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BIKING

APRIL 1991 VOLUME 5, NUMBER 4

ROLLING THUNDER!

RIDING CANNONDALE'S EST SUSPENSION BIKE AND SPECIALIZED'S METAL MATRIX MARVEL!

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As gnarly as this terrain looks, the Cannondale E.S.T. frame soaked it up with nary a whimper.



CANNONDALE FIRST

Here's a little quiz. When you think of Cannondale, what's the first thing that comes to mind? A) Fat aluminum tubes. B) A conservative, successful east coast bicycle manufacturer. C) Bicycles known for their value and high quality craftsmanship. D) Futuristic bicycles with cutting edge technology and radical research and development. You'd be correct if you chose either A, B, or C, but D is the one Cannondale would like for you to think from now on. And how can you deny them when they've got a new frame concept and design so radical that it literally takes the mountain bike into another dimension.



Cannondale leaps
to the future with their
new suspension ATB.

Suspension has been getting a lot of press lately, as well it should. But in the rush to get a "first" on some of the more probable designs showing up on the market, pre-production prototypes have been tested and several mistakes have been made. It's bad enough that extravagant ideas, which require sensitive handling, get tested in sensational ways that are prematurely conclusionary. When journalists test products that have no business being tested, it sheds a negative light on the industry as a whole. That's why, in

The Gervin Flexstem was chosen over more advanced front shock absorbers to keep the bike's price affordable.

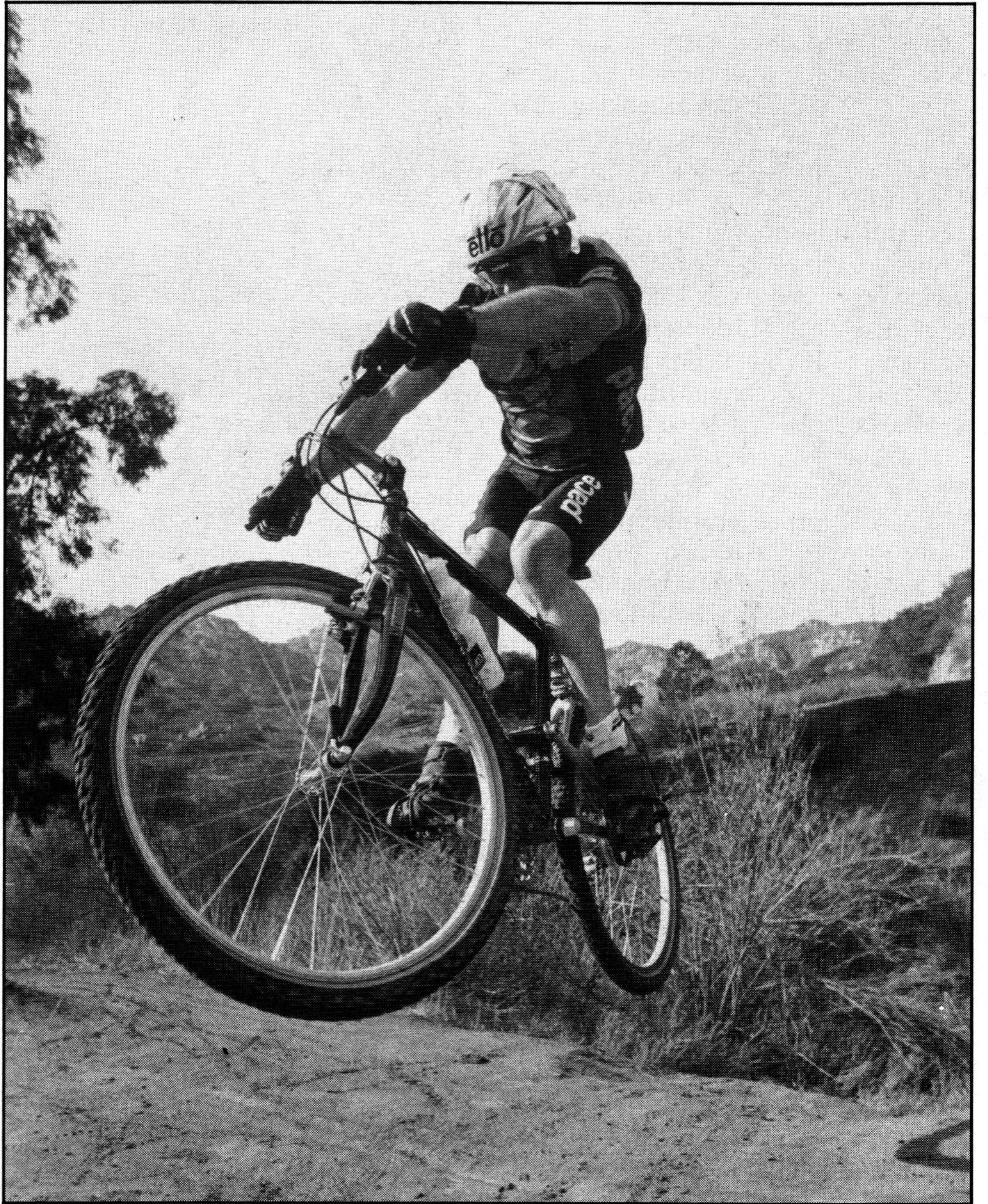
The all-aluminum rear triangle incorporates quite a bit of structural strutting, which actually does very little for lateral frame stability. Inherent frame flex is rather noticeable due to the pivot point's somewhat high location.



CANNONDALE E.S.T.

keeping with our policy of testing only production bikes and equipment whenever at all possible, we are a little late with our presentation of Cannondale's Elevated Suspension Technology (EST) mountain bike. To the best of our and Cannondale's knowledge, this is the first magazine test of a *production* EST frameset.

To be honest, our test bike was not really a '91 SE2000, but what Cannondale calls the 1EX, a mid-1990 bike with all Deore XT and some other components that aren't on the 1991 SE2000. However, the frame is the same, and is what you would get if you bought either the Omega EST, SE2000, or SE1000. We decided to get ahold of a real bike as soon as possible and give it a thorough testing before presenting it in our pages, rather than wait long into 1991 and then rush to print the test. We won't dwell too long on the components, because suspension is new enough that we are going to be taking more painstaking measures to be certain that we are fair in our coverage to both the manufacturer and you, the consumer. With the three EST bikes you can have your choice of the mostly Shimano equipped SE2000 (see spec list), the SE1000 with predominantly SunTour XC and Grip Shift twist ring shifters, or the radically cross spec'd Omega, with (get



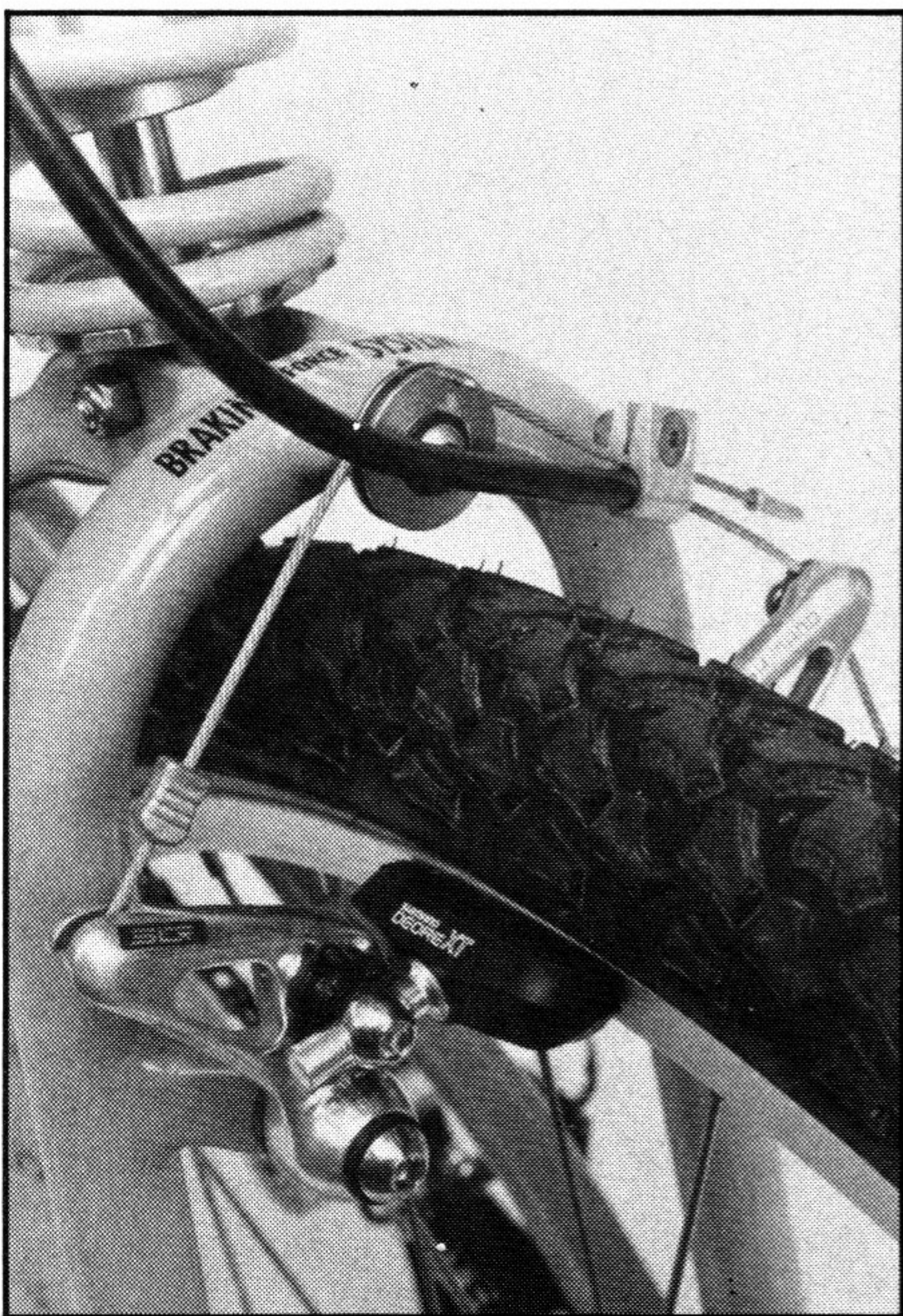
The Works Performance mini rear shock took landings like this well. While most of our test riders went looking for things like this to bash the 1EX on, it didn't have much problem.

A close-up of Force 40. The brake cable is connected directly to cantilever's cable anchor, and then a special aluminum clamp is used as a guide/anchor for the straddle cable. The roller requires a special weld. We experienced a bit of slippage from the guide/anchor as the bolt uses a small 3mm allen that required almost more torque than the opening could handle.

this) Campagnolo rims, SunTour XC Pro hubs, Shimano Deore XT pedals, Cook Bros. Racing cranks, SunTour XC Pro derailleurs and shifters, a Mavic 305 headset, and Ritchey FD seatpost.

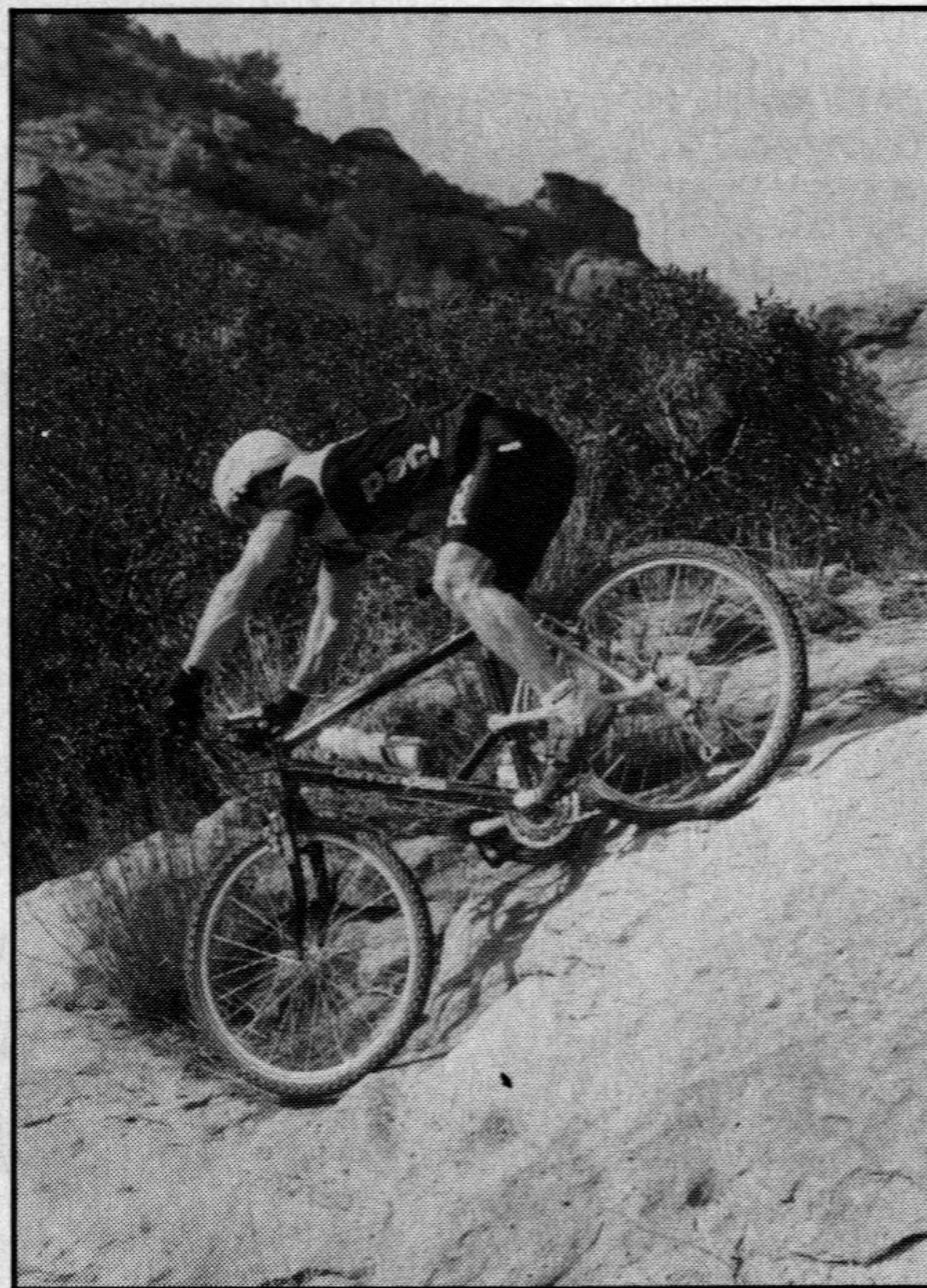
SUSPENSION SPEAK

The subject of suspension is one of the hottest right now, and there are quite a few companies forging ahead with what they think is the "right" one. We'll let you in on a secret. As of now, there's no "right" suspension system, because the bicycle industry is still exploring the parameters of not only what works, but what we really need. There is the group that feels that a



bicycle should first and foremost remain a bicycle, with the suspension improvements being subtle and unobtrusive. But how will we know if a whole bunch of travel is what we want if we don't have it available to us for testing?

Our EST test bike's radical approach to bicycle rear suspension, with its mini oil dampened shock absorber and outer coil preload spring, is pretty clean, albeit slightly over-engineered looking. The preload is also adjustable by turning an adjuster ring located at the top of the shock. Cannondale even provides a trick machined aluminum wrench for just this adjustment. The elevated chainstay design, which prevents the shock absorber from being activated from direct pedaling power input (although it doesn't eliminate "pogo-ing" when hammering out of the saddle) is connected to the main triangle via a one-piece all aluminum swingarm/mono-shock unit. The E-stay pivot is a precision sealed bearing mini-bottom bracket of sorts, with the "cups" being custom made. The chainstays are attached with 1-1/4 inch Allen bolts to the inner sleeve which incorporates an anti-loosening device. In order to tighten or



While the ride that was provided by the combination of the Flexstem and rear shock was fairly well balanced, the Flexstem's urethane spring needed to be interchanged a few times to find exactly the right combination. We found the green level durometer was good for soaking up shock, but was too soft for really aggressive riding. A red spring worked better overall.

loosen the bolts, you need to remove a little rubber plug located on the top of the pivot housing shell and insert a pin to keep the internal bolt sleeve from rotating, thus enabling you to torque on the bolts. These bolts are also fixed with Loc-Tite.

Still looking at the swingarm we see a strut-bound fixture that would do the builders of the Eiffel Tower proud. The shock is a slick aluminum unit built for Cannondale by Works Performance, which is a highly reputable motorcycle shock and suspension tuning company best known for making trick aftermarket mono-shocks for motocross motorcycles. It's oil dampened, and the preload is controlled by an outer steel coil spring that is then powder coated. Cannondale offers these springs in different stiffnesses for varying rider weights. The shock is attached to the swingarm by a single allen bolt and "ny-lock" nut. It's connected to the frame at the seatpost, just behind the top tube, via two aluminum tabs welded out from the seatpost tube and another single bolt/ny-lock nut.

The swingarm's drop outs feature Cannondale's patented cantilevered extensions

(Continued on page 104)



| | |
|-------------------------------------|---|
| Top Tube Length | 23.25" (frame anatomically sized) |
| Chainstay Length | 16.75" |
| Wheelbase Length | 42.80" (frame anatomically sized) |
| Bottom Bracket Height | 11.62" |
| Frame Material(s) | 6061 T6 aluminum thin wall & over sized |
| Frame Construction | 3.0 Series and Elevated Suspension Technology (EST), TIG welded, Swingarm made from 6061 T6 aluminum and TIG welded with oil dampened shock/steel coil spring, precision sealed swingarm pivot bearings |
| Fork Offset | 1.75" |
| Fork Material(s)/Construction | Oversized 6061 T6 aluminum, TIG welded, thermally bonded steerer |
| Gross Bicycle Weight | N/A (frame weight approx. 5.5 lbs) |

COMPONENTS:

Cannondale offers three versions of their EST. All models feature Cannondale Force 40 braking system, Gervin Flexstems, Ritchey Megabite 2.1" Kevlar bead tires, Ritchey Force Directional seat posts. Other similar components found on the SE1000 and 2000 feature Sun Metal Chinook CR16 rims, Easton Hyperlite aluminum handlebars, Tioga Kraton hand grips, and Ritchey Logic headsets. The SE1000 features SunTour XC Comp 32 hole hubs, SR LowFat comp pedals, SunTour XC Ltd. crank and bottom bracket, SunTour XC Comp derailleurs and Grip Shift shifters, SunTour XC Pro low profile cantilever brakes and XC Comp four finger levers. The SE2000 features Shimano Deore XT 32 hole hubs, Shimano Deore XT comp pedals, Ritchey Logic crank and Shimano Deore XT bottom bracket, Shimano Deore XT derailleurs, Shimano Deore XT top mount thumb shifters, Shimano Deore XT low profile cantilever brakes and Ritchey Logic levers. The Omega comes with Campagnolo Alpha XL rims, SunTour XC Pro 32 hole hubs with Grease Guard, DT double butted spokes, Shimano Deore XT SPD (clipless) pedals, Cook Bros. Racing aluminum crank and precision bearing bottom bracket, Sedisport ATB chain, SunTour XC Pro derailleurs, SunTour XC Pro shifters, Mavic 305 headset, and Selle Italia Turbo saddle.

MFG. OR DIST.: Cannondale Corp.
9 Brookside Pl
Georgetown, CT 06829
(203) 854-8480

APPROXIMATE SUGGESTED RETAIL PRICE: SE1000 \$1280,
SE2000 \$1760, SE Omega \$2560

COLORS AVAILABLE: Cosmic black with green
swingarm (SE2000), Jetfighter silver (SE1000)

SIZES AVAILABLE: 17", 19", 21"

SIZE TESTED: 19" (center to effective center of top tube)

FRAMESET:

Head Angle 71 degrees
Seat Angle 73 degrees

CANNONDALE

(Continued from page 60)

and replaceable derailleur hanger. The rest of the frame is vintage C'dale, with the "3.0" technology ever present. The massive two inch outer diameter/thin wall down tube is still the biggest on the market, providing stiffness and light weight while still exhibiting that classic aluminum feel. The Pepperoni aluminum fork is also huge, and stiff. The all-aluminum unicrown fork uses welded dropouts and a steel steerer that's bonded to the fork with a special heated glue process. Cable routing is fairly standard, except when it deviates for the swingarm. Especially interesting is the rear derailleur route, which starts on the left side of the frame, does a hefty "S" at the seat tube, then continues down the right chain stay to the derailleur.

As we mentioned before, we'd rather devote the space to the way the frame works and handles, rather than talk about the components. And since our IEX is not really a '91 bike, we don't feel so bad about it. Our Shimano equipped bike worked fine, with the Gervin Flexstem, standard on all the ESTs, balancing out the rear shock absorption pretty well.

Maybe you're wondering why we

haven't mentioned the brakes. Well, they're just your plain old run-of-the-mill Deore XT cantilevers, made into god-like stoppers by Cannondale's revolutionary Force 40 cable routing and leverage system. We thought Shimano's Super SLR Servo-Wave was the hottest thing going until we tried this! A specially placed roller and unique cable routing makes the braking modulation and power unsurpassed. The bad news is, you guessed it, it's only available on Cannondale's EST bikes. If we all wish real hard, maybe they'll put it on *all* their mountain bikes next year (are you listening, guys?).

TEST BOUNCING

Like we said earlier, we spent quite a bit more time on our EST Cannondale in order to really give the bike a fair assessment. We'll be up front. All production integrated rear end frame suspension systems we've tried have a certain degree of lateral flex inherently present. It's no different with EST, but then, to think you're going to get a suspension frame as laterally stiff as a conventional one you're missing the point. Let's just say that Cannondale has already addressed this element. But you need to go beyond what you're used to, for riding EST is like almost relearning riding itself.

You can ride over and through tricky terrain with more control and comfort than with a standard frame. For instance, you don't have to raise off the saddle when the rear end goes over a small to medium bump. The shock just soaks it up. Like wise, the Flexstem, while not having the travel of a telescoping front fork, takes out quite a bit of the roughness. We tried a few different durometer levels, and found that a medium soft green spring actually complimented the rear shock nicely.

When we first were test riding the IEX, we had the rear shock set with a medium preload. When riding on moderate off-road surfaces, the ride was smooth. Climbing out of the saddle was impressive as the rear end followed the contour of ruts and dips better, allowing for more traction. Downhills were obviously very plush. But some riders noted that they preferred a stiffer feel on the flats and climbs, so we cranked down on the preload spring. A funny thing happened. The bike instantly felt much more like a conventional frame when going over fire road type dirt surfaces. However, another thing happened, that of the frame's lateral flex becoming more pronounced. And although it didn't really look like it was flexing that much — we never shifted the chain off the chain rings while hammer-

"BICYCLE SUSPENSIONS? ONLY PRO-FLEX HAS IRONED OUT ALL THE BUMPS."

The advantages of suspension are nothing new to the designers at Pro-Flex™. While others struggle with the technology, only Pro-Flex has perfected the bikes that are fast revolutionizing the sport of all-terrain cycling. On rock-strewn downhills the Girvin Flexstem™ and Pro-Flex system components allow faster descents with greater control and confidence. At maximum effort during tough climbs, the suspension actually forces your rear wheel in contact with the ground, preventing wheel spin and loss of control. And on level sections of bumpy trail, a Pro-Flex suspension bicycle flat-out flies.

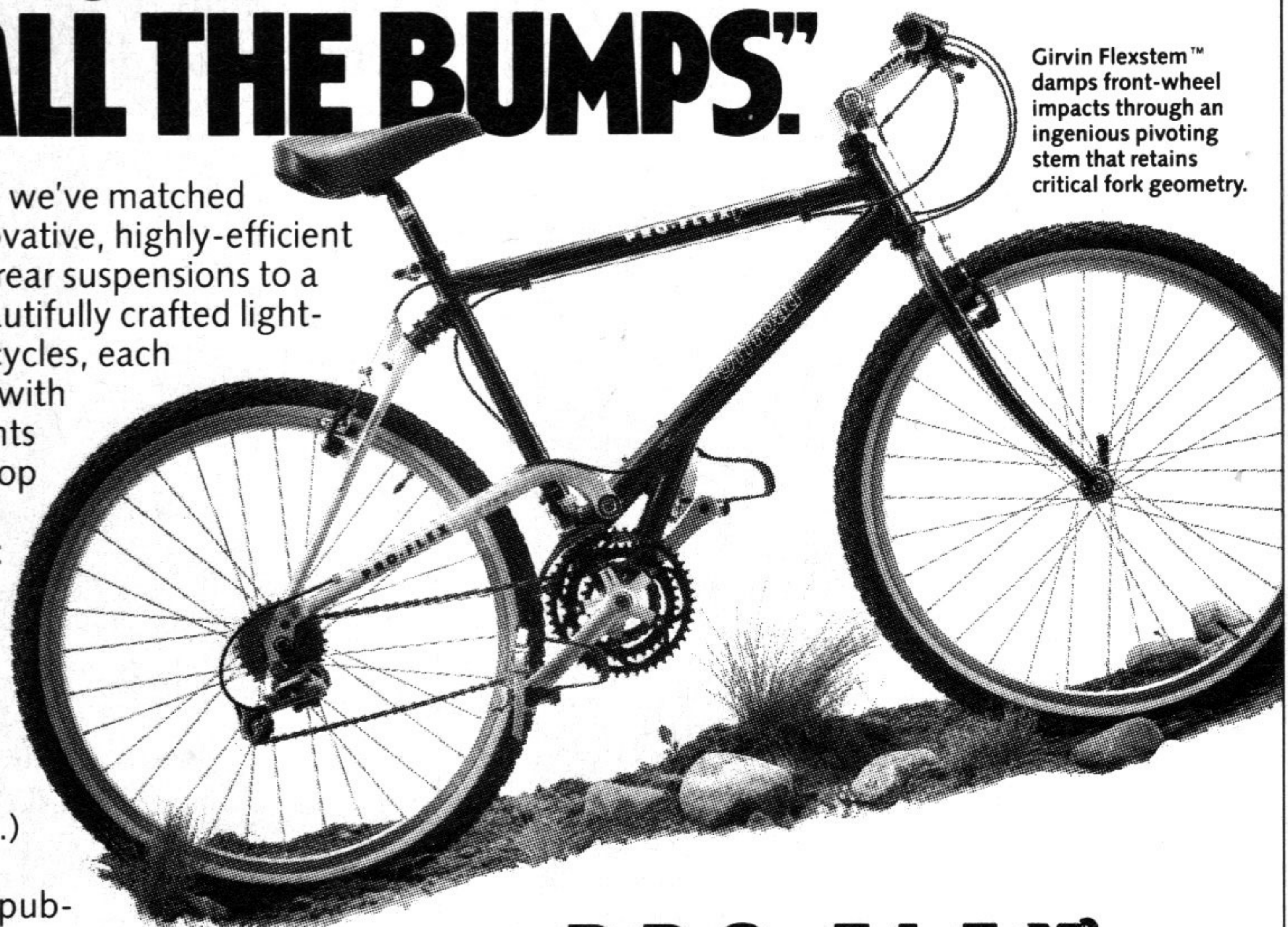
Recent testing confirms a significant speed advantage.



SunTour, Dia-Compe, and Ritchey. (With a wider range of frame sizes, more cyclists will find a Pro-Flex bike to be a better fit, too.)

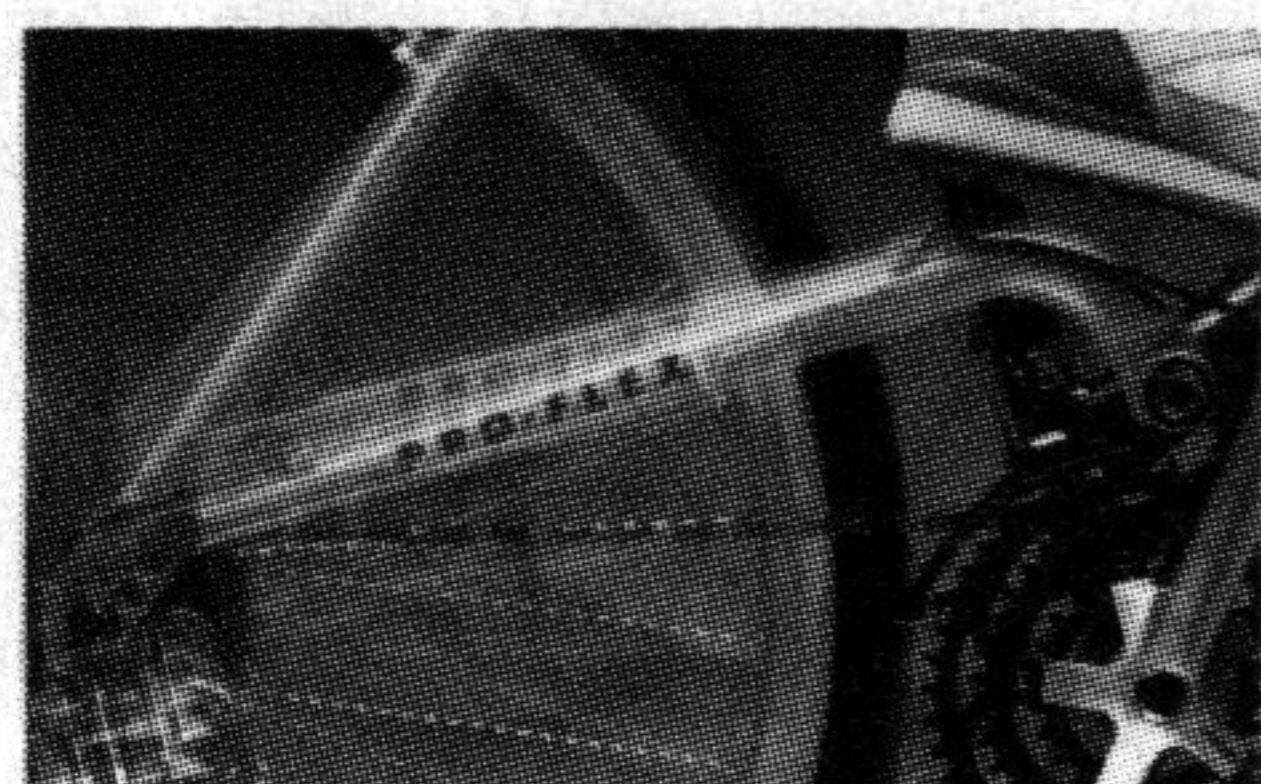
Discover what leading bicycle publications have been calling "the most significant innovation yet in all-terrain bicycle design" at your Offroad Pro-Flex dealer soon. Once you try a Pro-Flex, your belief about what a bicycle can do will be suspended forever.

Best of all, we've matched these innovative, highly-efficient front and rear suspensions to a line of beautifully crafted light-weight bicycles, each equipped with components from the top names in all-terrain: Girvin, Shimano,



Girvin Flexstem™ damps front-wheel impacts through an ingenious pivoting stem that retains critical fork geometry.

Pro-Flex™ swing arm allows up to 32 mm of wheel travel while maintaining lateral stiffness. Precise pivot location also reduces interaction between applied force and suspension, and drives the rear tire downward for incredible traction.



With their advanced elastomer disc "springs", Pro-Flex bikes reduce total bump forces for a faster, more controlled, and less fatiguing ride. Unlike overly complex suspensions, Pro-Flex's simple design solution needs no maintenance or special tuning.

PRO-FLEX

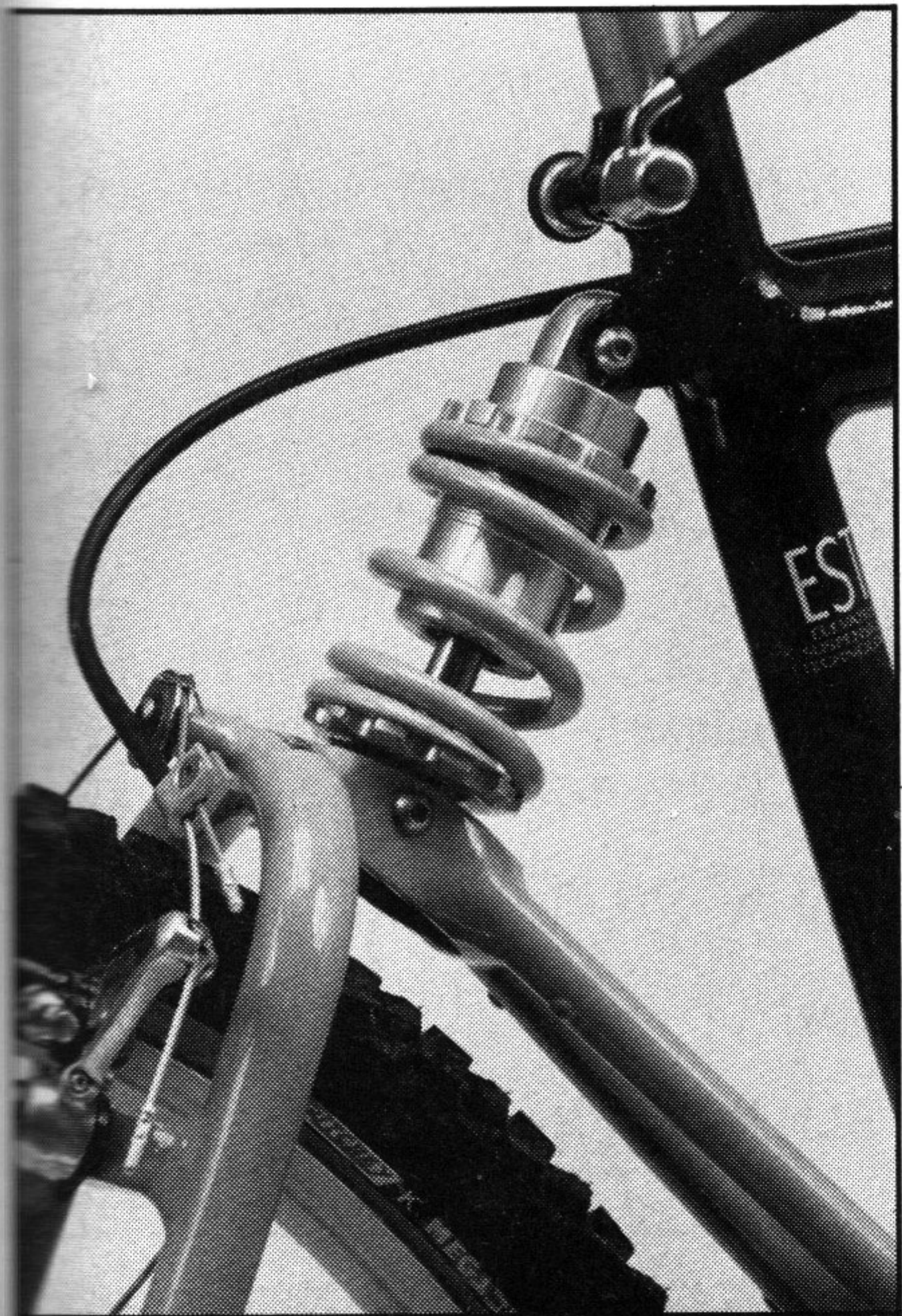
Send me your latest full-color catalog along with a copy of the research report "Effect Of Bump Forces And Efficiency Analysis Of The Pro-Flex Bicycle Suspension". I've enclosed \$1 to cover postage and handling.

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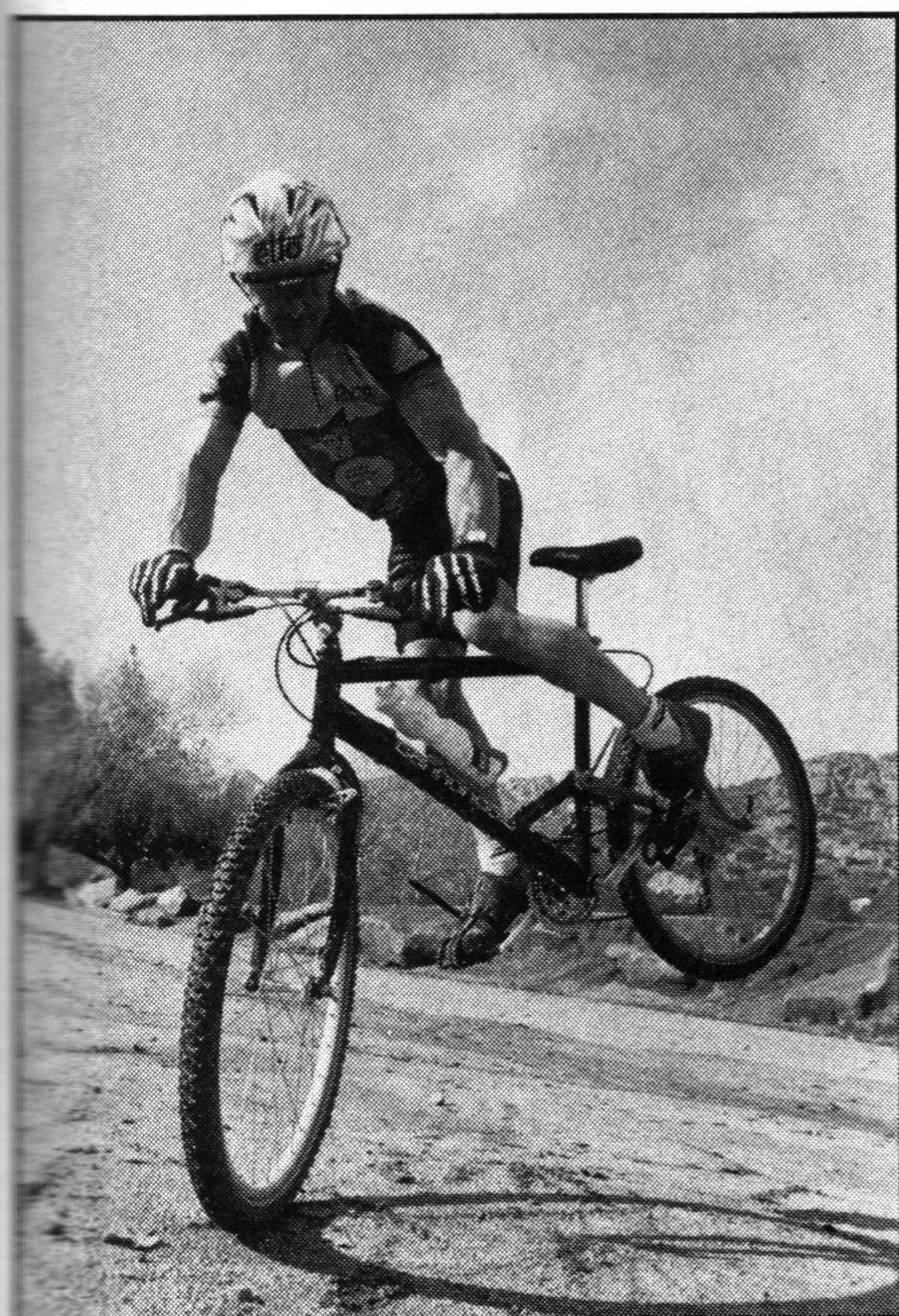
Mail to Offroad Pro-Flex - Dept. C.
115 Front Street, Box 1040, Woonsocket, RI 02895

ing, for instance — there were more than a couple of riders who said that they felt that the frame's flex was taking more strength to compensate for, in effect robbing their legs of power. As one tester put it, "I'm more tired at the top of a climb on the EST than on a conventional bike."

Another characteristic of the EST design is a tendency to "fold" when going into hard, fast turns. First, we should say that on the whole the bike has a well-balanced, responsive geometry that real-



Works Performance builds the mini oil dampened shock especially for Cannondale. The outer coil return dampening spring is made of steel. Although efficient, there's a question as to whether or not it's overkill.



Perhaps even more impressive than their suspension design is the Force 40 braking system. Sensitivity, modulation, and power were all superior, making maneuvers like this almost effortless.

ly makes the bike a joy to ride in all types of terrain. But stuff the bike hard into a turn while braking and for an instant the flex of the frame causes the rear tire to steer independently of the front. Once we isolated this phenomenon, we were able to correct it by braking before an anticipated turn and then carving through it. However, there are going to be some times when you're going to have to really crank on the frame with some body english, and there's just nothing you can do about this particular frame trait.

DELIBERATION

After one of our longer test rides, there

were some delighted riders, some perplexed, and others you could tell hadn't made up their minds. This is good. There needs to be a consortium of input so that what we eventually come up with is a spectrum of suspension types. Hey, some people drive Cadillacs, others like the way a Ferrari rides. If we know Cannondale, they're thinking the same thing. This isn't the only suspension they're going to make, just the first. And for a first try they've come up with a pretty impressive presentation. •

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