CHAPTER THREE

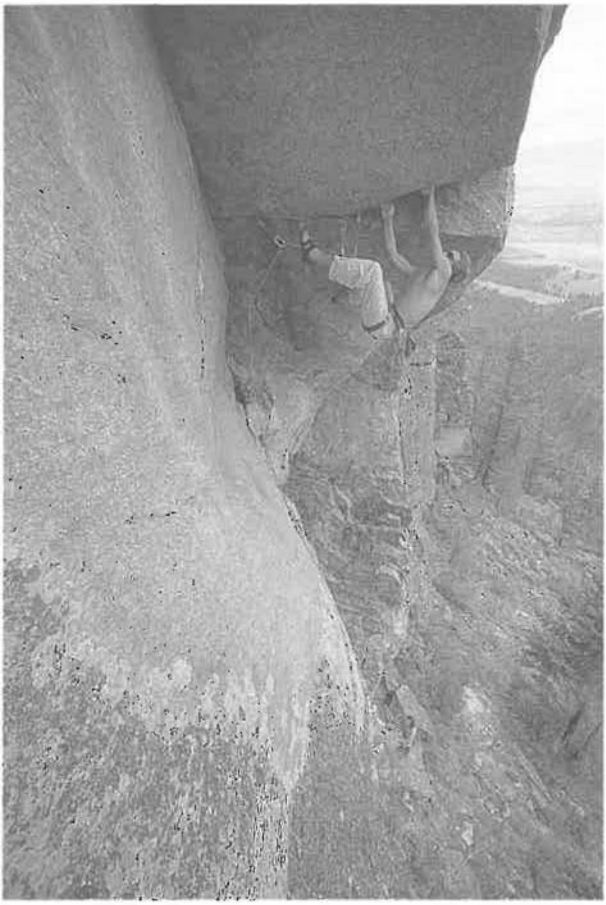
Mechanical Chocks

In contrast to the simple looks and what-you-see-is-what-you-get mechanics of passive chocks, the ingenuity of the high-tech gear described in this chapter would impress Da Vinci. The bottom line, however, is that when properly placed, they work great, especially in places where nothing else can.

SPRING-LOADED CAMMING DEVICES (SLCDs)

The only way to get a clear mental image of an SLCD is to get one and start pulling on the trigger. Though there's a lot of artful engineering packed into every cam, the basic mechanics are simple. Currently SLCDs are made by many companies, each with a slightly different look and slightly different features. But all involve a stem (or two) and cams, and the similarities are far greater than the differences in design. Briefly, most SLCDs are shaped similar to a capital T. The top (horizontal) part of the T features a solid axle on which are arranged either two, three or four opposing, teardrop-shaped lobes. The vertical part of the T is the stem (there are both rigid and flexible-stemmed SLCDs), featuring a triggering device that allows you to adjust the span of the spring-loaded lobes. Each unit has a minimum and maximum degree of latitude, and each is adjustable within those parameters. With a full selection of SLCDs (including Wild Country's Zero Size, the Z1), you have a rack that can be micro-adjusted to perfectly fit most any size crack from about $\frac{13}{64}$ inch to $6\frac{1}{2}$ inches. Again it's best to get several of these units in hand to understand fully how they work. Once you grasp the basic principles, SLCDs are perhaps the easiest, most functional and certainly most adaptive pieces of equipment on your rack.

Historically the advent of the SLCD marked the start of the protection revolution, and in terms of gear, it was rivaled only by the development of "sticky" boots in the technical advancement of the sport. That was more than twenty-five years



Ian Spencer-Green on *Dickie Gets It Done*, Big Creek Canyon, Montana. PHOTO BY STEWART M. GREEN.

ago; perhaps nothing in the near or distant future of protection devices will have the instant and significant impact of SLCDs.

Great secrecy surrounded the arrival of the original Friend, the first commercially viable SLCD (the Lowe brothers sold one briefly, but it performed poorly and quickly disappeared). Friends were developed over a period of several years by Ray Jardine, a climber as odd as he was talented. Ray always had to enlist other climbers to help with his many projects throughout Yosemite, ventures undertaken with all the stealth of a *coup d'etat*. The real secret, however, was not the new route, but the queer tackle on Ray's rack. Partners were sworn to secrecy over Ray's prototypes, and Ray made them do everything but sign a contract in triplicate that they wouldn't filch the concept (as Ray had apparently done from the Lowe brothers years earlier), tool up and start cranking out the newfangled widgets for commercial ends. I remember John Bachar climbing halfway up the *East Face* of Washington Column to try to clean a fixed Friend. He got it, too. The next year we all had them, and Ray sailed for Palau on his 80-foot schooner. Never saw Ray again.

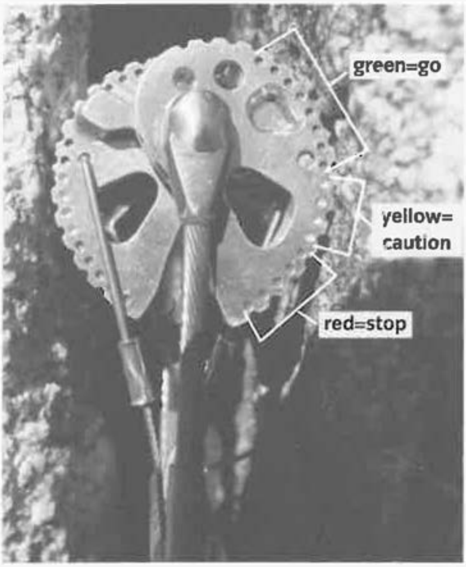
In short, SLCDs work by translating a downward/outward pull to an even larger force against the walls of the crack; this in turn creates friction between the rock and the nut, thereby resisting the pull. (Just get one and look at it, and all will become clear.)

The chief advantage of SLCDs over passive protection devices is the speed and relative ease of placing them in a crack. But just because you can get almost instantaneous placement does not mean the protection is secure. The majority of SLCD placements are sound and straightforward, but for those tricky placements, it is essential you know the limitations of the devices, as well as some general rules of thumb that apply to all camming units.

Three or Four Cams, Flexible or Rigid Stems?

Most SLCDs are four- and three-cam units, though two-cam units are also available (but are used far less). Four-cam units have two sets of opposing lobes, or cams, situated along the axle, whereas three-cam units feature a single middle cam opposing the two outside cams. Four cams provide the best strength and stability, while three cams reduce the unit's profile to allow placement in shallow cracks.

This BD Camalot fits this pocket like a pea in a pod. All four cams have magnificent, flush surface contact, and the range of retraction is about 50 percent. To maximize the holding power of the unit, look for each of the cams to contact the rock at lower to mid expansion range (50 to 90 percent *retracted* for Camalots). All cams are a little different, so be sure to read the manufacturer's guidelines on placement for whatever brand you buy.



Camming devices should be placed in the tighter aspect of their range. This flexible-stemmed Metolius unit has colored dots (drilled holes) on the rim of the cams; this placement sits on the borderline between the yellow (caution) and green (go) dots. Remember, *tighter* is better (although leave the last 10 to 25 percent of retraction for removal). The ideal placement is often when the bottom tips of the cams are in line with each other.

Any camming device is "flexible" if the stem is not rigid. There are several reasons why flexible camming devices were invented. First and foremost, a rigid stem is a liability in pockets and in horizontal, diagonal or shallow placements. When odd angles or torque is involved, a fall can wrench the unit in strange ways, bending or even breaking (rarely) the rigid stem, or—more commonly—ripping the unit from the rock. In thin placements the stem is sometimes thicker than the crack, making placement impossible. A cable stem gives the unit a thinner profile and greater placement utility.

Also contributing to the development of flexible camming technology is the matter of economics and the trigger design patent on rigid-stemmed devices, originally held (now expired) by Wild Country. Individuals who wanted to make camming devices couldn't afford to tool up like a big company. By using cable (which was inexpensive and readily available in small amounts), they eliminated a machined or cast part and were able to create a trigger design that didn't infringe on Wild Country's patent. Oddly enough, these monetary hardships and patent considerations led to many of the refinements in flexible camming devices, because budding manufacturers were left to solve problems creatively, rather than by throwing dough at them.

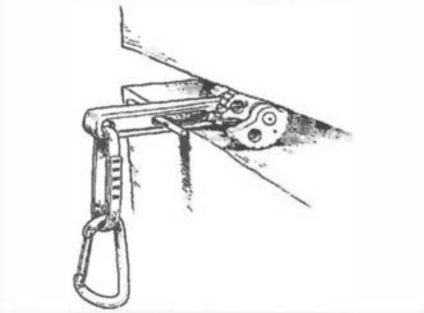
It is not entirely fair to contrast rigid-stemmed camming devices with flexible units because the applications are different. Rigid units won't work in ultrathin cracks because the stem is too big. Flexible-stemmed units generally will work fine in wider cracks, though not as well as rigid units. But to claim a flexible unit cannot provide adequate protection in anything but thin cracks is untrue. The issue becomes more involved with flexible units that feature a double stem. Though indeed flexible, they offer more stability than a single-cable stem, but still are less predictable (in terms of loading the cams) than a rigid stem. All told, double-stem units are not designed for shallow, vertical cracks, where the stems of the unit protrude horizontally from the crack. The single flexible stem is much better suited for this and other situations, leading to recent design changes—namely, the Black Diamond Camalot Jr., and the Wild Country Zero, which have both changed to a single flexible stem design. Many climbers have noted over the years that the Metolius double-wire stem design protects the cable triggers from wearing out prematurely, whereas the designs previously used by Black Diamond and Wild Country were far less wear resistant.

In terms of use, differences between rigid- and flexible-stemmed camming devices are obvious. Performance differences are less obvious, and debatable. It was once believed that rigid devices have a strength advantage over flexible-stemmed units. That might have been the case a dozen years ago, but no longer. Different makes have different specs, of course; but all American- or British-made SLCDs employ quality materials and craftsmanship, so the relative strength of rigid stems versus flexible stems often is overstated.

As noted, the primary difference is that rigid-stemmed units cannot be placed where the impact of a fall will stress the stem, other than along its vertical axis—for instance, in a horizontal placement where the stem is set over an edge, and

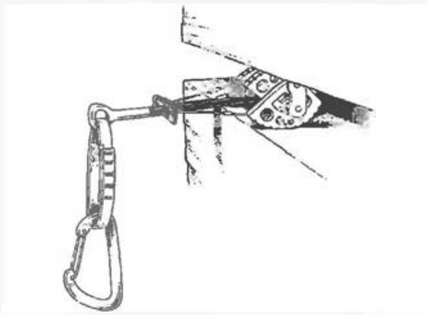
YOU SHOULD KNOW THIS MUCH ABOUT FLEXIBLE CAMMING DEVICES:

- They are less durable than rigid units. Under the impact of a fall, the cables can sometimes kink and/or become permanently deformed.
- The action of the flexible units is less positive because of the inherent flex. This can make placement and removal more difficult, particularly when a climber is fagged.
- It is impossible for a flexible cable to load the cams as predictably as a rigid stem does—or so it would seem. Wild Country claims to have overcome this problem on their Technical Friends, using stronger springs and incremental increases in cam-head width that resist rotation as a climber moves past the placement. This, they say, combined with the single axle and frame that supports the stem, ensure the cams are always loaded in the best possible plane of rotation.



Incorrect use of a rigid-stemmed Friend in a horizontal placement risks shearing the stem.

Not an ideal fit for this rigid-stemmed Friend; a bigger unit should be tried, or this piece should be moved to the right, where the crack is a little thinner. The inner lobe on the left side is nearly maxed out, but the others look better. Flexible-stemmed units were designed for horizontal placements like this. Given that a climber will probably pass over this placement, or will belay below it, the loading direction is straight down, and any load could bend or tweak a solid-stemmed unit like this one. Here the problem has been solved by tying the unit off short with some cord (the "Gunks tie-off"). Understand that even when all things check out, horizontal placements tend to be the most problematic for SLCDs. PHOTO BY KEVIN POWELL



The best option on a horizontal cam placement is to go with a flexible-stemmed unit. It can withstand a downward bend.

where a fall will bend or even break it. Avoid these placements. Wild Country warns against placing its rigid-stemmed Forged Friends in horizontal placements, but offers some suggestions that can make the prospect more acceptable if you have no alternative: First, place the unit as deeply as possible in the crack. Second, if the stem runs over the edge, use a Gunks tie-off, which consists of 5.5mm cord tied through the stem up near the cams.

Finally, Wild Country warns that any Friend, rigid- or flexible-stemmed, placed in a vertical shallow (bottoming) crack where it is impossible to align the stem in the direction of anticipated loading, will have its holding power seriously compromised.

The promotional materials on SLCDs, while useful, can be misleading, especially in terms of strength. The real question is not the absolute strength of the component materials, but how well (secure) the device holds in the crack. Since most tests are conducted in a shop (using a jig), and because the rock affords a virtually unlimited variety of placements, most of the testing can only prove the strength of component parts (the axle, etc.), as opposed to how well the unit will perform in the field. Consequently, shop tests only tell us so much. It should be noted that a properly placed SLCD very rarely breaks. It's almost unheard of that a fall has reduced a device to a glob of bent cams and blown-out springs. Most often the unit has simply ripped out of the rock for any number of reasons. A recent Metolius catalog stated that "rock strength accounts for what is probably the most common mode of failure in the real world. Even in very hard rock types it is not uncommon for the surface layer of rock to pulverize under the force of the cams, forming a loose layer (like ball bearings), which allows the cams to pull out." Thus when you read claims of stronger SLCDs, the propaganda generally refers to the component parts, and not the unit's effectiveness under the stress of a fall out in the field.

Each cam on every SLCD is individually spring-loaded—regardless of the axle configuration, whether it's a three- or four-cam unit, or is equipped with a rigid or flexible stem. The degree of expansion or contraction of one cam is not affected by the position of the other cams. This allows the unit to accommodate size irregularities inside the crack with little loss in stability. The first camming unit, the Friend, was designed to provide quick protection in parallel-sided Yosemite cracks. But there are many climbing areas besides Yosemite, and most cracks are not parallel-sided. When the inside of a crack is even slightly wavy, the individual cams on SLCDs adjust automatically to the irregularities. That is, the cams will be deployed at varying widths. When this happens, as it often does, certain things must be remembered to ensure sound placement.

Though most camming devices feature a constant, or nearly constant angle at which the cams meet the rock throughout their expansion range, the safest and most secure placement is when the cams are retracted as far as possible while still

This Camalot is retracted only about 10 percent. Based on the "constant camming angle" (engineers call it the logarithmic spiral), a camming device will theoretically work at any point in the range. Throughout the cam's rotation, a line drawn from the axle to the cam's point of contact (with the wall of the crack) will remain at the same angle to a line drawn perpendicular from the stem. However the most secure placements will be those in the lower to mid expansion range (50 to 90 percent retracted). Try to shoot for placements where the bottom tips of all four cams come into line. With all camming devices, tighter is better, though if you don't leave at least 10 to 25 percent off the tightest retraction position, you'll likely never get the unit out.

Here a larger camming device is called for. And if this is all you've got—beware. If loaded directly downward, the unit may be strong. But this unit lacks stability and security, as the cams are not adequately supported, and the unit could possibly twist out of the placement and fail.

Also beware of the walking phenomenon. The action of a rope wiggling through a carabiner (or the repeated falling or lowering of someone on a toprope) can force a placement like this to pivot back and forth and "walk" upward. If the crack is wider above the placement, the cams can possibly open even further, rendering the placement worthless. A long sling can help prevent this, but not eliminate the possibility altogether. Avoid situations where the camming device may walk into a wider section of the crack, and look for that sweet, tightly retracted placement, ideally in a pod or a crack with parallel-sided walls.

This Camalot is retracted about 50 percent. Think of 50 percent as a starting point—shoot for 50 percent or tighter. This placement could be improved simply by placing it slightly higher and deeper in the crack. Avoid placing camming devices on the edge of a crack (particularly in soft rock like sandstone), and look for placements in the most parallel-sided spot in the crack, avoiding any flares like the one directly below this placement.

leaving 10 to 25 percent unretracted to facilitate removal. Be careful not to stuff a piece into the tightest placement it can fit, lest you sacrifice a $50 (at least) piece of gear. In an irregular-sided crack, maneuver the unit around so the cams are deployed as uniformly as possible. Remember that even moderate rope drag can cause the unit to walk, or move around in a crack. Because an SLCD will often auto-align to accommodate a new direction of pull, some climbers consider them multidirectional. The problem is that rope drag can also auto-align the unit into an unfavorable position. Bear this in mind. In a wavy crack, even meager movement can radically alter the position of the cams and render the placement poor, or even useless.

While Wild Country recommends its cams be placed between 25 to 75 percent retracted (the middle half of the expansion range), Black Diamond suggests 50 to 90 percent retraction for their Camalots, which reflects the difference between a double-axle (BD is the only one) and single-axle design. Other manufacturers have recommendations specific to their own devices. Read the guidelines that come with the unit.

Some manufacturers alter these cam-deployment recommendations somewhat for really small camming devices, such as Metolius micro TCUs and Power Cams. Metolius says it is critical to place these tiny units near their full retraction and only trust them to hold in hard, solid rock types. The company also notes their units have a slightly smaller cam angle than most manufacturers, so the cams are generating more outward force for a similar load. They believe the increased outward force of the cams, and thus increased holding power, is worth the slight decrease in range. Metolius also touts its cam faces as being the widest on the market, which helps to spread the force on the rock, thus reducing the chance of failure due to rock breakage.

There are several configurations a camming unit can assume that spell danger—or at least trouble. As mentioned, one of the most troublesome positions is when the cams are fully closed inside the crack. That means no matter how hard you pull on the trigger, you can't suck the cams in any tighter, you can't loosen the unit and you probably can't get it out. It's not unheard of for excessive rope drag to put enough tension on a unit that it walks itself into this full-closed position. Much more common is when a hysterical climber shoves too big a unit into too small a crack. Sure, the unit will most likely hold a fall, but removing it probably will entail holding someone on tension so both hands are free to spend a good long time cursing and jerking the unit this way and that. Again, when placing cams, leave some room in the range for removal. Because micro-camming units feature a limited expansion range and must be placed near full retraction or they might pull out, particular care must be taken to avoid getting these units stuck. You have much less room for error because the cams only expand a little, requiring you to make placements with the same precision as with a tricky taper placement.

Offset Cams

Offset cams always should be avoided. This occurs when one cam is near minimum range, and another near maximum. (Don't confuse the concept of unintentionally offset cams with deliberately manufactured offset cams, which are made for flaring cracks—see upcoming section on flaring and tapering.) Beware of this happening in wavy cracks, when the cams must adjust to extravagant differences in crack size. If such a placement is your only option, try a passive chock. Offset cams can also occur in parallel-sided cracks. Remember, if you split the difference, the cams would be at 50 percent—or optimum range—so it's not a problem of size. Instead, the cams have been forced or wrenched into offsetting positions, which renders the placement worthless, or nearly so. When the lobes of any cam approach 80 percent deployment, it only takes minimal movement for the cam to invert. Although modern cams have cam-stops to prevent this, the best policy is to consider placements worthless when the cams are radically offset, inverted or nearly inverted.

This Camalot placement has several problems. While the rock looks sound, the outer cam on the left wall of the crack is too close to the edge. The real problem, however, is the violation of this rule, listed in the Black Diamond literature under BAD PLACEMENTS: "Never place a unit so that the cams are offset, e.g., with two cams extended and two cams retracted. It may not hold a fall."

Strive to keep the loading axis (the axle) near the middle. That is, when the SLCD is placed, it forms a shape, and you want the axle to be pretty much dead center in that shape. If the axle is too far to one side or the other of the cam lobes, the physics are all wrong and the loading is unstable.

Color Coding

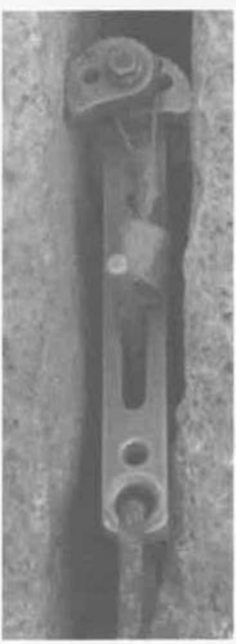
Tom Cecil, of Seneca Rocks Mountain Guides, first introduced the idea of color coding cams. He took the larger units, painted them red at each end, yellow toward the middle and green at dead center. This technique works wonderfully—he could know at a glance the orientation of the cams. In the near future I expect to see this method used—in some way, shape or form—by all SLCD manufacturers (as opposed to the far subtler dot patterns). Paint does wear off, so the exact solution is probably a ways off.

Tipsy

Avoid "tipped-out" placements, where the cams are fully, or nearly fully deployed. No camming device is capable of functioning correctly when the cams are at maximum expansion, except the Black Diamond Camalot, which has the requisite strength but virtually no stability in this position and is never recommended to be placed this way. Other units are simply too small for these placements. A fall often will stress the unit just enough to make the cams invert, and the unit will either blow out like a wind-blown umbrella, or the unit will walk to an opening in the crack and become utterly worthless.

As mentioned, the security of a cam is only as good as the position of the cams combined with the relative soundness of the rock. When the unit is placed too deep, the trigger is hard to reach and the unit is that much harder to remove, hence the need to place the unit near the outside of the crack, or as near to that as placement allows. In soft desert sandstone, however, it's best to set the SLCD somewhat inside the crack, so an impact on the piece won't blow out the edge of the crack.

There is a lot of talk about the ability of camming units to swivel toward the direction of pull, once weighted. In many cases this is true, and the cam then becomes a multidirectional anchor. The swiveling action will often align the cams for maximum strength and stability. But the fact is, you should avoid letting your



This old-style rigid-stemmed Friend is too small for the crack, obvious because the second lobe from the front is "tipped out." As mentioned, when the lobes are at or near the limit of their possible breadth, the unit is considered marginal. Even the slightest rope drag can pivot the piece enough for the lobe to invert, like a sprung umbrella, rendering the unit worthless. Often you can jockey the unit around and find a better placement. If not, use a bigger unit. Fact is, you climb long enough and you'll inevitably have to make just such a placement. The crack will be just this size, and the only unit left on your rack will be too small. Place it, trying to find the narrowest place in the crack. It may hold. But understand that you are hoping the unit performs beyond the specs for which it was designed. PHOTO BY KEVIN POWELL

Here the rock is solid and the placement looks bomber. But the gate on the biner is contacting the rock and could possibly open when loaded. Remember that when a carabiner is loaded with the gate open, it loses two-thirds of its strength. By looping a sling through the SLCD using the "basket" configuration (see below) this problem is easily remedied.

Solution to above problem.

protection swivel, because a shock load may swivel the unit straight out of the crack, especially if the crack is wavy. *Take special care to anticipate the direction of pull, and to align the unit accordingly when you place it.* Basically—as is the case with all protection that is not beaten into the rock—place the unit with the stem pointing in the anticipated direction of pull, and do whatever is necessary to ensure rope drag won't set the unit to walking inside the crack. Even nominal rope drag can change the unit's position, so most all camming units come with sewn slings. (Those that don't should be connected to the rope with a quickdraw when leading.)

The sewn slings have less bulk than knotted slings, and they can't come acci-

THE BASIC ESSENTIALS OF PLACING SLCDS

- Always align the unit with the stem pointing in the anticipated direction of pull.
- To keep the unit from "walking" because of rope drag during a lead, clip a quickdraw into the sewn sling of the unit.
- Try to place the unit near the outside edge of the crack, where you can eyeball the cam lobes to determine their position. This also makes it easier to reach the trigger to clean the device.
- Strive for the ideal placement, with the cams deployed/retracted in the most uniformly parallel section of the crack, so the cams cannot open if the unit walks a bit. Metolius puts color-coded dots on the cams to help with lobe positioning, but with others you'll have to eyeball it. Read and follow the manufacturer's recommendations for cam deployment.
- Use a larger device over a smaller one, but, unless you are absolutely desperate, never force too big a unit into too small a hole. Once the cams are rolled to minimum width, removal, if possible, is grievous.
- Never trust a placement where the cams are nearly "tipped" (the cam lobes almost fully deployed). In such a position there is little room for further expansion, and stability is poor.
- Never place a rigid-stemmed unit so the stem is over a lip. A fall can either bend or break the unit. If no other placement is available, use a Gunks tie-off (see text and photo).
- Take some time to experiment with marginal placements on the ground. Clip a sling into the SLCD and apply body weight to discover just how far you can trust it. But remember—body weight testing is far milder than a lead fall!

dentally untied. Inspect the slings regularly to make sure they are in good shape. A few companies, such as Yates Equipment, specialize in replacing the webbing on SLCDs. If you use your own supertape, employ a water knot, but keep your eyes on the tails because they will creep toward the knot. High-tensile cord of the 5.5mm variety can also be used to sling an SLCD. For the high-tensile cord the manufacturer recommends a triple fisherman's knot. Rigid Friends are intended to be slung in the large hole in the stem on the opposite end from the cams. An exception would be the aforementioned Gunks tie-off, where the cord is run through the hole nearest the cams to reduce the leverage on the stem when making placements in shallow, horizontal cracks.

Flaring and Tapering

Camming devices work in flaring cracks if the rock is sound and the flare is not so radical that the cam lobes cannot attain adequate bite. When a crack nears the critical flare angle, a fall will load the unit in an unstable manner. If the rock is poor as

This Camalot is placed in the middle of its expansion range, but the crack widens appreciably just above the unit. A little rope wiggle could walk the piece up into the opening, rendering it useless. A taper or hex would fit better in a crack that constricts like this, whereas this camming unit would be better placed in a more parallel section.

well, the placement can sheer out; even in dense granite, the unit can fail if the flare is too great.

With outward flaring cracks—where the lip of the crack is wider than the depths—you should jockey the unit around to find that spot where the difference in cam expansion is the least. If the rear cams are rolled tight, and the outside cams nearly tipped, you're looking at some pretty sketchy pro. Though two cams actually can hold a fall, the unit tends to pivot when the other cams fail, and this pivoting can dislodge the unit altogether.

For tapering cracks—where the crack is wider below the placement—a couple of hours of tinkering with placements on the ground are advisable to fully understand where the critical taper angle starts. Offset Aliens, offset Friends, and the new Black Diamond C3s rule in flaring cracks or pin scars. However, be aware that since most cam angles are about 14 degrees, a cam can't hold at all once the taper angle is 28 degrees or beyond. Another significant problem with tapering cracks is the extra load placed on the cam axles in these placements. A crack with a 14-degree taper will place four times the force on the cam axles, and it only goes up from there.

Camalots (C3s) feature a double axle. The design means the Camalot can cover a significantly larger expansion range than other, comparably sized devices. I will not attempt to describe why this is so. Simply get a unit, fiddle with the movement, and you'll understand the mechanics. The added camming range is also beneficial in flaring cracks, where the disparity of crack width is more pronounced. One drawback of the added range is a slight increase in weight, but technology is making up the difference: The newest Camalots are about 20 percent lighter than the previous generation, with only a slight strength decrease in the components of the larger (.75 and up) sizes. The handle is a durable stainless steel cable. The cams are stamped from aircraft-quality aluminum and are narrower than those found on other SLCDs.

Dirty

All mechanical devices eventually become dirty. For optimal trigger and cam action, clean with soapy water and lubricate with a Teflon or silicone lubricant. Elmer's Slide-All Teflon lubricant is an excellent choice. Do not use oil or oil-based lubricants such as WD40 because they collect dirt, which will eventually gum up the cams, perhaps at the worst possible moment.

Stuck

A stuck SLCD is like seeing a wad of twenty dollar bills lying on the ground that you just can't seem to pick up. But boy do you want to. Once you realize an SLCD might be stuck, be careful how you work with it—frantic jerking can turn a mildly stuck SLCD into a fixed one. As with cleaning any climbing hardware, brute force is a poor removal strategy. Pull hard on the trigger to retract it as far as possible and try to pull the piece straight out. This may seem obvious, but you wouldn't believe how often a novice has claimed an SLCD to be hopelessly stuck, only to have an expert remove it in a few seconds. If that doesn't work, look in the crack for an opening to move the unit through, carefully working the unit toward the edge of the crack. Clever and delicate maneuvering is the best bet for getting the unit free. Some climbers sling the triggers on their SLCDs, particularly the smaller ones, with cord to make removal easier if a unit should get stuck or if the trigger is inside the crack and cannot be reached. As a last resort, clip a sling to this cord with a carabiner and give it a good jerk. If the first tug or two doesn't free the piece, you're usually hosed. Nut tools can often be used to snag the trigger of a stuck SLCD.

This crack is too small for this cam, which is placed with the cams cranked to minimum width. Removal might be difficult. Avoid such placements if at all possible, although in dire circumstances with no other options, it is better to risk losing a cam than losing your life.

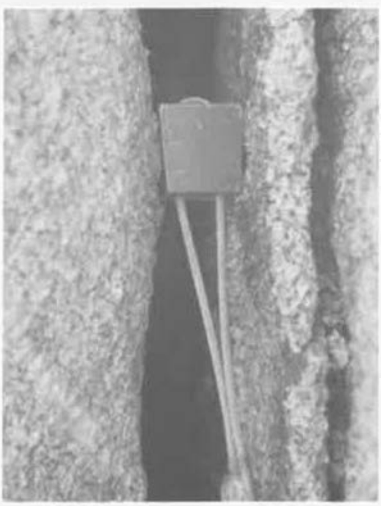
SOS

SOS is an acronym devised by Tom Cecil of Seneca Rocks Mountain Guides. It stands for **solid, orientation,** and **surface area.** Beginners often find it helpful to keep SOS in mind when placing most any protection device, especially tapers.

The **S (solid)** tells the climber to check the rock and make sure it is solid, using a sight, sound and feel approach. You first look around (sight) and determine that the rock is of good quality and the area is clear of loose flakes and obvious choss. This helps break the tunnel vision many beginners experience when first learning to place gear. To determine the "sound" aspect, you beat on the rock to see if it's hollow, holding a hand on the rock to feel for vibration. You have to start with solid rock to get a solid primary placement, and climbers should examine the rock in macro and micro terms. In macro terms, what you're looking for is the proverbial straight-in crack set in massive, solid rock, as opposed to a flake crack, or worse, a crack under a block. Micro structure refers to what's inside the crack. Ideally you want a fairly uniform crack devoid of hollow spots, flakes, grit or decomposed sections.

The **O (orientation)** means the placement must be aligned to withstand loading in the anticipated direction of pull. In the event of a fall, you cannot count on the gear holding if it changes direction or must adapt to an oblique angle of pull.

S (surface area) ensures the placement is well seated, with sufficient surface area contacting the rock and everything touching the way you want it. For instance, the most common mistake with SLCDs is that climbers don't look closely at the back cams.



The Stopper placement is flush in this endwise configuration, but how strong is that flake of rock on the right wall of the crack? Probably strong enough to hang off, but not strong enough to hold a leader on a 30-foot ripper. Believe it: The principal cause of anchor failure is rock failure. Protection devices seldom break, but they often rip out, meaning *security*, not strength, is often the main issue. The importance of the "S" in SOS cannot be overstated.

Wild Country offers some specific recommendations for removing stuck cams. First, focus on one pair of cams at a time, and try to feel or see if there is any play. (Wild Country claims the floating trigger design of Friends will enable you to do this, as it allows the manipulation of individual pairs of cams on either side of the axle.) Another solution is to use a pair of bent wires looped around the trigger. Use the loops to fiddle with the trigger while you tap the end of the stem. Another technique is to move or tap the cams sideways, in the direction the axle is pointing (perpendicular to the stem). Finally, don't give up too early, because most cams can be removed with patience.

Investing in Cams

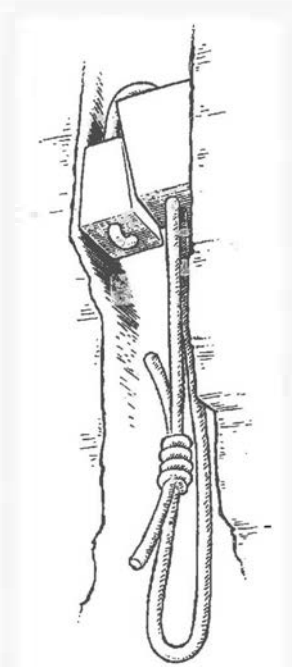
Whenever something is expensive and cherished, there is always someone out there making crude replicas. It's a safe bet that these knockoffs will be inferior to the Real McCoy, even if they look the same. Some of the units look good enough, while others are clearly trash, with loose wires, poor action, wobbly cams, etc. A decade ago knockoff SLCDs were rare but not unheard of. You might have to hunt far and wide to find a shoddy SLCD these days, but understand they might still be out there.

Before buying any SLCD, test the trigger action and the smoothness with which the cams retract and expand. If the cams "wiggle" on the axle, the machining tolerances were not kept tight, which sacrifices the stability of the unit. Bear in mind the age-old saying, "You get what you pay for." In the case of SLCDs, or any climbing gear, buying cheap may land you in the Knotty Pine Motel.

SLIDING NUTS

Many climbers have never owned a sliding nut—and never will. They are currently manufactured on a limited basis. As previously mentioned, the main curse of the sliding nut is the capacity of the unit to seat itself so securely that removal is grim to impossible. Nevertheless, because it is important that you understand the concept of all the protection devices out there, we'll take the time to investigate the sliding nut.

In brief, all sliding nuts work off the principle of opposing wedges. The first examples were simply two tapers arranged on one sling. Next came two cabled tapers, swaged together at the base to form a mutual clip-in loop. On one cable was a taper, right side up; on the other was another taper (or equal size), upside down, which could be



An original sliding nut pair was strung on one cord

A spring-loaded sliding nut in a virtually perfect placement (one you will rarely get). Note that the symmetry of the crack matches both the fixed taper on the left, and the sliding half-ball component on the right. Likewise, notice that the sliding component is at mid-range on the fixed taper; the unit works best this way. PHOTO BY KEVIN POWELL

moved up and down the cable. As the two tapers contacted each other, the width of the combined nut increased, eventually fitting the intended placement.

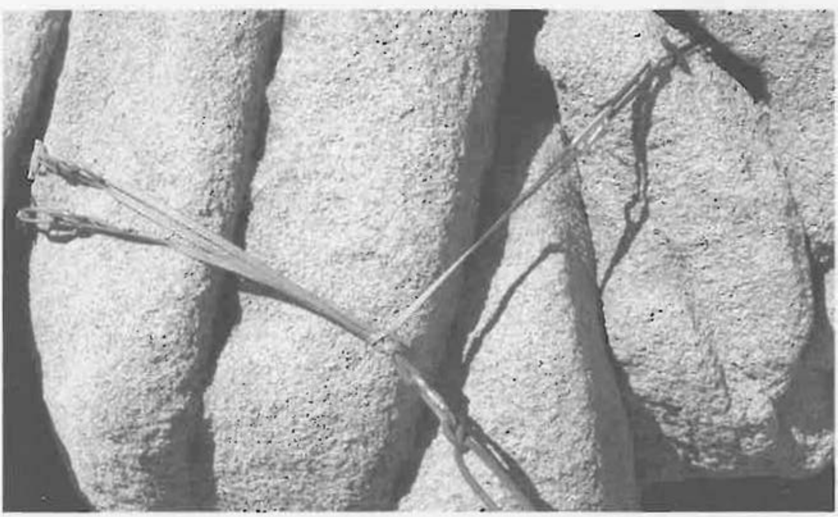
The original slider nuts are long gone. Refinements in the original units have left us with spring-loaded sliding nuts such as Ball Nuts made by CampUSA (formerly Lowe Balls), and ClimbTech Tech Nuts, which employ a boxier shape on the sliding piece. Don't expect the market to become flooded with other sliding nuts. Malcolm Daly, of Trango USA, once informed me that in terms of manufacturing setup, slider nuts are a hassle of the first order. In addition to the manufacturing hardships, slider nuts present some bewildering problems for both the reviewer and the consumer.

Sliding nuts can work like magic, but you must know their limitations. First, sliding nuts are small, especially the smallest ones, which allow placement in the same size cracks as microtapers. Even in ideal placements, the breaking strength of the tiny units is relatively low. Second, the placement is only as good as the purchase of either the cylinder or ball. Because the surface area contacting the rock is pretty small, the rock can sometimes break away if the unit is fallen on. Third, whenever the cylinder or ball is fully extended or at the end of its range, holding power is significantly reduced. Lastly, if the units are placed to hold large loads over sharp edges (a use for which they were not designed), they might hold, but the impact will invariably kink the cable and you'll have to chuck them.

A taper has obvious advantages over the more elaborate sliding nuts in most placements. Most likely, you'll find tapers are stronger, more straightforward to place and remove, and get more surface area on the stone. But in thin, shallow, parallel-sided cracks—and plenty exist—sliding nuts might provide the only option for protection. If you place one on lead, consider placing two and equalizing them, or use a Yates Screamer.

SUMMARY

Selecting your purchase from such a panoply of available protection can be as confusing as throwing down big bucks for a new car. It becomes all the more baffling when you read product catalogs. Most manufacturers are somewhat guilty of overstating their product's capabilities—just the standard business of pimping a product. But we should remember this: The rock-climbing market, though steadily growing, still is relatively small compared to surfing and many other adventure sports. Any product must be viable or it won't last. Almost without exception, all the devices listed here are first-rate in terms of design, materials and construction. Selection, then, is best decided by determining the climbing situations you will most likely encounter, and knowing what gear is specifically suited to them.



This anchor has three solid cams and is well equalized, but the problem is the structural integrity of the rock itself—basically a pile of cracked blocks not well attached to the main formation. How reliable is this anchor? Would the individual pieces fail due to a force exceeding their potential holding power, or would they rip out of the rock because the granite is rotten and the structure weak? Probably the latter. Catastrophic anchor failures occur more often than not from bad rock, pure and simple.

When analyzing rock structure before placing nuts or cams, look at both macro and micro structure. Macro is the big picture. Is the feature a straight-in crack in the planet, or a crack under a car-sized block? Micro is the specifics of the crack itself. Are there any loose flakes or hollow spots inside the crack? Grainy or decomposing rock? Here (an actual field anchor photographed in Joshua Tree), the camming devices are set in suspect rock, basically wedged against a wafer of cracked flakes between the walls of the crack. The whole rig might blow out owing to poor rock quality.

Tapers and camming devices have several standard types, and as the sport evolves, so does the archetypal design. The archetype represents the nut that is best suited for generic use in the United States. When you move too far away from the archetype, you gain advantage in specialized situations, at the loss (though usually limited) of overall utility. With tapers, the standard used to be the straight taper, but now the curved taper is the archetype. A majority of American climbing is done on granite, sandstone or rock that fractures in a similar manner, with reasonably uniform cracks. Hence your basic curved taper is probably best for general use. Not necessarily so in conglomerate rock, where your cutaway or scooped tapers can snag on crystals inside a crack and offer extra holding power.

The four-cam, single center stem SLCD is the archetypal camming device. When you move to the three-cam units, you gain the advantage of lower profile, but one less cam means less surface area on the rock and a reduction, however small, in security.

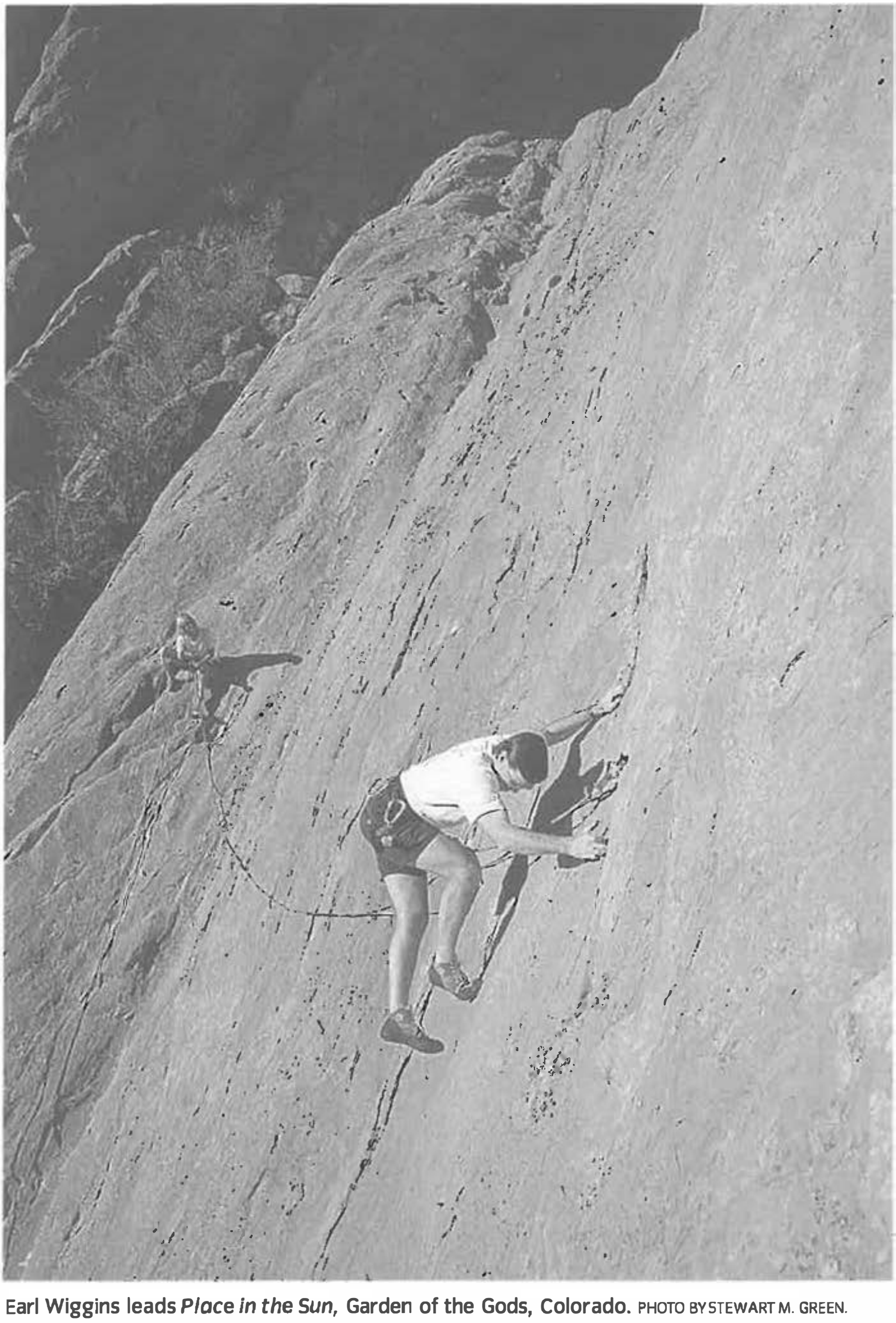
The point is, all the under-designed gear lacks specific features and has less utility as a generic tool. If much of your climbing is done on rock requiring queertailored gear, that's what you should buy. Active local climbers are the best instructors in what gear works best at a given crag. Remember that with the exception of offset tapers, which definitely under-perform a regular taper in parallel-sided cracks, most of the other gear can function almost equally well in a given situation, provided the gear is used by someone who understands its nuances. Fact is, the difference gear makes in your climbing usually is overstated. If you can get one brand of nut to fit, other brands will probably work just as well. That assumes, of course, that the nut is either American or European. American- and European-made products are, by any engineering or manufacturing standards, far superior to all others.

Gear manufacturers now have the option of having their gear tested and CE (Conformité Européenne) certified, and all the top brands do so. All of our strength ratings have so far been discussed in pounds, though in recent years the industry has shifted over to rating everything in kiloNewtons (kN). I've converted everything to pounds for easy comprehension (for Americans), but the time is nigh to deal with kNs as the prevailing system.

In talking with various manufacturers, I came to appreciate the uniqueness of the rock gear business. Not one of the manufacturers sets the top priority on making money (which seems so remarkable that I'm not certain I believe it). Their stated aim is to produce a great product. The understanding, it would seem, is that a good product will result in honorable profits. All talk with deserved pride about their tackle. A hell of a lot of care, passion and engineering creativity is evident in modern rock-climbing hardware, and every climber is indebted to these manufacturers because each has taken our needs so seriously.

There is magnificent parity among all the gear competing for your greenback. Ultimately it's not the gear, but the person placing it that makes the difference. Considering that forty-five years ago, British climbers used to protect their most difficult leads with machine nuts found on the railroad tracks, the present-day climber should respect having such wide choices among what 95 percent of the time is fabulous gear.

Lastly, while we can investigate equipment in a generic way, an active trad climber needs to consider equipment in terms of an ongoing study, much as an attorney is required to take annual courses to keep his license up to date. The trick here is not to try and learn everything at one exhaustive session every year or so, but to casually keep abreast via the gear reviews featured in climbing magazines and on-line analyses. Information is like insurance, and with rock climbing, you want as much as you can get.



Earl Wiggins leads *Place in the Sun*, Garden of the Gods, Colorado. PHOTO BY STEWART M. GREEN.