WHEELS OF CHANGE

The search for the perfect wheel size

When the first production mountain bikes rolled off the massive assembly line of Joe Breeze’s Breezer bicycle factory (and by massive, we mean around eight bikes), 26-inch wheels were the number-one choice of mountain bike designers. The 26-inch wheel diameter remained unchallenged for the next 20 years, until bike designers started toying with the idea of utilizing a larger, 29-inch diameter wheel.

The 29er almost died at birth due to limited support from tire companies and even less support from suspension suppliers. And it didn’t help that frame geometry was intended to work around 26-inch wheels. But the big wheels were saved from the mountain bike junk pile because all three of these problems were solved. Today, 29ers enjoy plenty of wheel and suspension choices, and geometry has been dialed to take full advantage of the 29-inch format while minimizing the weaknesses of the big wheels. There are companies like Niner that only produce 29er bikes. And, Fisher Bikes announced that for 2010, all their upper-end bikes will only be available with 29-inch wheels.

A third wheel diameter, not new to cycling but new to mountain bikes, was recently introduced and championed by frame designer/builder Kirk Pacenti. The new wheel size with a two-inch tire works out to 27.5 inches, about halfway between the 26er and the 29er wheel. The draw to the mid-sized format (also referred to by bike geeks as 650b) is that the slightly larger wheel will fit some existing forks and rear suspensions engineered for 26-inch wheels. The extra space that the 27.5-inch-diameter wheel affords makes it easier to eke out clearance for rear suspension travel and for the action of the front derailleur, which is quite cramped by the placement of the 29-inch tire.

WHY FIGHT?

Is the current battle for wheel diameter supremacy the brainchild of a lonely frame builder trying to stay alive or a major bike company's marketing director? Neither. All three wheels have a valid reason to exist.

Think of the wheel as an inclined plane—a ramp. When the wheel contacts a bump, say a two-inch block of wood, a triangle is formed from the top edge of the block to the ground and back to the point where the tire contacts the trail. The steeper the triangle, the harder it is to get the wheel up and over the block. The smaller the diameter of a wheel, the steeper the triangle becomes, until it reaches the point where the wheel is too small to get up and over and stops dead in its tracks. The difference between the strike angle of a 26-inch wheel and a 29-inch wheel (over the wooden block) is only about five percent, but the cumulative effect of rolling up and over a five-percent-steeper angle thousands of times a mile adds up quickly. The larger-diameter 29-inch wheel has noticeably less rolling resistance.

Another less-quoted benefit of a larger-diameter wheel format is the relationship between the bottom bracket center and the wheel axles. Frame designers know that a lower bottom bracket causes a bicycle to roll faster over rough terrain and gives the chassis a more stable feel while cornering. The bottom bracket heights of 26- and 29-inch designs are about the same, but a closer look reveals a secret that might explain the highly lauded cornering ability of a 29-inch chassis. At 12.5 inches, the bottom bracket center is only 1/2-inch lower than the axles of a 26-inch bike, but the bottom bracket is two inches below the wheel axles of a 29er. Weighting the pedals of a 29er puts much of the rider's weight well below the axles, which has a profound stabilizing effect.

PUTTING THE WHEELS TO THE TRAIL

When KHS offered three aluminum hardtails with three different wheel sizes, we jumped at the chance to test them. It was the first opportunity the wrecking crew had to ride a 26er, 27.5er and a 29er back to back on similar bikes. The models that arrived were the Tucson 29er trailbike, the SixFifty 606 27.5-inch wheeled trailbike and the Alite 3000 trailbike and pseudo cross-country racer.

All three bikes were similarly equipped, with the only real caveat being the Tucson was a size medium while the other two were large sizes. We took the three bikes to Corriganville Park in Simi Valley, California. The park's tight loops, used by a local race promoter, offer an opportunity to throw down short laps with a great variety of trail surfaces. After the Corriganville shootout, we spent individual time on each bike on our regular two- and three-hour trail ride loops.

Tucson: More fork choices, geometry specific to 29ers and plenty of tire and wheel choices have made the large hoops more than a passing fad. Most riders who have made the jump never go back to 26.

SixFifty 606: It takes a trained eye to spot the use of 27.5-inch wheels. The fork doesn't look stunted, and the wheels appear to be properly proportioned to the rest of the bike. There is a big difference on the trail.

Alite 3000: The day has arrived when 26-inch wheels look small on a mountain bike. Still, 95 percent of the mountain bikes in use today use 26-inch wheels. That type of domination makes it tough for competing wheel sizes.

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THE BANKED TURN

The 29er delivers the kind of bite that inspires riders to lean further into the turn, enter faster and exit with confidence. The big hoops require you to commit to your intended line because sudden changes can cause loss of momentum.

Riders in this situation were hard-pressed to notice any loss in grip going from the 29er down to the 27.5-inch wheels. What you do lose is the tall feel of the 29er wheels. The in-between size encouraged line changes.

The Alite 3000 used the cross-country-oriented Kenda Small Block 8 tires. This and the smaller wheels produced the kind of traction that requires riders to pay attention. Switching directly from the Tucson or SixFifty 606 caused riders to become more apprehensive in the corners. The Alite 3000 had the lightest and quickest feel exiting the corner.

Favorite: The SixFifty 606 (27.5")

THE BANKED TURN REVERSED

Victor "Big Ring" Robles felt right at home on the big-wheeled Tucson. While traction was never a problem, loss of momentum was. The 29er wheels like to hit sections like this as fast as possible, with the rider spinning and staying on top of the gear. Fall into the torque zone, and it will take more muscle to get things moving again. The introduction of a 36-tooth cassette cog helps reduce this inherent problem of 29-inch wheels, but the Tucson only had a 34 on there.

The 27.5-inch wheels again deliver in the traction department and did not drop off the speed like the larger wheels. The mid-size wheels allowed the rider to lose a little momentum without too much penalty to be paid when bringing the bike back up to speed.

Check out the gear. The same rider felt comfortable enough to drop down two cassette cogs after switching to the 26-inch wheels. The bike accelerated out of the corner with more enthusiasm as long as the rider worked the limit of tire traction properly.

Favorite: The Alite 3000 (26")

THE FAST, LOOSE CORNER

The Tucson didn't feel the fastest, but look closely at the tires. There is zero traction loss, and this strength is the reason riders didn't feel as fast. There was no skidding. It hooked up and allowed riders to remain calm and confident.

The SixFifty 606 introduced the limits of the tire's grip in the same corner that the Tucson was glued to. Overall, the 27.5er delivered a confident, controlled feel.

The Alite 3000 attempts to slide into home plate. Remember, the tires were less aggressive than on the other two bikes. Still, this setup didn't come close to the confidence of the other two bikes.

Favorite: The Tucson (29")

THE WALL

If the Tucson was equipped with a 36-tooth rear cog, it would have a low gear equivalent to the SixFifty 606. Every rider was wishing for those two extra teeth after a few times up the wall. The added traction of the 29er was a bonus, but after several times up this nasty little wall, the Tucson rider was done.

The SixFifty 606 required less effort to muscle it up and helped the rider along with lower gearing than the 29er. It weighted the exact same as the Tucson, but felt lighter. The rear tire was not prone to slippage, even during out-of-the-saddle efforts.

The Alite 3000 had the best gearing to attack the wall, but traction was severely limited. The wrong body position or poor pedaling input would cause the rear tire to let loose and lose the dreaded quarter pedal rotation that hurts so badly in this situation.

Favorite: The SixFifty 606 (27.5")

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THE ROCKY CHUTE

The Tucson didn't break a sweat on this rocky downhill section (that is much worse than it appears). The large wheels floated over steps and crevasses that gave the smaller wheels something to think about. An aluminum hardtail never felt so good.

The SixFifty 606 again wasn't far off the Tucson's lead, but just couldn't match the big guy's stability and roll-ability. This was the one section where the 27.5-inch wheels felt closer in performance and comfort to the 26-inch wheels.

Can't we use that smoother line to the left? The Alite 3000 reminded us of why most riders have adopted dual-suspension bikes for trail riding. This type of terrain doles out the punishment for the rider of any aluminum hardtail with 26-inch wheels.

Favorite: The Tucson (29")

THE SPRINT

The Tucson takes more effort to get up to speed and does not like riders who toss a bike from side to side to build speed. The large wheels seem to flop from side to side if sprinted in this fashion. Still, if you have a long build-up to the sprint's end, the Tucson builds a lot of steam.

The SixFifty 606 will leave the 29er from a stop because of very similar traction performance combined with lower gearing. It doesn't have the large feel of the Tucson, but it still doesn't like to be tossed.

The Alite 3000 is a rocket out of the gate. Throw the thing from side to side, stay out of the saddle and push a big gear if your knees can take it. The Alite 3000 feels light and agile. The Tucson and SixFifty 606 may have taller top gears, but they are going to have to catch the long-gone Alite 3000 to use them.

Favorite: The Alite 3000 (26")

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THE OFFICIAL MBA PROCLAMATION

"And the award for best mountain bike wheel sizes goes to—the envelope, please—the KHS…" Sorry, it is not that easy, and any rider who tells you there is a "best" wheel size may try to sell you beach-front property in Arizona, too. It still comes down to rider preference and riding conditions. ❑

COMPARISON CHART	TUCSON 29ER	SIXFIFTY 606	ALITE 3000
Price	$1099	$1199	$1299
Weight	29.5 lb	29.5 lb	27 lb.
Frame tested	17"	19"	19"
Bottom bracket height	12.75"	11.5"	12.25"
Chainstay length	17.9"	16.75"	16.5"
Top tube length	23.5"	23.5"	24.5"
Head tube angle	71.5°	71°	71°
Seat tube angle	73°	73°	72°
Standover height	30.5"	30.5"	30"
Wheelbase	43"	42.5"	43"
Fork travel	3.1"	3.1"	3.9"
Crankset	175mm	175mm	175mm
Handlebar	27"	27"	27"
Handelbar height	41.5"	40"	39.5"
Saddle height*	41"	40"	40.25"
Chainrings	44/32/22	44/32/22	44/32/22
Cassette	11-34	11-34	11-34
Lowest gear (feet)	4.91	4.65	4.40
Tallest gear (feet)	30.36	28.80	27.23
Front wheel	5.15 lb	4.85 lb	4.1 lb.
Front tire	2.2 lb	2.1 lb	2.1 lb.
Tire/tube	2.29 lb	1.96 lb	1.54 lb.

*When saddle is set 30 inches from the bottom bracket axle to the saddle.

THE IDEAL WHEEL DIAMETER

NONE OF THE ABOVE!

If we had to start from scratch, what would be the perfect wheel and tire size for off-road cycling? Pioneer mountain bikers chose the 26-inch wheel because it was the only viable format available. Rear hubs were narrower, so the spoke angles of larger-diameter road wheels were too narrow to hold up to the pounding. Wide knobby tires only existed for 26x1.75-inch wheels, and existing cranksets and bottom brackets were too narrow to fit around a 2.125-inch tire, even if one were available.

Now, hubs are wider, cranks are built to wrap around wide tires, and frame makers have solved all the clearance issues that plagued pioneer mountain bike makers, so there is no compelling reason to stick with 26-inch wheels if science proves them to be inferior. Before we commit to two more borrowed wheel diameters, however, we should do some research.

It seems that a series of quantitative tests that compare rolling resistance values over smooth and rough terrain are in order. There must be a convergence point where the tire's air volume is optimized for sucking up big hits, the overall wheel weight is minimized, and the diameter of the tire delivers the lowest possible rolling resistance. As long as everyone is in agreement that a larger-diameter wheel is an improvement, we owe it to ourselves to find out exactly what diameter wheel and which tire sizes are best suited for the job before we commit to a standard.

If we do our homework, we won't be arguing about the wheel size of the future, we will be rushing to implement it.