

AMP RESEARCH'S SECRET LINKAGE FORK

From those wonderful people who brought you . . .

AMP Research is the cutting-edge design house in the world of mountain bike suspension (of that there can be no doubt). AMP, whose background is in building prototype racing motorcycles (including the ATK four-stroke, KTM 125 one-off and a Harley military prototype), has been building full-suspension mountain bikes since '90. Horst Leitner, the eccentric, Austrian-born head of the Laguna Beach (California) company, has almost singlehandedly dominated the rear-suspension world: it was AMP that built the first MacPherson Strut bike; it was AMP that designed the rising-rate

linkage Specialized FSR; it was AMP that pioneered the ground-breaking Horst Link (that made active suspension feasible); it was AMP that manufactured rear-suspension systems for Rocky Mountain, Fat Chance, Dean, Litespeed, Titus and Woejik (not to mention the copycats); it was AMP that built the original Mongoose Amplifier; it was AMP that rocked the scene with the radical AMP B-4 (that features an interrupted seat tube, bolt-on seat tower and one-piece top/seat tube); it was AMP that built the most powerful, lightweight disc brake on the market.

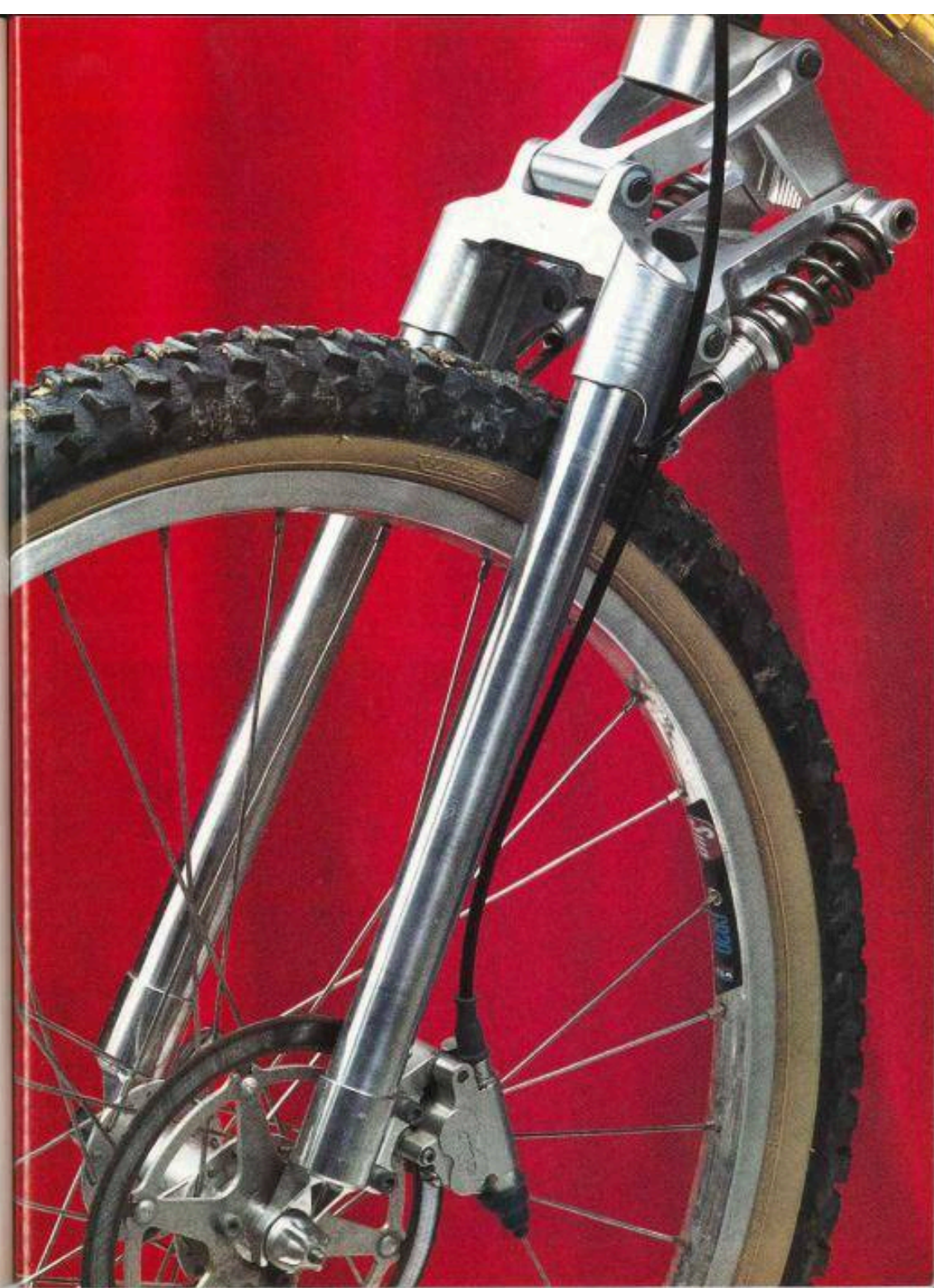
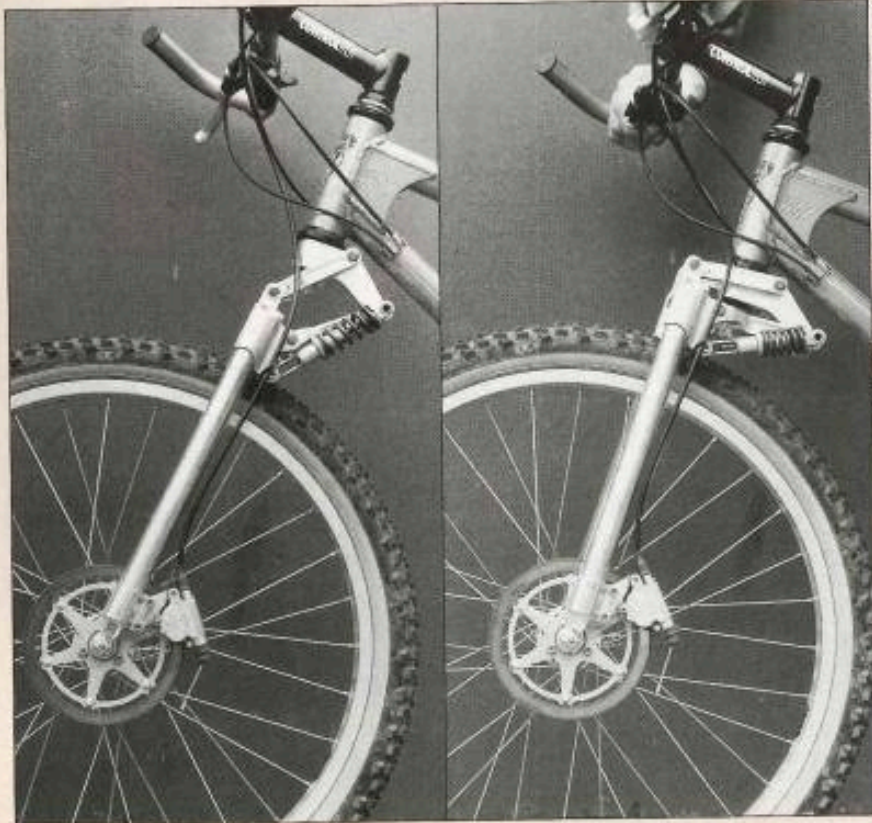
When it comes to the development of

off-road suspension, AMP Research has "been there, done that."

The strange thing is that while AMP Research has led the way in most suspension areas, it has stayed away from telescopic forks. Telescopic forks get their name from the telescopes used by pirates of olden day. Two tubes that collapse into each other are telescopic. Rock Shox, Manitou, Marzocchi, RST and almost everyone else are telescopic. However, three fork designers refuse to be swayed. These three outlaw designers insist that parallel-gram linkage forks are the best way to make bicycle forks. AMP's Horst Leitner,

Post-modern fork: AMP's original linkage fork was an eye-turner when it first hit the market in '91. Against all odds, Horst Leitner's ugly-duckling design bucked the mighty telescopic trend and his new 3"-travel twin-shock fork should really rock the boat. ▶

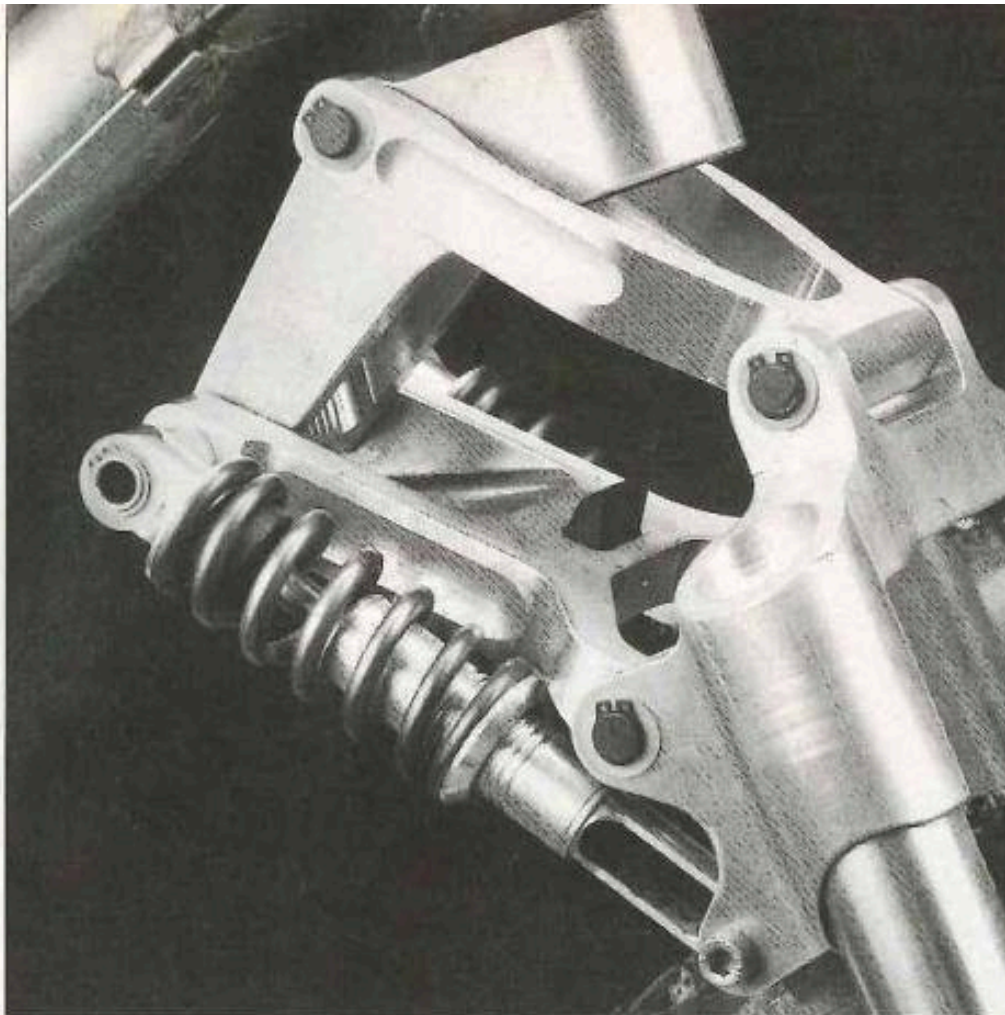
◀ **Traction action:** Two views depict the remarkable 3"-travel AMP fork in action. The geometry of the AMP's linkage creates a slightly rising rate at the end of the fork's travel, although the bulk of the stroke remains a straight-rate (to make 'em buttery smooth, without bottoming over big bumps).



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Different by design:

There are more differences between the new AMP prototype and the old standard unit than there are similarities: 1" more travel; better geometry; double dampers with external springs; and low-end suppleness. Two aspects the proto did retain from its ancestor were minimal weight and spindly, 1"-diameter legs. ►



Pro-Flex's Bob Girvin and former Fisher designer Mert Lawwill all make parallelogram forks—exclusively. That is a powerful group of men! Lawwill is one of the founding fathers of production mountain bikes. As a former motorcycle Grand National Champion (and star of *On Any Sunday*), Mert developed the revolutionary Fisher RS-1 suspension bike in '92 and, with it, his Lawwill linkage fork. Bob Girvin's creativity has taken his small

Rhode Island bicycle company and turned it into a suspension powerhouse. Another motorcyclist, Girvin developed the Flex Stem, Pro-Flex rear-suspension system and the Girvin Vector linkage fork.

Why link forks? Increased rigidity, decreased stiction, controlled geometry, light weight and versatility.

WHAT'S IT ALL ABOUT?

The *MBA* wrecking crew has lots of experience with the Lawwill, Girvin and

AMP forks. Each offers traits that telescopic forks don't, but they don't all necessarily offer the same traits. So when the *MBA* wrecking crew heard spy reports that AMP Research was building a new-generation linkage fork, we put on our trench coats, belt-buckle spy camera and went snooping.

Our covert operation ferreted out a unique new fork that was in such prototype form the CNC machine was still warm when we got there. The fork was number 00001 and will be the test bed prototype. AMP insiders report that the new AMP fork will probably spend a year or more in testing before being released. That year will be used to test different linkage arms, parallelogram geometries, tubing sizes, spring rates, damping settings and design configurations.

So what is AMP up to? AMP has been in the linkage fork business for a long time. It has sold over 50,000 of the original AMP F2 parallelogram forks. As OEM units on Mongoose, Univega and a host of European brands, the current AMP fork is well received as one of the lightest two-inch-travel, cross-country forks available. At 2 lb. 7 oz., an AMP-equipped rider saves about a half-pound over top-of-the-line Rock Shox- or Manitou-equipped bikes. The standard AMP F2 works best at trail speeds, but requires careful setup to give the perfect ride. The F2 forks are best suited to cross-country riders looking for a

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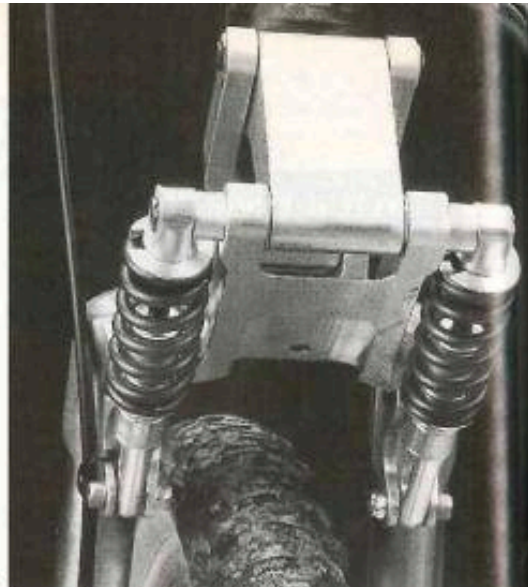
fork that feels more like a standard bicycle fork until it is needed to go into action. The reason that this is such a good trail fork is because of something called "kinematic lockout." It doesn't bob or dart when the rider is on a typical trail, but it is still ready for medium and larger debris. The kinematic lockout can be lessened for a more supple feel, but at the expense of big-hit capabilities. This is a popular fork for riders who are weight-conscious, don't want to ride on marshmallow foam bumpers and are seeking rigidity. It is not, though, a super absorbent, do-it-all fork.

Times are a-changin'. The new generation of long-travel, microcellular forks has developed a new mindset in off-road riders—more is better. The difference between two inches of travel and 2-1/2 inches of travel is noticeable, and for a host of off-road riders there are worthwhile gains to be made in long travel. AMP is aware that three-inch-travel forks are coming.

AMP GOES LONG TRAVEL

The new prototype AMP linkage fork offers three inches of travel, yet still comes in under three pounds. The highlights of AMP's future fork are interesting.

Rising rate: With a carefully chosen linkage rate that starts out as a straight rate and then has a kicker of rising rate at



Open wide for chunky: Unlike Rock Shox and Manitou, AMP's long-travel entry has mud clearance aplenty (that's good). The twin dampers protrude well into the flight path of the rider's kneecaps (that's bad). AMP's next prototype will have reconfigured shock locations and larger-diameter legs.

the end of the arc, the three-inch-travel AMP prototype differs from the falling rate AMP F2 fork. By using a straight rate for the first three-fourths of the travel, the AMP prototype can easily be dialed in with spring rate and damping changes to be either marshmallow-soft or sprinter-firm. The rising rate at the end of the stroke increases the fork's resistance to movement to lessen any tendency to bottom (with less dependence on heavy spring rates or stiff damping).

Coil-over springs: There is nothing on the planet that can compete with coil-spring suspension. Every intelligent suspension designer knows this to be true, but most can't resolve the problem of how to suspend the bicycle without resorting to the use of too much wound steel. In the end, air, elastomers or microcellular foam are the simplest solutions to the weight problem, while not necessarily the best choices as a spring. The AMP linkage fork has resolved the weight problem and the coil spring problem at the same time. Because the AMP fork is not telescopic, it doesn't need long coil springs in each fork leg. Its design only demands short, small and stout coil springs between the linkage spans. By using two, small, oil-damped, thru-shaft shock absorbers (one on each side of the linkage), the AMP fork achieves everything a designer would want without the weight.

Stiction: An inherent problem with telescopic forks is stiction (static friction). When two tubes are collapsed into each other under a load (typically a load at an oblique angle to the tubes' direction of travel), there is a great deal of drag, friction and wall-to-wall interference. So much so that a telescopic fork can—and most do—suffer from an occasional friction lockup. Linkage forks don't have telescopic tubes. Stiction, while not non-

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existent, is minute on linkage forks. When the front wheel hits a bump, the linkage arms simply rotate. With no stiction, a linkage fork can be amazingly supple. That said, it should be noted that the original AMP F2 fork, while having minimal stiction, wasn't always supple because of the kinematic lockout. Not so with the three-inch-travel AMP prototype fork. It is butter-smooth over the tiniest trail irregularities. The biggest advantage of minimal stiction is that the damping can be set to consistent loads (without having to compensate for unknown and changing

drag coefficients).

Ride-over characteristics: Over 30 years ago motorcycle racers discovered that linkage forks had the ability to ride up and over obstacles with greater ease than telescopic forks. The first and most basic linkage forks produced were called "leading link" forks. A leading link was a swingarm turned around backwards. When the front wheel hit a bump, the link would swing up and back to allow the front wheel to crawl over the bump. When leading link riders switched to bikes with telescopic forks, they discovered that when a telescopic fork hit a bump, the fork legs were pressed backwards by the force and then compressed upwards on a path of least resistance principle.

Telescopic forks didn't climb over obstacles as much as they submitted to their will. The new generation of linkage forks is now taking advantage of the properties that were inherent in Greeves and DKW off-road suspension. Linkage forks, including parallelograms (of which a leading link was not), have ride-over characteristics that have not been all that apparent in short-travel form. The three-inch-travel version eats bumps for breakfast.

Looks: Taste is something that takes time to develop. Unfortunately for Girvin, Lawwill and AMP, the linkage fork is the ugly duckling of the suspension world. Regardless of how well they work, there is always going to be a large group of fashion-conscious riders who will have nothing to do with the large aluminum legs of the Girvin, double yoke of the Lawwill or landing-gear look of the AMP. Fashion aside, these forks offer performance capabilities that would suit large portions of the off-road riding public (if only they were blindfolded).

HOW DO THEY WORK?

We have never ridden a set of forks with this much potential. Even in the rawest prototype form, with ballparked springs and damping rates, the AMP fork is incredibly absorbent. It delivers an incredibly supple ride over the smallest of bumps. As the size of the obstacle or the speed that you hit it with increases, the AMP fork doesn't blink. Most noticeable is the amount of travel. The average bicycle forks never feel like they have as much travel as advertised... probably because they don't. Even when the numbers are accurate, a fork loses a portion of its travel to rider sag on the low end and even more to bumper stiffness on the high end. The AMP fork is the first long-travel fork we have ridden that feels like it has more travel than what they claim. It is a marvel of off-road engineering. Rain ruts, stair-steps and roots are little more than inconveniences. It can climb over rooted singletrack and whistle down pockmarked ravines with the front linkage arcing effortlessly.

It is good. Really good. AMP will be spending the next year testing the three-inch-travel prototype. AMP has a few more geometric patterns it wants to try with the parallelogram, and then will spend the rest of the time working on spring and damping characteristics to suit a wide range of trail riding conditions. Paradoxically, this could be the ultimate downhill fork, but that isn't a market that AMP Research has ever pursued. It believes that the best use of full suspension, and of its new long-travel fork, is in the hands of trail riders. After all, it's the trail rider who takes a beating for the longest period of time. The new AMP fork is going to take the pain out of epics.

For more info on AMP Research call (714) 497-7525. Before you call, remember that no price has been set and the fork's still high-tech unobtainium. □

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