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I.1 Believe it or not, you will be able to put all of this back together!
This book is intended for people who have an interest in maintaining their own mountain bikes. I have written it for mountain bike owners who do not think they’re capable of working on their own bikes, as well as for those who do and who want the how-to details at their fingertips.

In *Zen and the Art of Motorcycle Maintenance*, the late Robert Pirsig explores the dichotomy between the purely classical and purely romantic views of the world, a dichotomy that also applies to mountain biking. Riding a mountain bike is generally a romantic experience of emotion, inspiration, and intuition, even when solving the complex physics of how to negotiate a technical section of trail without putting your foot down. Mountain bike mechanics, however, is a purely classical structure of underlying form dominated by reason and physical laws. The two practices—mountain bike riding and mountain bike maintenance—fit eloquently together. Each is designed to function in a particular way, and to have one without the other would be missing out on half the fun.

The romantic can appreciate how success at bike mechanics requires that the procedures be done with love, without which the care you imagined putting into your mountain bike would be lost. And even the pure romantic can follow the simple step-by-step procedures and “exploded” diagrams in this book (of which Fig. 1.1 is an extreme example and is the only one not intended to be simple and clear!) and discover a passion for spreading new grease on old parts.

**Zinn & the Art of Mountain Bike Maintenance** is organized in such a way that you can pick maintenance tasks appropriate for your level of confidence and interest. The repairs in these pages require no special skills to perform; anyone can do them. It takes only a willingness to learn.

Mountain bikes are admirably resilient machines. You can keep one running a long time just by changing the tires and occasionally lubricating the chain. Chapter 2 is about the most minimal maintenance your bike requires. Even if that is the only part of this book you end up using, you’ll have gotten your money’s worth by avoiding some unpleasant experiences out on the trail.

This book is intended for home enthusiasts, not professional mechanics. For that reason, I have not included the long and precise lists of parts specifications that a shop mechanic might need. Nonetheless, when combined with a specification manual, this book can be a useful, easy-to-follow reference for bike shop mechanics, too.
WHY DO IT YOURSELF?

There are a number of reasons why you would want to maintain your own mountain bike. Obviously, if done right, it is a lot cheaper to do yourself than to pay someone else to do it. This is certainly an important factor for those riders who live to ride and have no visible means of support. Self-maintenance is a necessity for that crew.

As your income goes up and the time available to maintain your bike goes down, this becomes less and less true. If you’re a well-paid professional with limited free time, it probably does not make as much economic sense to maintain your own bike. Yet you may find that you enjoy working on your bike for reasons other than just saving money. Unless you have a mechanic whom you trust and to whom you take your bike regularly, you are not likely to find anyone else who cares as much about your bicycle’s smooth operation and cleanliness as you do. You may also need your bike fixed faster than a local shop can do during its busy season. And you need to be able to fix mechanical breakdowns that occur on the trail.

It is a given: Breakdowns will happen, even if you have the world’s best mechanic working on your bike. For this reason, it takes away from my enjoyment of a ride if I have something on my bike that I do not understand well enough to know whether it is likely to last the ride or how to fix it if it does not.

There is an aspect of bicycle mechanics that can be extremely enjoyable in and of itself, almost independent of riding the bike. Bicycles are the epitome of elegant simplicity. Bicycle parts, particularly high-end components, are meant to work well and last a long time. The best ones are designed and engineered by people who care deeply about them and how they work. With the proper attention, these parts can shine both in appearance and in performance for years to come. There is real satisfaction in dismantling a filthy part that is not functioning well, cleaning it up, lubricating it with fresh grease, and reassembling it so that it works like new again. Knowing that I made those parts work so smoothly—and that I can do it again when they get dirty or worn—is rewarding. I am eager to ride hard to see how they hold up rather than being reluctant to ride for fear of breaking something.

Also, if you share my stubborn unwillingness to throw something out and buy a replacement simply because it has quit working—be it a leaky Waterpik; a torn tent; a duffle bag with a broken zipper; or an old car, dishwasher, clock, or chainsaw that is no longer running well—then this book is for you. It is satisfying to keep an old piece of equipment running long past its prime, and it’s a great learning experience!

There is also something very liberating about going on a long ride and knowing that you can fix just about anything that might go wrong with your bike out on the trail. Armed with this knowledge (which begins with learning to identify the parts of a mountain bike, shown in Fig. I.2) and the tools to put it into action, you will have more confidence to explore new areas and to go farther than you might have otherwise.

To illustrate, an experience from way back in 1995 comes to mind, when I took a day to ride the entire 110-mile White Rim Trail loop in Utah’s Canyonlands National Park. It is quite dry and desolate out there, and I was completely alone with the sky, the sun, and the rocks for long stretches. I had a good mileage base in my legs, so I knew I was physically capable of doing the ride during the limited daylight hours of late October. I had checked, replaced, or adjusted practically every part of my bike in the weeks before the ride. I had also ridden the bike on long rides close to Moab in the preceding days and knew that it was in good running order. Finally, I added to my saddlebag tool kit a few tools that I do not ordinarily carry.

I knew that there was very little chance of anything going wrong with my bike, and with the tools I had, I could fix almost anything short of a broken frame on the trail. Armed with this knowledge and experience, I really enjoyed the ride! I stopped and gawked at almost every breathtaking vista, vertical box canyon, colorful balanced rock, or windblown arch. I took scenic detours. I knew that I had a good cushion of safety, so I could totally immerse myself in the pleasure of the ride. I had no nagging fear of something going wrong to dilute the experience.
Confidence in your mechanical ability allows you to be more courageous about what you will try on trails. And armed with this confidence, you'll be more willing to share your love of the sport with less experienced riders. Bringing new people along on rides is a lot more fun if you know that you can fix their bikes and they won't be stranded with a junker that won't roll.

**HOW TO USE THIS BOOK**

Skim through the entire book. Skip the detailed steps, but look at the exploded diagrams and get the general flavor of the book and what's inside. When it is time to perform a particular task, you'll know where to find it, and you'll have a basic idea of how to approach it.

Along with illustrators Todd Telander and Mike Reisel, I have done my best to make these pages as understandable as possible. Exploded diagrams are purposefully used instead of photographs to show more clearly how each part goes together. The first time you go through a procedure, you may find it easier to have a friend read the instructions out loud as you perform the steps.

Obviously, some maintenance tasks are more complicated than others. I am convinced that anyone with an opposable thumb can perform virtually any repair on a bike. Still, it pays to spend some time getting familiar with the really simple tasks, such as fixing a flat, before throwing yourself into complex jobs, such as servicing a suspension fork.

Tasks and tools required are divided into three levels indicating their complexity or required proficiency. Level 1 tasks need level 1 tools and require of you only an eagerness to learn. Level 2 and level 3 tasks also have corresponding tool sets and are progressively more difficult. All repairs mentioned in this book are classified as level 1 unless otherwise indicated. Tools are shown in Chapter 1. The section at the end of Chapter 2, “Performing Mechanical Work: A General Guide” (2-19), is a must-read; it states general policies and approaches that apply to all mechanical work.

Each chapter starts with a list of required tools in the margin. If a section involves a higher level of work, there will be an icon designating the level and tools necessary to perform the tasks in that section. Tasks and illustrations are numbered for easy reference. For instance, “3-6” means “see Section 3-6 in Chapter 3.” Illustrations are referred to as “Figures,” for instance, “Fig. 3.3.”

At the end of some chapters there is a troubleshooting section. This is the place to go to identify the source of a certain noise or particular malfunction in the bike. There is also a comprehensive troubleshooting guide in Appendix A.

There is a wealth of other valuable information in the appendices. Get used to using them; many tasks will be simplified.

Appendix B has complete gear charts for the three most common mountain-bike wheel sizes, and it also includes instructions on calculating your gear with non-standard-size wheels. Appendix C is an extensive section on selecting a properly sized bike and positioning it to fit you. Appendix D lists the tightening specifications of almost every bolt on the bike in the Torque Table. As bike parts become ever lighter and made out of ever more exotic materials, tightening them to the recommended torque spec becomes ever more important. The glossary is a comprehensive dictionary of mountain bike technical terms. There is a separate index of the key words as well as of the illustrations in the book if you want to quickly check and see what something looks like.

**THE MOUNTAIN BIKE**

This (Fig. I.2) is the creature to which this book is devoted (in this case, a “hardtail” with cantilever brakes). All of a mountain bike’s major parts are illustrated and labeled here. Take a minute to familiarize yourself with these parts now, and refer back to this diagram whenever necessary.

The mountain bike comes in a variety of forms, from models with rigid frames and forks (Fig. I.3), to hardtails (front suspension only—Fig. I.2), to models with front- and rear-suspension systems (Fig. I.4). They can come with rim brakes (Figs. I.2, I.3, and I.5) or disc brakes (Fig. I.4).
See? There it is, all back together!
A mountain bike generally comes with knobby tires in a 26-inch, 27.5-inch, or 29-inch diameter, and fat bikes have their own fatter and taller tires. Smaller 24-inch wheels and tires are found on small mountain bikes. Tire widths and shapes vary and include everything from studded snow tires to smooth street tires. This book also covers “hybrid” bikes (Fig. I.5), which are a cross between road bikes and mountain bikes.

No matter how a mountain bike is configured, even those who see themselves as having no mechanical skills will be able to tackle problems as they arise if they study the steps necessary to properly maintain and repair their bike. With a little bit of practice and a willingness to learn, your bike will transform itself from a mysterious contraption seemingly too complicated to tamper with to a simple, very understandable machine that can be a genuine delight to work on. Just allow yourself the opportunity and the dignity to follow along, rather than deciding in advance that you will never be able to do this. All you have to do is follow the instructions and trust yourself.

So, set aside your self-image as someone who is “not mechanically oriented” (and any other factors that may stand in the way of your making your mountain bike ride like a dream), and let’s start playing with your bike!
I.4 Fully suspended

I.5 Hybrid
You can’t do much work on a bike without tools.

Still, it’s not always clear exactly which tools to buy. This chapter identifies the tools you should consider owning on the basis of your level of mechanical experience and interest.

As I mentioned in the Introduction, the maintenance and repair procedures in this book are classified by their degree of difficulty. Nearly all the repairs in this book are classified as level 1, unless otherwise indicated. The tools for levels 1, 2, and 3 are pictured and described in the following pages. Lists of the tools needed in each chapter are shown in the margin at the beginning of each chapter.

For the uninitiated, there is no need to rush out and buy a large number of bike-specific tools. With only a few exceptions, the Level 1 Tool Kit (Fig. 1.1A) consists of standard metric tools. This kit is similar to the collection of tools I recommend later in this chapter to carry with you on rides (Figs. 1.5 and 1.6), though in a sturdier and more durable form. The Level 2 Tool Kit (Fig. 1.2) contains several bike-specific tools, allowing you to do more complex work on the bike. The tools in the Level 3 Tool Kit (Fig. 1.3) are extensive (and expensive), and they ensure that your riding buddies will show up not only to ask your sage advice but also to borrow your tools.

After that, if you really want to go all out and be set up like a pro (and have a line of mechanics waiting to borrow your tools), you can splurge on the set shown in Figure 1.4. If you loan tools, you might consider marking your collection and keeping a file of who has what to help recover those items that might otherwise take a long time finding their way back to your workshop. You would be surprised how easy it is to forget who has one of your seldom-used tools when you need your snapring pliers or a metric tap.

**LEVEL 1 TOOL KIT**

Level 1 repairs are the simplest and do not require a workshop, although it is nice to have a good space to work. You will need the following tools (Fig. 1.1A):

- **Tire pump** with a gauge and a valve chuck to match your bike’s tubes (either Presta or Schrader valves—see Fig. 1.1B; many pumps will fit both). A spare rubber insert for the chuck is a good idea; these wear out.
1.1A Level 1 Tool Kit

- **Standard screwdrivers**: small, medium, and large (one of each).
- **Phillips-head screwdrivers**: one small and one medium.
- Set of three plastic **tire levers** (Fig. 7.5).
- At least two **spare tubes** of the same size and valve type as those on your bike.
- Container of **talcum powder** for coating the inside of tires. Do not inhale this stuff.
- **Patch kit**. Choose one that comes with sandpaper, not a metal scratcher, and patches with soft orange rubber backing to the black rubber (Fig. 7.10). At least every year and a half, check that the glue has not dried up, regardless of whether the tube has been opened or not. On rides, you may as well take a little packet of glueless patches; they don't work as well as standard patches, but if the glue in your patch kit has dried up, you'll be glad you have them.
- One 6-inch **adjustable wrench** (a.k.a. Crescent wrench).
- **Pliers:** regular and needle-nose.
- Set of **metric hex keys** (a.k.a. Allen wrenches or hex wrenches) that includes 2.5mm, 3mm, 4mm, 5mm, 6mm, 8mm, and 10mm sizes. Folding sets are available and work nicely to keep your wrenches organized. But the folding variety aren’t strong enough or long enough in the big sizes (6mm and up); big bolts require more leverage so you’ll want the full-size model. I also recommend buying extras of the 4mm, 5mm, 6mm, and 8mm sizes.
- Set of **metric open-end/box-end wrenches** that includes 7mm, 8mm, 9mm, 10mm, 13mm, 14mm, 15mm, and 17mm sizes.
- **15mm pedal wrench** (Fig. 13.3). This is thinner and longer than a standard 15mm wrench and thicker and stronger than a cone wrench. Your bike’s pedals may accept only a 6mm or 8mm hex key (Fig. 13.4), so you may not need this tool.
- **Chain tool** for disconnecting and reconnecting chains (Figs. 4.10 and 4.11). Older chain tools may be too wide for the narrow chains on newer bikes; read the Pro Tip in Chapter 4 before buying one.
- **Chain-elongation gauge** to monitor the condition of the chain (Figs. 4.5 and 4.6).
- **Spoke wrench** that matches the size of the nipples on your bike’s wheels.
- **Pad spacers** for disc brakes to prevent pushing the pads out too far when the wheel is out. Sometimes these have an integrated bleed block and hose-clamping groove, which are required for cutting and bleeding hydraulic brake hoses.
- Tube or jar of **grease**. I recommend using bicycle grease; however, if you already have some automotive grease, you can use it on everything except suspension forks and shocks or in twist shifters.
- Drip bottle of **chain lubricant** (Fig. 4.1). Please choose a nonaerosol; it is easier to control, uses less packaging, and wastes less in overspray.
- **Rubbing alcohol** for cleaning disc-brake pads, rotors, shocks, and internal parts and for removing and installing handlebar grips.
- A lot of **rags**!

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**LEVEL 2 TOOL KIT**

Level 2 repairs are a bit more complex, and I recommend that in addition to assembling these tools you create a well-organized workspace with a shop bench. Keeping your workspace organized is probably the best way to make maintenance and repair easy and quick. You will need the entire Level 1 Tool Kit (Fig. 1.1A) plus the following tools (Fig. 1.2):

- **Portable bike stand.** Be sure that the stand is sturdy enough to remain stable when you’re really cranking on the wrenches. If for some reason you can’t clamp your bike’s seatpost, you will need a bike stand that holds the bike by the bottom bracket and the front or rear end with one wheel out; see the one in Figure 1.4.
- **Shop apron** (to keep your nice duds nice).
- **Tire pressure gauge.** It is more accurate than a pump gauge and a must for getting pressure exact for technical riding.
• **Hacksaw** with a fine-toothed blade.
• **Box-cutter knife** (Fig. 11.32) or razor blades.
• **Files**: one round and one flat, not too coarse.
• **Cable cutter** for cutting coaxial shift cable housing without crushing it as well as for cutting brake and shifter cables without fraying.
• Set of **metric socket wrenches** that includes 7mm, 8mm, 9mm, 10mm, 13mm, 14mm, and 15mm sizes.
• **Cable cutter** for cutting coaxial shift cable housing without crushing it as well as for cutting brake and shifter cables without fraying.
• **Torx keys**, which look like hex keys with star-shaped tips. Torx T10, T25, and T30 are common sizes on modern bikes.
• **Crank puller** for removing crankarms (Fig. 11.6) if you have an old, three-piece crankset. Its push rod is sized for either square-taper spindles (Fig. 11.20) or ISIS or Octalink spindles (Figs. 11.21 and 11.22); get the right one for your crankset.
• **Chainring-nut tool** for holding the nut while you tighten or loosen a chainring bolt (Fig. 11.9).
• **Chainring-cassette removal tools**, if you happen to have old Shimano Octalink–style HollowTech I cranks (Fig. 11.12).
• **Bottom-bracket tools**. For **external-bearing cranks** (Fig. 11.2), you’ll need an oversize **splined wrench** to remove the cups (Fig. 11.14); this will also remove some Center Lock rotor lockrings (Fig. 9.8). For some Shimano cranks, you’ll also need a **little splined tool** to tighten the left crank’s adjustment cap. To fit smaller external-cup sizes without having to buy a wrench or socket for each size, use a **splined step-down insert** to plug into a standard external-bearing splined tool. For sealed-cartridge bottom brackets (Figs. 11.20 and 11.21), you’ll need a **splined bottom-bracket socket** (Fig. 11.28); if your bike has an ISIS or Octalink splined-spindle bottom bracket, you’ll need one with a bore large enough to swallow the fatter spindle (Fig. 11.21), and if your bike has a square-taper cartridge bottom bracket (Fig. 11.20), the bigger-bore tool (Fig. 11.21) will work on both types. And for old-style cup-and-cone and adjustable cartridge-bearing bottom brackets (Figs. 11.23 and 11.24), you’ll need a **locking spanner** and a **pin spanner** to fit the bottom bracket (Fig. 11.31).
• **Snapring pliers** (Fig. 11.27) for BB30 cranks (Fig. 11.15) and other unthreaded bottom brackets with snapring grooves and for use in removing snaprings from suspension forks, pedals, and other parts.
• **Cone wrenches** for loose-bearing hubs (Fig. 8.9). The standard sizes are 13mm, 14mm, 15mm, and 16mm, but check which size you need before buying.
• **Medium ball-peen hammer**.
• **Valve core removers** for both Schrader and Presta valves. These are used for tire service and shock service.
• **Tire sealant** for setting up tubeless tires (Fig. 7.17) or installing into inner tubes for puncture protection.
• **Fine-tipped grease gun**.
• **Assembly paste**. Especially for seatposts (Fig. 14.7).
• **Threadlock fluid** for keeping bolts tight that have a tendency to unscrew.
• **Penetrating oil** or **ammonia** for freeing stuck parts.
• **Sound system** laden with good tunes.
1.2 Level 2 Tool Kit

- portable bike stand
- shop apron
- hacksaw
- cable cutter
- metric socket wrenches
- silicone grease
- penetrating oil
- chainring-nut tool
- files: 1 round, 1 flat
- fine-tipped grease gun
- integrated-spindle external-bearing tool
- splined socket wrench
- pin spanner
- chain whip
- Channellock pliers
- splined pedal-spindle removal tool
- valve core removers
- Presta
- Schrader
- Pedro’s Vise Whip
- drywall sanding screen
- tire sealant
- assembly paste
- sound system
- tire pressure gauge
- razor blades or box-cutter knife
- Torx T25, T30 wrenches
- Shimano hollow-crank chainring-cassette tools
- crank puller
- chainring-nut tool
- medium bench vise
- ball-peen hammer
- headset wrenches
- cone wrenches
- cassette and rotor lockring tool
- splined step-down insert
- integrated-spindle external-bearing tool
- lockring spanner
- splined pedal-spindle removal tool
- sound system
- taper wrench
- chainring-nut tool
**GLOSSARY**

**adjustable cup** the non-drive-side cup in the bottom bracket (Fig. 11.23). This cup is removed for maintenance of the bottom-bracket spindle and bearings, and it adjusts the bearings. The term is sometimes also applied to the top cup of the headset (Figs. 12.20–12.21).

**AheadSet** (a trademark of Dia-Compe and Cane Creek; or “threadless headset”): a style of headset that allows the use of a fork with a threadless steering tube (Fig. 12.6).

**Allen key** (or “Allen wrench”) (see “hex key”).

**all-terrain bike (ATB)** another term for mountain bike.

**anchor bolt** (or “cable anchor” or “cable anchor bolt” or “cable-fixing bolt”): a bolt securing a cable to a component (Fig. 5.3).

**Answer Products** an American bicycle- and motorcycle-component company and the parent company of Manitou.

**Avid** a brake manufacturer, subsidiary of SRAM.

**axle** a shaft around which a part turns, usually on bearings or bushings.

**axle overlock dimension** a length of a hub axle from dropout to dropout, referring to the distance from locknut face to locknut face (Fig. 17.28).

**ball bearing** a set of balls, generally made out of steel or ceramic, rolling in a track to allow a shaft to spin inside a cylindrical part; may also refer to one of the individual balls.

**bar end** a short handlebar extension clamped onto the end of the handlebar and extending approximately perpendicular to it (Fig. 12.7).

**barrel adjuster** a threaded cable stop that allows for fine adjustment of cable tension. Barrel adjusters are commonly found on rear derailleur, shifters, and brake levers (Figs. 5.3, 5.20–5.21, 10.1) and dropper-post remote levers.

**BB** (see “bottom bracket”).

**bearing** (see “ball bearing”).

**bearing cone** a conical part with a bearing race around its circumference. The cone presses the ball bearings against the bearing race inside the bearing cup (Fig. 8.6).

**bearing cup** (or “headset cup”) a polished, dish-shaped surface inside which ball bearings roll. The bearings roll on the outside of a bearing cone that presses them into their track inside the bearing cup (Figs. 8.6, 11.5, 12.19).

**bearing race** a track or surface on which the bearings roll. The race can be inside a cup, on the outside of a cone, or inside a cartridge bearing.

**binder bolt** a bolt clamping a seatpost in a frame (Fig. 14.7), a bar end to a handlebar (Fig. 12.7), a stem to a handlebar (Fig. 12.5), or securing a threadless steering tube (Fig. 12.6).

**bonk** (1) v. to run out of fuel for the human body so that the ability to continue strenuous activity is impaired. (2) n. the state of having such low blood sugar from insufficient intake of calories that the ability to perform vigorous activity is impaired.

**bottom bracket (BB)** an assembly that allows the crank to rotate (Fig. 11.13). Generally the bottom-bracket assembly includes bearings and an axle and on older bikes may include a fixed cup, an adjustable cup, and a lockring.

**bottom-bracket drop** the vertical distance between the center of the bottom bracket and a horizontal line passing through the wheel-hub centers. Drop is equal to the wheel radius minus the bottom-bracket height (Appendix C, Fig. C.1).

**bottom-bracket height** the height of the center of the bottom-bracket spindle above the ground (see Appendix C, Fig. C.1).
bottom-bracket shell a cylindrical housing at the bottom of a bicycle frame through which the bottom-bracket axle passes (Fig. 11.13).

brake a mechanical device that decelerates or stops the motion of the wheel (and hence of the bicycle and rider) through friction.

brake block (see “brake pad”).

brake booster an arch-shaped part bolted to the ends of the brake bosses to reduce the flex of the bosses and seatstays when the cantilever or V-brakes are applied (Fig. 10.33).

brake boss (or “brake pivot,” or “brake post,” or “cantilever boss,” or “cantilever pivot,” or “cantilever post”): a fork- or frame-mounted pivot for a brake arm (Figs. 16.2–16.3, 17f).

brake caliper a brake part fixed to the frame or fork containing moving parts attached to brake pads that stop or decelerate a wheel (Figs. 9.11, 9.13, 9.14, 9.17, 9.19, 9.20, 9.22, 9.24, 9.26, 9.27–9.29).

brake pad (or “brake block”): a block of rubber or similar material used to slow the bike by creating friction on the rim, hub-mounted disc, or other braking surface (Figs. 9.1–9.3, 9.5, 9.24, 9.27–9.29).

brake pivot (see “brake boss”).

brake post (see “brake boss”).

brake shoe a metal pad holder that secures the brake pad to the brake arm (Fig. 10.14).

braze-on boss a generic term for most metal frame attachments, even those not brazed but rather welded or glued to the frame.

brazing a method commonly used to construct steel bicycle frames. Brazing involves the use of brass or silver solder to connect frame tubes and attach various “braze-on” items, such as brake bosses, cable guides, and rack mounts, to the frame. Although it is rarely done, it is also possible to braze aluminum and titanium.

bushing a metal or plastic sleeve that acts as a simple bearing in pedals, suspension forks, rear shocks and shock-mounting points, suspension swingarms, derailleur pivots, and jockey wheels.

butted tubing a common type of frame tubing with varying wall thicknesses. Butted tubing is designed to accommodate high-stress points; the ends of the tubes are thicker and other sections are thinner to reduce weight.

cable (or “inner wire”): wound or braided wire strands used to operate brakes and derailleurs.

cable anchor (see “anchor bolt”).

cable anchor bolt (see “anchor bolt”).

cable boss (see “cable stop”).

cable end cap a cap on the end of a cable that keeps it from fraying (Fig. 5.26).

cable hanger cable stop on a stem, headset washer, fork, or seatstay arch used to stop the brake cable housing for a cantilever or U-brake (Figs. 10.4–10.6).

cable housing (or “outer wire”): a metal-reinforced exterior sheath through which a cable passes (Fig. 5.26).

cable stop (or “cable boss,” or “cable-housing stop,” or “outer wire stop”): a fitting on the frame, fork, or stem at which a cable-housing segment terminates (Fig. 17f).

cable-housing stop (see “cable stop”).

cage two guiding plates through which the chain travels. Both the front and rear derailleurs have cages. The cage on the rear also holds the jockey pulleys. Also, a water-bottle holder.

caliper (see “brake caliper” and “measuring caliper”).

Campagnolo an Italian bicycle-component company.

Cane Creek (originally Dia-Compe USA): American bicycle-component company and originator of the threadless headset.

cantilever boss (see “brake boss”).

cantilever brake a cable-operated rim brake consisting of two opposing arms pivoting on frame- or fork-mounted posts. Pads mounted to each brake arm are pressed against the braking surface of the rim via cable tension from the lever (Figs. 10.16–10.32).

cantilever pivot (see “brake boss”).

cantilever post (see “brake boss”).

cartridge bearing ball bearings encased in a cartridge consisting of steel inner and outer rings, ball retainers, and sometimes bearing covers (Figs. 8.5, 8.23, 11.31).

cassette a group of cogs that mounts on a freehub (Fig. 8.23); also, a group of chainrings that mounts on a spiderless crankarm (Fig. 11.12).

cassette hub (see “freehub”).
casting (see “outer leg”).
chain a series of metal links held together by pins and used to transmit energy from the crank to the rear wheel (Fig. 4.1).
chain link a single unit of bicycle chain consisting of four plates with a roller on each end and in the center (Fig. 4.7).
chain suck a dragging of the chain by the chainring past the release point at the bottom of the chainring. The chain can be dragged upward until it is jammed between the chainring and the chainstay (Fig. 4.27).
chain whip (or “chain wrench”): a flat piece of steel, usually attached to two lengths of chain (Fig. 1.2). This tool is used to remove the rear cogs on a freehub or freewheel. (See also “Vise Whip,” a more robust and secure substitute for this tool.)
chainline an imaginary line connecting the center of the middle chainring with the middle of the cogset. This line should, in theory, be straight and parallel to the vertical plane passing through the center of the bicycle. The chainline is measured as the distance from the center of the seat tube to the center of the middle chainring (5-50, Fig. 5.61).
chainring a multiple-tooth sprocket attached to the right crankarm (Fig. 11.1).
chainring-nut tool a tool used to secure the chainring nuts while tightening the chainring bolts (Fig. 1.2).
chainstay a frame tube on a bicycle connecting the bottom-bracket shell to the rear dropout and hence to the rear hub axle (Figs. 17.1–17.2).
chase (see “goose chase”).
circlip (or “Jesus clip” or “snapring”): a C-shaped or spiral ring that fits in a groove to hold two cylindrical parts together.
clip-in pedal (or “clipless pedal”): a pedal that relies on spring-loaded clips to grip a cleat attached to the bottom of the rider’s shoe without the use of toeclips and straps (Fig. 13.2).
clipless pedal (see “clip-in pedal”).
cog a sprocket located on the drive side of the rear hub (Fig. 8.23).
compression damping a diminishment of the speed of compression of a spring on impact by hydraulic or mechanical means.
cone a threaded conical nut that serves to hold a set of bearings in place and also provides a smooth surface upon which those bearings can roll (Fig. 8.6); can also refer to the conical (or male) member of any cup-and-cone ball-bearing system (see also “bearing cone”).
crank bolt (see “crankarm anchor bolt”).
crank length the distance between the centerline of the bottom-bracket spindle and the centerline of the pedal axle (Appendix C, Fig. C.4).
crankarm a lever attached at the bottom-bracket spindle and to the pedal used to transmit a rider’s energy to the chain (Fig. 11.1).
crankarm anchor bolt (or “crank bolt”): a bolt attaching the crank to the bottom-bracket spindle on a cotterless drivetrain (Fig. 11.1).
crankset an assembly that includes a bottom bracket, two crankarms, a chainring set, and accompanying nuts and bolts (Fig. 11.1).
cross-three (see “three-cross”).
crowfoot socket (see “crowfoot wrench”).
crowfoot wrench (or “crowfoot socket” or “crow’s foot”): a flat, open-end wrench head with a square hole at its base to accept the drive stub of a socket wrench or torque wrench (Fig. 1.3).
crow’s foot (see “crowfoot wrench”).
cup a cup-shaped bearing surface that surrounds the bearings in a bottom bracket (Fig. 11.13), headset (Fig. 12.19), or hub (Fig. 8.6) (see also “bearing cup”). Also, the upper part of the shaft-eyelet assembly of a rear shock (the big end of the shock).
damper (or “damping cartridge”): a mechanism in a suspension fork or shock that reduces the speed of the spring’s oscillation movement (Fig. 16.25).
damping a reduction in speed of the oscillation of a spring, as in a suspension fork or shock.
damping cartridge (see “damper”).
derailleur a gear-changing device that allows a rider to move the chain from one cog or chainring to another while the bicycle is in motion (Figs. 5.3, 5.17–5.21).
derailleur hanger a metal extension of the right rear dropout through which the rear derailleur is mounted to the frame (Fig. 17.1).
Di2 model name of Shimano electronic-shifting components.
diamond frame  a traditional bicycle frame shape (Fig. 171).

disc brake  a brake that stops the bike by squeezing brake pads attached to a caliper mounted to the frame or fork (Figs. 9.9–9.11) against a circular disc attached to the wheel (Figs. 9.6–9.8).

dish  or “wheel dish”: a difference in spoke tension on the two sides of the rear wheel (Fig. 15.23).

dishing  or “wheel dishing”: a centering of the rim in the frame or fork by adjustment of spoke tension in a wheel.

dishing tool  a tool to check the centering of a wheel rim relative to the axle ends.

double  a two-chainring drivetrain setup (as opposed to a three-chainring, or “triple,” setup).

down tube  a frame tube that connects the head tube and bottom-bracket shell together (Fig. 171).

drift  a flat-ended rod used for driving out bearings and bushings.

drivetrain  the crankarms, chainrings, bottom bracket, front derailleur, chain, rear derailleur, and freewheel (or cassette).

drop  (1) the difference in height between two parts (see also “bottom-bracket drop”). (2) a terrain discontinuity you may or may not want to ride off. (3) something not to do with your tools.

dropouts  or “fork ends” or “fork tips”: slots in the fork and rear triangle where the wheel axles attach (Figs. 16.2, 171).

dropper post  a telescoping seatpost whose length can be adjusted on the fly, while riding.

DT  (a.k.a. DT Swiss): a manufacturer of spokes, other bicycle components, and tools.

dust cap  a protective cap keeping dirt out of a part.

easy-out  a cone-shaped, hardened-steel tool with coarse, reverse threads to remove broken bolts. To remove a broken bolt with one, a hole is drilled into the center of the bolt, the easy-out is inserted into the hole, and the easy-out is then turned with a tap handle in a counterclockwise direction.

elastomer  a urethane spring sometimes used in suspension forks (Fig. 16.26), rear shocks, suspension seatposts, and saddles; also called an MCU for the material and construction (microcellular urethane).

electronic shifting  (see also “Di2”): a system for shifting gears on a bicycle in which the power to shift the derailleurs comes not from the pull on a cable, but rather from an electric signal turning a servo motor on and off.

endo  a (usually unintentional) rotation of the bike and rider forward over the front wheel.

expander bolt  a bolt that when tightened pulls a wedge up inside or alongside the part into which the bolt is anchored to provide outward pressure and secure said part inside a hollow surface. Expander bolts are found inside quill stems (Figs. 12.9–12.10) and some handlebar-end plugs and handlebar-end shifters.

expander wedge  or “wedge”: a part threaded onto an expander bolt and usually used to secure a quill stem inside the fork steering tube or handlebar-end plugs or handlebar-end shifter inside a handlebar. An expander wedge is threaded down its center axis to accept the expander bolt and is either cylindrical in shape and truncated along an inclined plane (Figs. 12.9–12.11) or conical in shape and truncated parallel to its base.

ferrule  a cap for the end of cable housing (Fig. 5.26).

fixed cup  a nonadjustable cup of the bottom bracket located on the drive side of the bottom bracket (Fig. 11.13).

flange  largest diameter of the hub, where the spoke heads are anchored (Fig. 15.4).

fork  a part that attaches the front wheel to the frame (Figs. 16.1–16.3).

fork casting  (see “outer leg”).

fork crown  a crosspiece connecting the fork legs to the steering tube (Figs. 16.1–16.2).

fork ends  (see “dropouts”).

fork rake  or “offset,” “rake,” or “wheel offset”: perpendicular offset distance of the front axle from an imaginary extension of the steering-tube centerline (see also “steering axis”).

fork steerer  (see “steering tube”).

fork tips  (see “dropouts”).

fork trail  or “trail”: the distance measured on the ground between the vertical line passing through the center of the front-hub axle (i.e., the center of
the wheel contact patch) and the extension of the centerline of the head tube.

**Fox** a bicycle-suspension manufacturer that makes forks, rear shocks, and dropper posts. Parent company of RaceFace and Easton.

**frame** a central structure of a bicycle to which all of the parts are attached (Figs. 17.1–17.2).

**freehub** (or “cassette hub”): a rear hub that has a built-in freewheel mechanism to which the rear cogs are attached (Fig. 8.23).

**freewheel** a mechanism through which the rear cogs are attached to the rear wheel on a derailleur bicycle (Figs. 8.23–8.25). The freewheel is locked to the hub when turned in the forward direction, but it is free to spin backward independently of the hub’s movement, thus allowing the rider to stop pedaling and coast as the bicycle is moving forward (see also “freehub”).

**friction shifter** a traditional (nonindexed) shifter attached to the frame or handlebar. Cable tension is maintained by a combination of friction washers and bolts.

**front triangle** (or “main triangle”): the head tube, top tube, down tube, and seat tube of a bike frame (Fig. 17.1).

**FSA** (Full Speed Ahead): a manufacturer of bicycle components.

**girl’s bike** (see “step-through frame”).

**goose chase** (see “wild goose chase”).

**granny gear** the lowest gear, generally of a triple drivetrain. In the granny gear the chain is on the largest rear cog and the innermost (usually of three) front chainrings.

**Grip Shift** a twist shifter of the SRAM Corporation that is integrated with the handlebar grip of a mountain bike (Figs. 5.34–5.37). The rider shifts gears by twisting the grip (see also “twist shifter”).

**handlebar** a curved tube, connected to the fork via the stem, that the rider holds in order to turn the fork and thus steer the bicycle. The brake levers and shift levers are attached to it (Fig. 12.1).

**head angle** an acute angle formed by the centerline of the head tube and the horizontal.

**headset** a bearing system, consisting of a number of separate cylindrical parts installed into the head tube and onto the steering tube, that secures the fork and allows it to spin and swivel in the frame (Figs. 12.19–12.22).

**headset cup** (see “bearing cup”).

**headset top cap** (see “top cap”).

**head tube** the front tube of the frame through which the steering tube of the fork passes (Fig. 17.1). The head tube is attached to the top tube and down tube and contains the headset.

**hex key** (or “Allen key” or “Allen wrench”): a hexagonal wrench that fits inside a hexagonal hole in the head of a bolt (Fig. 1.1A).

**hub** the central part of a wheel to which the spokes are anchored and through which the wheel axle passes (Figs. 8.1, 8.5–8.7).

**hub brake** a disc, drum, or coaster brake that stops the wheel with friction applied to a braking surface attached to the hub.

**Hurricane Components** a bicycle-component company.

**Hutchinson** a French tire company.

**hydraulic brake** a type of brake that uses fluid pressure to move the brake pads against the braking surface (Figs. 9.11, 10.33).

**index shifter** a shifter that clicks into fixed positions as it moves the derailleur from gear to gear.

**inertia valve** a valve on the compression-damping system on a front or rear shock that opens upon hard impacts and otherwise stays closed, in order to distinguish between bump forces and pedaling forces and prevent the shock from bobbing up and down during pedaling. The inertia valve is similar to a lockout lever, but unlike a lockout, it allows the shock to still be fully active for bump absorption while engaged.

**inner** (see “inner leg”).

**inner leg** on a telescoping suspension fork, a tube, usually clamped into the fork crown (except in the case of an “upside-down fork”), that slides in and out of the larger-diameter outer leg as the fork compresses and rebounds (Fig. 16.26). On a standard (non-upside-down) fork, it is also called an “upper tube,” “inner,” or “stanchion.”

**inner wire** (see “cable”).
integrated headset a headset in which the bearing seats are integrated into the head tube (rather than requiring separate headset cups) and the bearings are completely concealed within the head tube (Fig. 12.20).

Jesus clip (see “circlip”).

jockey pulley (see “jockey wheel”).

jockey wheel (or “jockey pulley”): a circular, cog-shaped pulley attached to the rear derailleur that is used to guide, apply tension to, and laterally move the chain from rear cog to rear cog (Fig. 5.47).

knobby tire an all-terrain tire used on mountain bikes (Fig. 7.1).

lawyer tabs (see “wheel-retention devices”).

leverage ratio amount the rear axle moves vertically on a full-suspension bike with a given amount of movement of the shock shaft.

link a pivoting steel hook on a V-brake arm that the cable-guide “noodle” hooks into (Fig. 10.12) (see also “chain link”).

lock washer a notched or toothed washer that serves to hold surrounding nuts and washers in position.

locknut a nut that serves to hold the bearing adjustment in a headset, hub, or pedal.

lockout a valve on the compression-damping system on a front or rear shock that prevents the shock from compressing. Modern shocks usually have a “blow-off” system that will allow the compression-damping circuit to open with a large impact to prevent the shock from being damaged on big hits while the lockout is engaged.

lockring a large circular locknut. On a bottom bracket, it is the outer ring that tightens the adjustable cup against the face of the bottom-bracket shell (Fig. 11.13). On a rear shock, the lockring is the threaded ring that tightens the coil spring on a coil-over shock or is used to secure the fore-aft position of the shock body on some air shocks. On a freehub, the lockring holds the cogs on (Fig. 8.23). On a CenterLock disc brake–compatible hub, the lockring secures the rotor to the hub shell (Fig. 9.8).

Low Normal (originally “Rapid Rise”): a style of rear derailleur pioneered by Shimano in which the return spring is connected to the opposite vertices of the rear derailleur’s parallelogram linkage elements compared to the setup for a standard rear derailleur. This arrangement results in the derailleur’s moving to the low-gear position (the largest, most inboard rear cog) when the cable tension is removed, rather than to the high-gear position (the smallest, most outboard cog), as on a standard rear derailleur.

Magura a German brake company.

main triangle (see “front triangle”).

Manitou an American suspension-fork and component company, subsidiary of Answer Products.

Marzocchi an Italian suspension-fork and component company.

master cylinder a piston chamber at the lever end of a hydraulic brake system (Figs. 9.15, 10.33).

master link a detachable link that holds the chain together. The master link can be opened by hand without a chain tool (Fig. 4.14).

Mavic a French wheel and bicycle-component company.

MCU (see “elastomer”).

measuring caliper a tool for measuring the outside dimensions of an object or the inside dimensions of a hole by means of movable jaws (Fig. 1.4).

Michelin a French tire company.

mixte frame (see “step-through frame”).

mounting bolt a bolt that mounts a part to a frame, fork, or component (see also “pivot bolt”).

needle bearing a steel cylindrical cartridge with rod-shaped rollers arranged coaxially around the inside walls (Fig. 8.20).

nipple (1) a thin nut designed to receive the end of a spoke and seat it in the holes of a rim (Figs. 15.1–15.2). (2) a flared tip of a hydraulic caliper bleed fitting onto which a bleed hose can be attached (Fig. 9.26).

noodle a curved cable-guide pipe on a V-brake arm that stops the cable housing and directs the cable to the cable anchor bolt on the opposite arm (Fig. 10.12).

NoTubes (or “NoTubes.com”) (see “Stan’s NoTubes”).

NoTubes.com (see “Stan’s NoTubes”).

offset (see “fork rake”).

outer (see “outer leg”).

outer leg in a telescoping suspension fork, a tube, often cast from magnesium and attached to the
front-wheel axle (except in the case of an “upside-down fork”), that slides up and down over the smaller-diameter inner leg as the fork compresses and rebounds (Fig. 16.2). On a standard (non-upside-down) fork, it is also called the “casting,” “fork casting,” “outer,” or “slider.”

outer wire (see “cable housing”).

outer wire stop (see “cable stop”).

pedal a platform the foot pushes on to propel the bicycle (Figs. 13.1–13.2).

pedal overlap (or “toe overlap” or “toeclip overlap”): an overlapping of the toe with the front wheel while pedaling (Appendix C, Fig. C.2).

pedal platform a highly damped low-speed compression circuit on a rear shock or suspension fork designed to reduce pedal-induced bobbing as well as keep the suspension high during braking and while riding berms and dips.

pedaling stance the lateral distance between the feet while pedaling. It’s the distance measured between the two vertical planes defined by the inboard side of each shoe at the first metatarsal as they move around the pedaling circle.

pin spanner a V-shaped wrench with two tip-end pins. The pin spanner is often used for tightening the adjustable cup of the bottom bracket or other lockings (Fig. 1.2).

pivot a pin about which a part rotates through a bearing or bushing. The pivot is found on brakes, derailleurs, and rear-suspension systems.

pivot bolt a bolt on which another part pivots.

preload (see “spring preload”).

Presta valve a thin, metal tire valve that uses a locking nut to prevent air from escaping from the inner tube or tire (Fig. 1.1B).

pulley (see “jockey wheel”).

Q-factor the distance from the outer face of one crankarm at the pedal hole to the plane formed by the outer face of the other crankarm at the pedal hole as it spins. Q-factor is measured normal to this plane. In practice, the easiest way to measure Q-factor is to install the two crankarms on the spindle so that they are parallel to each other (at 0 degrees, rather than at 180 degrees from each other) and measure from the outer face of one crankarm at the pedal hole to the outer face of the other crankarm at the pedal hole.

quick-release (1) a tightening lever and shaft used to attach a wheel to the fork or rear dropouts without using axle nuts (Figs. 8.5–8.6). (2) a quick-opening lever and shaft pinching the seatpost inside the seat tube in lieu of a wrench-operated bolt. (3) a quick cable release on a brake. (4) a fixing mechanism that can be quickly opened and closed, as on a brake cable or wheel axle. (5) any anchor bolt that can be quickly opened and closed by a lever.

quill a vertical tube of a stem for a threaded headset system that inserts into the fork steering tube. It has an expander wedge and bolt inside to secure the stem to the steering tube (Fig. 12.9).

quill stem a stem with a quill to insert inside a threaded fork steering tube (Fig. 12.9).

race a circular track on which bearings roll freely (see also “bearing race”).

Race Face a Canadian bicycle-component company.

rake (see “fork rake”).

Rapid Rise (see “Low Normal”).

Rapidfire shifter an indexing shifter manufactured by Shimano for use on mountain bikes with two separate levers operating each shift cable (Figs. 5.24, 5.37).

ratchet (see “socket wrench”).

rear triangle a rear part of the bicycle frame that includes the seatstays, the chainstays, and the seat tube (Fig. 17.1).

rebound damping a diminishing of speed of return of a spring by hydraulic or mechanical means.

ride height (see “sag”).

rim an outer hoop of a wheel to which the tire is attached (Fig. 15.1).

riser bar a handlebar with a double bend on each side of the stem clamp so that the grips are higher than the stem.

Ritchey an American bicycle and bicycle-component company.

RockShox an American suspension-fork and component company, subsidiary of SRAM.

roller-cam brakes a brake system using pulleys and a cam to force the brake pads against the rim surface (Fig. 10.40).
saddle (or “seat”): a platform made of leather and/or plastic upon which the rider sits (Fig. 14.1).

sag (or “ride height”): the amount the front or rear shock compresses with the rider’s weight static on the bike. Its purpose is to preload the shock so that it forces the rear wheel down into the ground when the bike is unweighted after a bump, thus increasing tire contact and traction in rough terrain.

Schrader valve a high-pressure air valve with a spring-loaded air-release pin inside (Fig. 11B). Schrader valves are found on some bicycle inner tubes and tubeless tires, on air-sprung suspension forks and rear shocks, and on automobile tires and tubes.

sealant (see “tire sealant”, Fig. 7.18).

sealed bearing a bearing enclosed in a protective seal in an attempt to keep contaminants out (Fig. 8.5) (see also “cartridge bearing”).

seat (see “saddle”).

seat angle an acute angle formed by the centerline of the seat tube and the horizontal.

seat cluster an intersection of the seat tube, top tube, and seatstays.

seat tube a frame tube into which the seatpost is inserted (Fig. 17.1).

seatpost a tubular member supporting, securing, and allowing height adjustment of the saddle (Fig. 14.5).

seatstay a frame tube on a bicycle connecting the seat tube or the rear shock to the rear dropout and hence to the rear hub axle (Figs. 17.1–17.2).

shim a thin element inserted between two parts to ensure that they are the proper distance apart. On bicycles, a shim can be a thin washer and can be used to space a disc-brake caliper away from the frame or fork or to space a bottom-bracket cup away from the frame’s bottom-bracket shell. A shim can also be a thin piece of metal used to make a seatpost fit more tightly inside the seat tube. Shims can also be small, thin discs found inside suspension forks and rear shocks to control suspension movement by permitting or hindering passage of hydraulic fluid through an orifice.

Shimano a Japanese bicycle-component company and maker of XTR, XT, Saint, LX, and STX component lines as well as Rapidfire (shifters), SPD (pedals), and STI (shifting systems).

sidepull cantilever brake (see “V-brake,” Figs. 10.11–10.14).

singletrack a trail with a single furrow made for feet or a two-wheeled vehicle, as opposed to a road or “doubletrack,” which has a track for each pair of wheels on a four-wheeled vehicle.

skewer (1) a long rod. (2) a hub quick-release (Figs. 8.5–8.6). (3) a shaft passing through a stack of elastomer bumpers in a suspension fork (Fig. 16.25).

slave cylinder a piston chamber in the caliper of a hydraulic brake.

slider (see “outer leg”).

Slime a brand of tire sealant consisting of chopped fibers in a liquid medium injected inside a tire or inner tube to flow to and fill small air leaks (Fig. 7.18).

snapring (see “circlip”).

socket a cylindrical tool with a square hole in one end to mount onto a socket-wrench handle and with hexagonal walls inside the opposing end to grip a bolt head or nut (Fig. 1.2).

socket wrench (or “socket wrench handle” or “wrench handle”): a cylindrical wrench handle with a ratchet- ing square head extending at right angles to the handle onto which sockets or other wrench bits for turning bolts or nuts are installed (Fig. 1.2).

spare on a bicycle, generally a thick washer, cylindrical in shape, intended to maintain a fixed distance between two parts. Spacers can be found between the headset and the stem and between the stem and the top cap on a threadless steering tube, and between the upper bearing cup and the top nut on a threaded steering tube. Spacers may also be used to space a bottom-bracket cup away from the frame’s bottom-bracket shell.

spanner (British parlance): a wrench.

spider a star-shaped piece of metal that connects the right crankarm to the chainrings (Fig. 11.1).

spline one of a set of longitudinal grooves and ridges designed to interlock two mechanical parts (Figs. 8.23, 9.7–9.8).

spokes metal rods that connect the hub to the rim of a wheel (Figs. 15.1–15.2).

spring an elastic contrivance that when compressed returns to its original shape by virtue of its elasticity. In bicycle suspension applications, the spring used...
is normally either an elastic polymer cylinder, a coil of steel or titanium wire, or compressed air.

**spring preload** (or “preload”): an initial loading of a spring so that part of its compression range is taken up prior to impact.

**sprocket** a circular, multiple-toothed piece of metal that engages a chain (see also “cog” and “chainring”).

**SRAM** an American bicycle-component company and maker of Grip Shift, Half Pipes, and ESP (derailleurs); owner of Sachs, RockShox, Avid, and Truvativ bicycle-component companies.

**stand-over clearance** (see “stand-over height”).

**stand-over height** (or “stand-over clearance”): the distance between the top tube of the bike and the rider’s crotch when the rider is standing over the bicycle (Appendix C, Fig. C.1).

**Stan’s NoTubes** (or “No Tubes” or “NoTubes.com”): a brand of tire upgrade system named after inventor Stan Koziatek that includes a latex-based tire sealant (Fig. 7.18) to convert a standard tire to a tubeless tire.

**star bolt** (see “Torx bolt”).

**star nut** (or “star-fangled nut”): a pronged nut that is forced down into the steering tube and anchors the headset top cap bolt to adjust a threadless headset (Figs. 12.6, 12.19–12.21).

**star wrench** (see “Torx wrench”).

**star-fangled nut** (see “star nut”).

**steerer** (see “steering tube”).

**steering axis** the imaginary line around which the fork rotates (Fig. 16.51).

**steering tube** (or “fork steerer” or “steerer”): a vertical tube on a fork that is attached to the fork crown, fits inside the head tube, and swivels within it by means of the headset bearings (Figs. 16.1–16.3). A steering tube can be threaded or threadless, meaning that the top headset cup can either screw onto the steering tube or slide onto it, and the stem can either insert inside the steering tube and clamp with an expander wedge (threaded) or clamp around the steering tube (threadless).

**stem** (or “gooseneck”): a connection element between the fork steering tube and the handlebar (Fig. 12.1).

**stem length** the distance between the center of the steering tube and the center of the handlebar measured along the top of the stem (Appendix C, Fig. C.4).

**step-through frame** (or “girl’s bike,” or “mixte frame,” or “women’s frame”): a bicycle frame with a steeply up-angled top tube connecting the bottom of the seat tube to the top of the head tube. The frame design is intended to provide ease of stepping over the frame and ample stand-over clearance.

**straddle cable** a short segment of cable connecting two brake arms together (Figs. 10.16–10.18).

**straddle-cable holder** (see “yoke”).

**swingarm** a movable rear end of a rear-suspension frame (Fig. 14.2). (see also “chainstay”).

**tap** (or “thread tap”): a threaded tool made of hardened steel to cut threads. It is shaped like a pointed bolt shaft, but it has lengthwise grooves cut across the threads to give the threads cutting edges. The tap has a square head that fits in a handle to provide leverage to turn the tap.

**threaded headset** a headset whose top bearing cup and top nut above it screw onto a threaded steering tube (Fig. 12.19).

**threadless headset** (see “AheadSet”).

**three-cross** (or “cross-three”): a pattern used by wheel builders that calls for each spoke to cross three others in its path from the hub to the rim (Fig. 15.1).

**through-axle** a removable rod that forms not only the axle of a front or rear hub but also the system that secures the wheel into the fork or frame.

**thumb shifter** a thumb-operated shift lever attached on top of the handlebar (Fig. 5.31).

**tire bead** an edge of a tire that seats down inside the rim (Fig. 7.7). The bead’s diameter is held fixed to established standards by means of a strong, stretch- and tear-resistant material—usually either steel or Kevlar. These strands alone are also referred to as the “bead.”

**tire lever** a tool to pry a tire off the rim (Figs. 7.4–7.5).

**tire sealant** a liquid that, when put into a tire, plugs leaks when air under pressure forces it through the leaks. The sealant (Fig. 7.18) either hardens in air or blocks the hole with fibers and flakes suspended in the liquid, or both.

**toe overlap** (or “toeclip overlap”) (see “pedal overlap”).

**toeclip overlap** (see “pedal overlap”).
**top cap** (or “headset top cap”): a round top part of a headset with a bolt passing through it that screws into the star nut to apply downward pressure on the stem to properly load and adjust the headset bearings on a threadless steering tube (Figs. 12.19–12.21).

**top cup** upper headset cup (see “bearing cup”).

**top tube** a frame tube that connects the seat tube to the head tube (Fig. 17.1).

**torque** a rotational analogue of force. Torque is a vector quantity whose magnitude is the length of the radius from the center of rotation out to the point at which the force is applied, multiplied by the magnitude of the force directed perpendicular to the radius. On bicycles, we are primarily interested in the tightening torque applied to a fastener (this value can be measured with a torque wrench—see Appendix D) and the torque applied by the rider on the pedals to propel the rear wheel and hence the bicycle.

**torque wrench** a socket-wrench handle with a graduated scale and an indicator to show how much torque is being applied as a bolt is being tightened (Figs. 1.3–1.4, 2.18; see Appendix D).

**Torx bolt** (or “star bolt”): a bolt with a six-point star-shaped hole in its head.

**Torx wrench** (or “star wrench”): a tool with a star-shaped end that fits in the star-shaped hole in the head of a Torx bolt (Figs. 1.3, 1.5).

**trail** (1) where to ride your mountain bike. (2) (see “fork trail”).

**triple** a three-chainring combination (Figs. 11.1–11.2, 11.4) attached to a right crankarm.

**Truvativ** a bicycle-component manufacturer, subsidiary of SRAM.

**tubeless** a system of rim and tire that stays inflated without an inner tube.

**tubeless ready** a tubeless system distinct from the UST tubeless system. Tubeless-ready (TR) indicates that the rim or tire or both require tire sealant in order to stay inflated. A TR rim requires an airtight rim strip to seal off the spoke holes in the rim bed. A TR tire is not guaranteed to be airtight without sealant inside to fill tiny pinholes in the tire casing; it is generally lighter than a UST tire, which is guaranteed to be airtight due to having a thin coating of rubber inside.

**twist shifter** a cable-pulling derailleur control handle surrounding the handlebar adjacent to the hand grip. It is twisted forward or back to cause the derailleur to shift (Fig. 5.28). (See also “Grip Shift.”)

**U-brake** a mountain bike brake consisting of two arms shaped like inverted Ls affixed to posts on the frame or fork (Fig. 10.39).

**unicrown** a manufacturing method of nonsuspended (i.e., rigid) forks in which the fork legs curve toward each other and are welded directly to the steering tube (Fig. 16.3).

**upper tube** (see “inner leg”).

**upside-down fork** a suspension fork whose lower legs (attached to the wheel axle) are the inner legs of the fork and move up and down within the upper, outer legs of the fork.

**UST** a tubeless-tire system originated by Mavic, Michelin, and Hutchinson in which an airtight tire with a sealing flap on its bead seals over a “hump” on the ledge inside a rim free of spoke holes in the rim bed (Fig. 7.7).

**V-brake** (or “sidepull cantilever brake”): a cable-operated cantilever rim brake consisting of two vertical brake arms pivoting on frame- or fork-mounted pivots pulled together by a horizontal cable. A brake pad is affixed to each arm, and there are a cable link and a cable-guide pipe on one arm and a cable anchor on the opposite arm (Figs. 10.11–10.14).

**Vise Whip** a Pedro’s tool (Zinn designed) with a Vise-Grip handle used to remove the rear cogs on a freehub or freewheel (Fig. 1.2). (See also “chain whip.”)

**wedge** (see “expander wedge”).

**wheel dish** (see “dish”).

**wheel dishing** (see “dishing”).

**wheel offset** (see “fork rake”).

**wheelbase** the horizontal distance between the two wheel axles.

**wheel-dishing tool** (see “dishing tool”).

**wheel-retention devices** (or “lawyer tabs”, or “wheel-retention tabs”): cast-in or separate fixtures at the fork ends designed to prevent the front wheel from falling out if the hub quick-release lever or axle and nuts are loose.
wheel-retention tabs (see “wheel-retention devices”).
wild goose chase (see “chase”).
women’s frame (see “step-through frame”).
wrench (or “spanner,” in British parlance): a tool having jaws, a shaped insert, or a socket to grip the head of a bolt or a nut to turn it.
yoke (or “straddle-cable holder”): a part on a cantilever or U-brake attaching the brake cable to the straddle cable (Fig. 10.26); also, the part of a rear-suspension swingarm attached to the main pivot.
Zinn the author of this book, not to be confused with Zen.
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Lennard Zinn is the world’s leading expert on bike maintenance and repair. He was a member of the US national racing team and has been riding and fixing bikes for more than 50 years. A professional frame builder and bike designer, Lennard is also a technical writer for VeloNews magazine and hosts the popular Tech Q&A column on VeloNews.com.