meters
Rood	¼ acre; width of 1 rod by length of 1 furlong
Acre	1 chain by 1 furlong (can be plowed in 1 day); about 0.4 hectare
Bovate	about 15 acres/6 hectares (can be plowed with 1 ox in 1 year)
Virgate	about 30 acres (can be plowed with 2-oxen team in 1 year)
Hide	4 to 8 bovates (land able to support 1 household for food/taxes)
Carucate	about 120 acres (can be plowed with 8-oxen team in 1 year)
Knight’s fee	5 hides (fee was enough money to produce 1 equipped soldier)
Hundred/wapentake	100 hides, grouped for administrative purposes (census, taxes, ownership records, and so on)

Volume	Equal to	Volume	Equal to (US gal. = about 3.8 l)
Mouthful	about ½ fluid ounce	Gallon	2 pottles (1.25 US gallons)
Pony	2 mouthfuls	Peck	2 gallons (2.5 US gallons)
Jack(pot)	2 ponies (2 ½ fl. oz.)	Kenning	2 pecks (4 gallons)
Gill	2 jacks (5 fl. oz.)	Bushel	2 kennings (8 gallons)
Cup	2 gills (10 fl. oz.)	Strike	2 bushels (16 gallons)
Pint	2 cups (20 fl. oz.)	Coomb	2 strikes (32 gallons)
Quart	2 pints (40 fl. oz.)	Hogshead	2 coombs (64 gallons)
Pottle	2 quarts (80 fl. oz.)	Butt/pipe	2 hogsheads (128 gallons)

Volume	Equal to
Tun	2 butts or pipes (256 gallons; see next page)
Jigger	1 ½ fluid ounces (still used in recipes for mixed drinks)
Perch	24 ¾ cubic feet of dry stone (a pile 16 ½ feet by 1 ½ feet by 1 foot)
Cord	128 cubic feet of firewood (a stack 8 feet long, 4 feet wide, 4 feet high)

Avoirdupois	Weight equal to
Grain	gr 1/7000 US pound; about 64.8 milligrams
Dram/Drachm	dr 1/16 oz. (possibly from ancient Greek silver <i>drachma</i> coin)
Ounce	oz 1/16 US pound; about 28 grams
Pound	lb US pound; about 454 g ( <i>lb</i> short for <i>libra</i> , “scales” in Latin)
Nail	1/16 long hundredweight; 7 pounds
Clove	7 pounds (wool) or 8 pounds (cheese)
Stone	st 2 cloves; 14 pounds
Quarter or tod	¼ hundredweight; tod is 2 stones or ¼ long hundredwt.
Hundredweight cwt	112 pounds (long) or 100 pounds (short)
Ton	t 20 hundredweights; long or short tons

Troy weight (coins, precious metal)	Apothecary (used in medicine)
Grain	gr 1/7000 US pound; about 64.8 milligrams (both troy & apoth.)
Pennyweight dwt	24 grains
Ounce	oz t 20 pennyweights
Mark	8 troy ounces
Pound	lb t 12 ounces troy or apoth.; about 0.823 avoirdupois/US pound
	Scruple s ap 20 grains
	Dram dr ap 3 scruples
	Ounce oz ap 8 apothecary drams

## Developments in Agriculture and Gardening: Before the Twentieth Century

	Cultivation	Harvesting	Husbandry	Gardening	Miscellaneous
<i>Ancient</i>					
<i>Middle Ages</i>					Coffee-drinking* thought to start
<i>Early Mod.</i>					
<i>1780s-1810s</i>					
<i>1820s</i>					
<i>1830s</i>	Steel plow*	Combine harvester		Mechanical lawnmower*	
<i>1840s</i>				Animal-drawn lawnmower	Solid chocolate*
<i>1850s</i>				Chain-driven lawnmower	Steam tractor
<i>1860s</i>					
<i>1870s</i>				Lawn sprinkler	
<i>1880s</i>					
<i>1890s</i>				Steam-powered lawnmower	



## Developments in Agriculture and Gardening: Twentieth and Twenty-First Centuries

	Cultivation	Harvesting	Husbandry	Gardening	Miscellaneous
1900s				Gasoline-powered lawnmower	
1910s					Self-serve supermarket
1920s				Riding lawnmower	
1930s					
1940s					
1950s					
1960s					
1970s					
1980s					
1990s					
2000s					
2010s					

## Developments in Power and Energy: Before the Twentieth Century

	Generation	Storage	Application	Physics	Miscellaneous
<i>Ancient</i>	Water wheel, wind-mill*, æolipile				
<i>Middle Ages</i>	Early experiments in steam power				
<i>Early Mod.</i>	Early steam engines	Leyden jar			
<i>1780s-1810s</i>	Modern steam engines	Voltaic pile	Limited gas lighting		
<i>1820s</i>	Portable steam engine, early internal combustion engine	Friction match			
<i>1830s</i>	Widespread steam power, early fuel cell	Daniel cell	Gas oven		
<i>1840s</i>	Corliss steam engine	Grove cell	Early arc lighting		
<i>1850s</i>		Lead-acid battery	Heat radiator, gas heater, widespread gas/kerosene lighting		
<i>1860s</i>	Practical internal combustion engine	Gravity cell	Fluorescent lighting		
<i>1870s</i>	Hydroelectric power*		Practical carbon arc lighting		Supercharger
<i>1880s</i>	Steam & wind turbines	Dry cell	Limited electricity, early incandescent lighting		
<i>1890s</i>			Gas water heater with tank	Subatomic particles & radioactivity discovered	

## Developments in Power and Energy: Twentieth and Twenty-First Centuries

	Generation	Storage	Application	Physics	Miscellaneous
1900s	Diesel engine	Nicad and nickel-iron batteries		Einsteinian physics	Turbocharger, electroluminescence discovered
1910s			Neon lighting	Bohr atomic model	Superconductivity discovered
1920s			Large electrical grids, modern incandescent lighting*	Early quantum physics	
1930s					
1940s	First nuclear reactor				
1950s	Modern fuel cell		Maser & laser*		
1960s			Early LED, lava lamp		
1970s					
1980s					
1990s			High-brightness LED		
2000s					
2010s					

## Developments in Materials and Metallurgy: Before the Twentieth Century

	<b>Animal &amp; vegetable</b>	<b>Mineral</b>	<b>Synthetic</b>	<b>Metallurgical</b>	<b>Miscellaneous</b>
<i>Ancient</i>	bone, paper*, papyrus, parchment (animal skin), vellum (calfskin)	Stone, glass	Early synthetic pigments	Copper, bronze, brass, iron, steel, gold, silver, natural gold-platinum alloy	Forge welding
<i>Middle Ages</i>					Water-powered paper mill
<i>Early Mod.</i>			First modern synthetic pigments	Large-scale steel smelting, platinum* “discovered”	Mechanical paper-making
<i>1780s–1810s</i>					Sewing machine* (pedal-powered)
<i>1820s</i>		Portland cement			Rubber balloon*, thermocouple
<i>1830s</i>	Modern glass mirror*				
<i>1840s</i>	Wood-pulp paper*, nitroglycerine (first high explosive)		Vulcanized rubber		Rubber band, squeeze tube*, single-edge safety razor
<i>1850s</i>			Petroleum cracking, first synthetic dyes	Mass-produced steel (Bessemer process)	
<i>1860s</i>			Many synthetic pigments*		Helium discovered, periodic table of the elements, modern chewing gum
<i>1870s</i>		Gem-quality synthetic ruby	Celluloid plastic, gelignite		
<i>1880s</i>				Mass-produced aluminum	Early arc welding
<i>1890s</i>		Mass-produced bottles*			Spray painting, noble gases discovered, glass-blowing machine



## Developments in Materials and Metallurgy: Twentieth and Twenty-First Centuries

	Animal & vegetable	Mineral	Synthetic	Metallurgical	Miscellaneous
1900s			Bakelite, cellophane, synthetic pigments, improved vulcanization, synthetic rubber		Oxygen-acetylene welding, double-edge safety razor
1910s	Early artificial fibers, stainless steel, growing metal crystals				Helium production*
1920s		Pyrex glass	Polymer plastics		Zipper*, bubble gum*, aerosol spray*, consumer adhesive tape*
1930s					
1940s					
1950s					
1960s					
1970s					
1980s					
1990s					
2000s					
2010s					

## Developments in Transportation and Travel: Before the Twentieth Century

	Land	Sea	Sky	Infrastructural	Miscellaneous
<i>Ancient</i>	Early horse-drawn railroad, saddle, stirrup	Sail- and oar-powered ships, muscle-powered paddlewheel		Roman road, mile-stone	
<i>Middle Ages</i>				Directional signs at intersections	
<i>Early Mod.</i>	Revival of horse-drawn railroad				
<i>1780s-1810s</i>	Velocipede bicycle	Steam-powered paddlewheel	Hot-air and gas balloons	Modern road-building	
<i>1820s</i>	<b>Steam locomotive*</b> , unsuccessful early steam carriages	Marine propellor		Macadam road	
<i>1830s</i>	Modern “caterpillar” tracks	Transoceanic steam-ship			
<i>1840s</i>		Early ocean liner		Railway semaphore signal	
<i>1850s</i>				Steel railroad rail*	Safety elevator
<i>1860s</i>	Early attempts at automobile & motor-cycle		Early glider*	Early (gas-powered) traffic light	Railway air brake
<i>1870s</i>	Penny-farthing bicycle	Larger ocean liner, reefer (refrigerated) ship, windjammer		Early (bicyclist) traffic signs	
<i>1880s</i>	Pneumatic tire, safety bicycle		Nonrigid airship* (filled with hydrogen)		Electric elevator
<i>1890s</i>	Automobile, motor-cycle, electric bicycle	Steam-turbine ship			Escalator

## Developments in Transportation and Travel: Twentieth and Twenty-First Centuries

	Land	Sea	Sky	Infrastructural	Miscellaneous
1900s	"Caterpillar"-tracked vehicle		Airplane, rigid airship	Tarmac, early motorist traffic signs, railway light signal	
1910s	Gasoline tractor	Diesel ship		Electric traffic light	
1920s	<b>Diesel locomotive,</b> text		Autogyro aircraft*, airship use of helium, flight of liquid-fueled rocket	Standardization of traffic signs begins	Parking meter
1930s					
1940s			Jet aircraft, helicopter	Traffic signs mostly standardized throughout industrial nations	
1950s	Diesel locomotive mostly displaces steam		Space flight		
1960s			First manned moon landing	Modern traffic signs finalized	
1970s			First space station, first robotic landing on another planet, last manned moon landing		
1980s			First reusable spacecraft		
1990s	Fuel-cell automobile				
2000s					
2010s			Last flight of first reusable spacecraft		

## Developments in Information and Communication: Before the Twentieth Century

	Writing and Type	Media	Computation	Communication	Miscellaneous
<i>Ancient</i>	Written language		Abacus		
<i>Middle Ages</i>	Quill pen*, pencil*, early reservoir pen, movable type, printing press, writing slate				
<i>Early Mod.</i>	Early fountain pen, large chalkboard*			Acoustic megaphone*, string telephone	
<i>1780s–1810s</i>	Cast-iron & steam-powered printing presses				Early hobby wargame, early metric system
<i>1820s</i>	Large-circulation newspaper, slip-in pen nib, fountain pen with replaceable cartridge				Fresnel lens, reform of imperial weights and measures
<i>1830s</i>	Mass production of pen nibs	Plate photography	Babbage engines (never finished)	Telegraphy*, Morse code	
<i>1840s</i>	Rotary printing press*	View (bellows) camera*		Postage stamp*	Wind-up alarm clock*
<i>1850s</i>	Modern fountain pen, eraser attached to pencil*			City postal codes	Mass-produced watch, “absolute zero” discovered
<i>1860s</i>	Typewriter*	Early color photography			Wristwatch*
<i>1870s</i>	Early offset printing press*	Cylinder phonograph		Carbon microphone, electric telephone	Inexpensive pocket watch*, atomic timekeeping proposed
<i>1880s</i>	Cash register*, early film photography, linotype machine*				
<i>1890s</i>		Silent movie		Early radio, rotary telephone	CRT, high-accuracy pocket watch, early hobby wargame using miniature figures



## Developments in Information and Communication: Twentieth and Twenty-First Centuries

	Writing and Type	Media	Computation	Communication	Miscellaneous
1900s	Early ball-point pen, modern offset printing press, early self-filler for fountain pen	Modern photography, early color film, disk phonograph*, children's crayon			
1910s	Modern fountain-pen self-filler, marker pen*			Radio broadcasting, condenser microphone	Sonar, high-accuracy wristwatch
1920s		Movie sound*, electric guitar, photo booth*		electric bullhorn*, early television broadcasting, early handset telephone	Self-winding watch
1930s				Improved handset telephone, national postal codes	
1940s			Electromechanical computer		Early atomic clock
1950s	Single-lens reflex camera*		Electronic computer	Widespread television broadcasting, "classic" handset telephone*	Modern metric system, modern hobby wargame, commercial atomic clock
1960s	Whiteboard, wet-erase pen, modern ballpoint pen displaces fountain pen			Pushbutton telephone, ZIP codes	Compact atomic clock, early LCD
1970s		Dry-erase pen	Early video games for arcade* & home console, desktop computer	Early cel phone	Role-playing game† (evolves from miniatures wargame), modern LCD
1980s			Early on-line and handheld video games, computer graphic user interface (GUI)		Collapse of wargame industry, peak of video-game arcade
1990s	Classroom whiteboard		Cel-phone video game, personal digital assistant (PDA)		Modern atomic clock, collapse of video-game arcade
2000s				Smartphone begins to displace "feature (cel) phone"	Microchip atomic clock, LCD displaces CRT display
2010s			Successful handheld tablet		

## Developments in Health and Safety: Before the Twentieth Century

	Medical	Preventative	Food safety	Community safety	Miscellaneous
<i>Ancient</i>	Surgery, pill, Hippocratic oath		Kosher law	Early fire brigade	
<i>Middle Ages</i>	Early anaesthesia	Early inoculation			
<i>Early Mod.</i>			Beer purity law		
<i>1780s–1810s</i>	Stethoscope		Canning		
<i>1820s</i>	Modern dental braces*			Modern city fire brigade	
<i>1830s</i>	Gel capsule* (for medication)		Icebox*	Modern city police force	
<i>1840s</i>	Modern anaesthesia				Pressure-sensitive adhesive tape (first used in surgery)
<i>1850s</i>			Commercial refrigeration	Steam-powered fire engine	Bathroom tissue
<i>1860s</i>			Sterilization and pasteurization		Mendelian inheritance (rejected & forgotten)
<i>1870s</i>	Modern sutures & germ theory		Widespread commercial refrigeration		Early electrical heartbeat detection (precursor to EKG)
<i>1880s</i>	Silk dental floss on the market	Vaccinations for more diseases	Pasteurized milk		
<i>1890s</i>	X-ray photography*, aspirin, antitoxins		“Crown” bottle cap		Bathroom tissue on rolls

## Developments in Health and Safety: Twentieth and Twenty-First Centuries

	Medical	Preventative	Food safety	Community safety	Miscellaneous
1900s	Blood typing, modern blood transfusion		Vitamins discovered	Gasoline fire engine	Mendelian inheritance rediscovered, chromosome theory, early EKG
1910s	Laparoscopic surgery, antibiotic		Mechanical icebox		Genetic chromosome map
1920s	Adhesive bandage*	Vaccinations for many diseases	Household refrigeration		Modern genetic theory and research
1930s					
1940s					
1950s	Early joint-replacement surgery*				Experimental MRI
1960s					
1970s					MRI scanner, CAT scan
1980s					
1990s					
2000s					
2010s					

## Developments in Military Science and Technology: Before the Twentieth Century

	Weaponry	Protection	Mobility	Military science	Miscellaneous
<i>Ancient</i>	Muscle-powered weapons*, early mechanical weapons, early siege engines	Walled city (prehistoric), hill fort (early historic), Roman fort, body armor	Tireme		
<i>Middle Ages</i>	Black powder, pyrotechnics*, cannon*	Motte-and-bailey castle			
<i>Early Mod.</i>	Flintlock	Star fort	Ship of the line, frigate, early submarine	Early formal rank system	
<i>1780s-1810s</i>			Ship used to launch leaflet-carrying kites		
<i>1820s</i>	Bolt action, percussion cap				
<i>1830s</i>	Explosive artillery shell				First class rings (West Point, US Army Academy)
<i>1840s</i>	Guncotton		Ship-launched hot-air observation balloon, early steam warship		
<i>1850s</i>	Metallic cartridge		Ironclad warship, steam frigate		
<i>1860s</i>	Gatling gun	Polygonal fort	First battles between ironclad warships		
<i>1870s</i>			Armored cruiser (warship type)		
<i>1880s</i>	Cordite, self-loading and fully automatic actions		Early battleship, protected cruiser		
<i>1890s</i>			Destroyer (warship type)		

## Developments in Military Science and Technology: Twentieth and Twenty-First Centuries

	Weaponry	Protection	Mobility	Military science	Miscellaneous
1900s			Armored car, “dread-nought” battleship, battlecruiser		
1910s			Light & heavy tanks*, armored personnel carrier, aircraft carrier, light & heavy cruisers		
1920s			Medium tank, fleet aircraft carrier		Washington Naval Treaty
1930s		Last major permanent fortification systems built			
1940s	Assault rifle, early ballistic and cruise missiles, atomic bomb	Permanent fortifications mostly abandoned	Small, light, & escort aircraft carriers, last new battleships built		
1950s	Thermonuclear bomb		Main battle tank, heavy tank disappears, modern aircraft carrier		
1960s			Nuclear submarine		
1970s					
1980s					
1990s			Last battleships decommissioned		
2000s					
2010s					



## Developments in Society and Governance: Before the Twentieth Century

	Structural	Economic	Artistic	Governance	Miscellaneous
<i>Ancient</i>					
<i>Middle Ages</i>					
<i>Early Mod.</i>	"Ms." invented but falls out of use				
<i>1780s-1810s</i>					
<i>1820s</i>					
<i>1830s</i>					
<i>1840s</i>			Early hardback "comic book"		First indoor (ten-pin) bowling alley
<i>1850s</i>					
<i>1860s</i>					
<i>1870s</i>					
<i>1880s</i>					
<i>1890s</i>			Magazine "comic book"		Early "salon" hair dryer

## Developments in Society and Governance: Twentieth and Twenty-First Centuries

	Structural	Economic	Artistic	Governance	Miscellaneous
1900s	"Ms." reinvented (unsuccessfully)				Automat
1910s					Early hand-held hair dryer
1920s			Modern comic book		Fast-food restaurant*
1930s			Fandom convention (science-fiction fandom), early superhero comic book		
1940s					Modern (ten-pin) bowling alley*
1950s			Rock and roll music, modern superhero comic book*		Hood hair dryer*
1960s			Term "graphic novel" coined		Modern hand-held hair dryer
1970s	"Ms." gains wide use*		"Underground" and alternative comics		
1980s					
1990s					Collectible card game
2000s					
2010s					

~ *A Summary Timetable of Developments* ~

	Energy and Power	Materials	Transportation	Information	Health and Safety
<i>Before 1820s</i>	Windmill, steam power, water wheel, limited gas lighting, early wet cell (battery)	Steel, synthetic pigments, sewing machine, platinum discovered, flintlock	Macadam, velocipede bicycle, hot-air/gas balloon, sailing ship, paddlewheel	Steam printing press, mechanical paper-making, acoustic megaphone	Germ theory, surgery, stethoscope, pill, early anæsthesia, icebox, inoculation, canning
1820s	Portable steam engine, early internal combustion engine, friction match	Portland cement, rubber balloon, thermocouple, bolt action, percussion cap	<b>Steam locomotive</b> , marine propellor, unsuccessful early steam carriages	Large-circulation newspapers, Fresnel lens	Modern dental braces, first modern city fire brigade (Edinburgh)
1830s	Widespread steam power, gas oven, Daniel cell (battery)	Steel plow, mechanical lawnmower, modern glass mirror, first class rings (West Point)	Combine harvester, modern “caterpillar” tracks, first trans-oceanic steamship	Telegraphy, Morse code, plate photography, Babbage engines (never finished)	Gel capsule (for medications), first modern police force (London)
1840s	Corliss steam engine, early arc lighting, Grove cell (battery)	Vulcanized rubber, rubber band, nitro-glycerine, guncotton, squeeze tube	Early ocean liner, railway semaphore signal	High-speed printing, wood-pulp paper, wind-up alarm clock, postage stamp	Modern anæsthesia, pressure-sensitive adhesive tape (first used in surgery)
1850s	Heat radiator, gas heater, widespread gas/kerosene lighting, lead-acid battery	Mass-produced steel, petroleum cracking, first synthetic dyes, metallic cartridge	Steam tractor, steel railroad rail, safety elevator, steam-powered fire engine	Modern fountain pen, mass-produced watch, “absolute zero” discovered	Commercial refrigeration, bathroom tissue
1860s	Practical internal combustion engine, fluorescent lighting, gravity cell (battery)	Many synthetic pigments, helium discovered, cranked automatic action	Early glider, early (gas) traffic light, railway air brake, early attempts at auto & motorcycle	Typewriter, wrist-watch, first color photography, periodic table of the elements	Sterilization and pasteurization, Mendelian inheritance
1870s	Hydroelectric power, practical carbon arc lighting, supercharger	Celluloid plastic, gelignite, gem-quality synthetic rubies, lawn sprinkler	Larger ocean liner, reefer (refrigerated) ship, windjammer, penny-farthing bicycle	Telephone, cylinder phonograph, inexpensive pocket watch, carbon microphone	Modern sutures and germ theory, widespread commercial refrigeration
1880s	Limited electricity, dry cell (battery), early incandescent lighting, steam & wind turbines	Mass-produced aluminum, cordite, self-loading and fully automatic actions	Nonrigid hydrogen airship, pneumatic tire, safety bicycle, electric elevator	Cash register, early film photography, linotype machine	Vaccinations for more diseases, silk dental floss on the market, pasteurized milk
1890s	Subatomic particles and radioactivity discovered, gas water heater with tank	Spray painting, noble gases discovered, glass-blowing machine (mass-produce bottles)	Automobile, motorcycle, electric bicycle, steam-turbine ship, escalator	Early radio, silent movies, high-accuracy pocket watch	X-ray photography, aspirin, antitoxins, bottle cap, bathroom tissue on rolls
1900s	Einsteinian physics, diesel engine, turbo-charger, nicad and nickel-iron batteries	Bakelite, cellophane, synthetic pigments, improved vulcanization, synthetic rubber	Airplane, rigid airship, military armored car, railway light signal, gasoline fire engine	Modern photography, early color film, disk phonograph, early ball-point pen	Blood types, modern blood transfusions, vitamins discovered, chromosome theory
1910s	Superconductivity discovered, Bohr atomic model, neon lighting	Early artificial fibers, helium production, stainless steel, growing metal crystals	Gasoline tractor, electric traffic light, tank (armored fighting vehicle), diesel ship	Radio broadcasting, condenser microphone, sonar, high-accuracy wristwatch	Laparoscopic surgery, antibiotics, genetic map of chromosome, self-serve supermarket
1920s	Large electrical grids, modern incandescent lighting, early quantum physics	Polymer plastics, zipper, Pyrex glass, aerosol spray, consumer adhesive tape	<b>Diesel locomotive</b> , autogyro aircraft, use of helium in airships, parking meter	Movie sound, electric guitar, self-winding watch, photo booth, electric bullhorn	Vaccinations for many diseases, household refrigeration, modern genetic research