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Why is a truck tire  
like a skyscraper?

Special Edition Three

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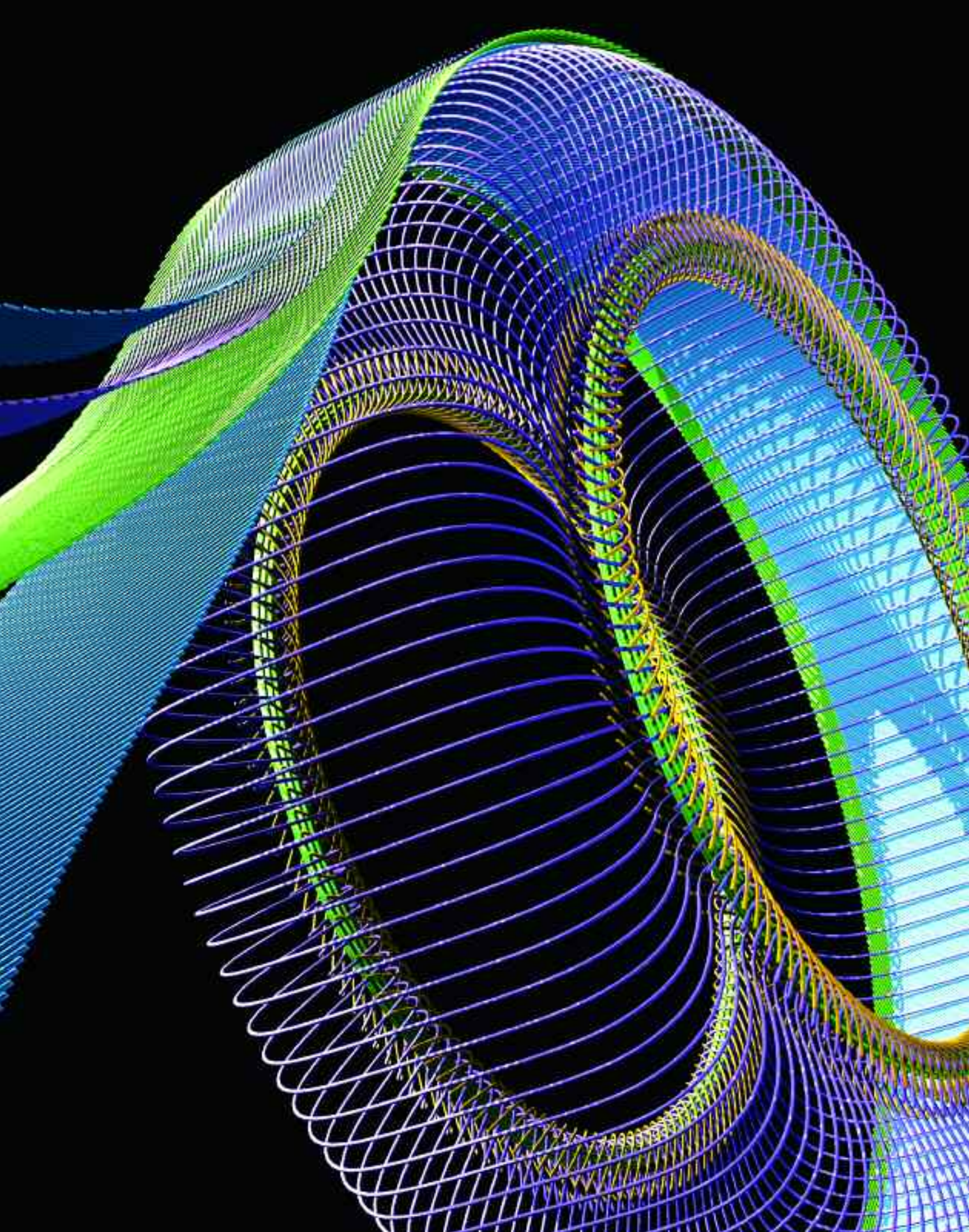


# Why is a truck tire like a skyscraper

*Because under the surface is a framework of steel. In fact, the modern steel radial truck tire is a masterpiece, a truly “engineered” product.*

*In its first “life” alone, a truck tire may travel 100,000 to 500,000 miles. Its sidewalls and tread may flex and unflex between 50 million and 250 million times.*

*And when all that’s done, we retread it and do it again. What makes this possible – as we’ll see – is a remarkable steel superstructure inside the tire, every bit like that inside a modern skyscraper.*



### Doesn't steel just reinforce the tire?

Not at all. The steel inside a modern radial truck tire is an integral part of the tire's structure and design, providing characteristics rubber alone can't.

It's pretty difficult to manufacture a tire from rubber alone. First, it just doesn't have the strength. Second, it doesn't hold a shape very well. And third, it's difficult to "build" the parts you need from rubber alone.

### Has there always been steel in tires?

Early tires were reinforced with layer upon layer of cotton fabric, arranged so that the cords crossed each other at angles, "on a bias," giving early tire construction its name.

The real strength was in the cotton, and that's why there were so many layers. Our modern ply ratings are a holdover from that era. Today's "14-ply"-rated tire would have needed 14 layers of cotton.

*Bias tires get their strength from multiple layers of fabric in which the threads cross each other at angles, on a "bias."*

### But cotton hasn't been used for years.

Nylon was the miracle fabric that ended the cotton era. You may remember nylon ply car tires marked "2 ply/4 ply rating." That's how much stronger nylon is.

Today, a 14-ply-rated radial may have only one body ply and 4 belts – of steel. And with even stronger steel, you may see a 20-ply tire with the same number of belts and body plies.

### Is the steel a "fabric"?

With cotton or nylon, you'd have individual threads crossing each other at right angles, woven together. With steel, you have steel cables, laid side by side, held together by a thin layer of rubber between them and coating them.

You might call it a "fabric," but it's a non-woven fabric.

*Several radial tire components are made of a sort of "fabric" created by aligning steel cords and coating them with rubber.*

### What does the radial tire "structure" look like?

Imagine a croquet "hoop." Then imagine thousands of them, arranged in a circle, evenly spaced. You can see that would create a sort of "tire" shape.

One way to make such a thing would be to take thousands of steel cords, all cut the same length, stick them together with rubber, then bend them into the hoop shape.

You could take a length of this hoop and join the ends together to make the tire shape.

### Is that how it's done?

As we'll see in a future article, that's pretty much what is done. But there's much more to a modern radial truck tire than that.

*The body ply of a modern radial truck tire consists of steel cord "hoops," linked together by rubber.*

### While we're at it, why is it called "radial"?

Consider the structure of steel hoops. If you drew a line down the sidewall portion of each one of them, they would all cross at the center of the axle.

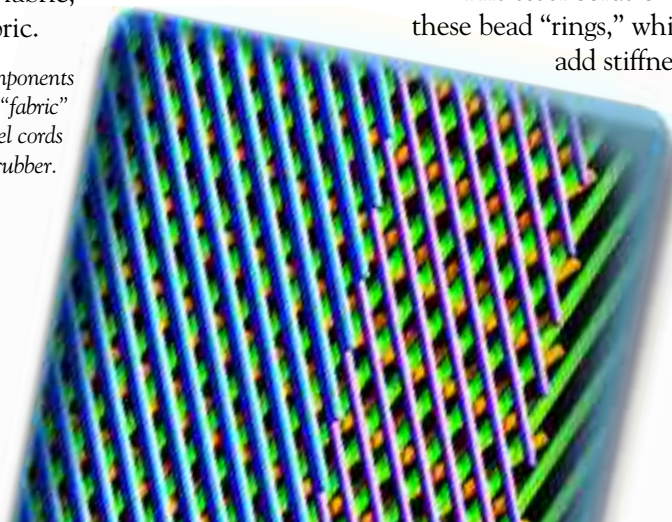
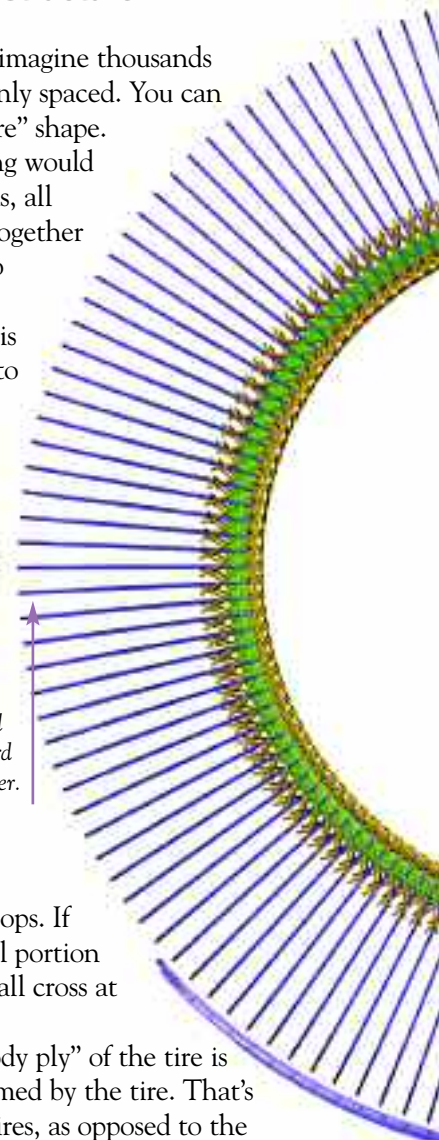
Each cord making up the "body ply" of the tire is part of a "radius" of the circle formed by the tire. That's how they got the name "radial" tires, as opposed to the older construction of criss-crossing fabric, called "bias."

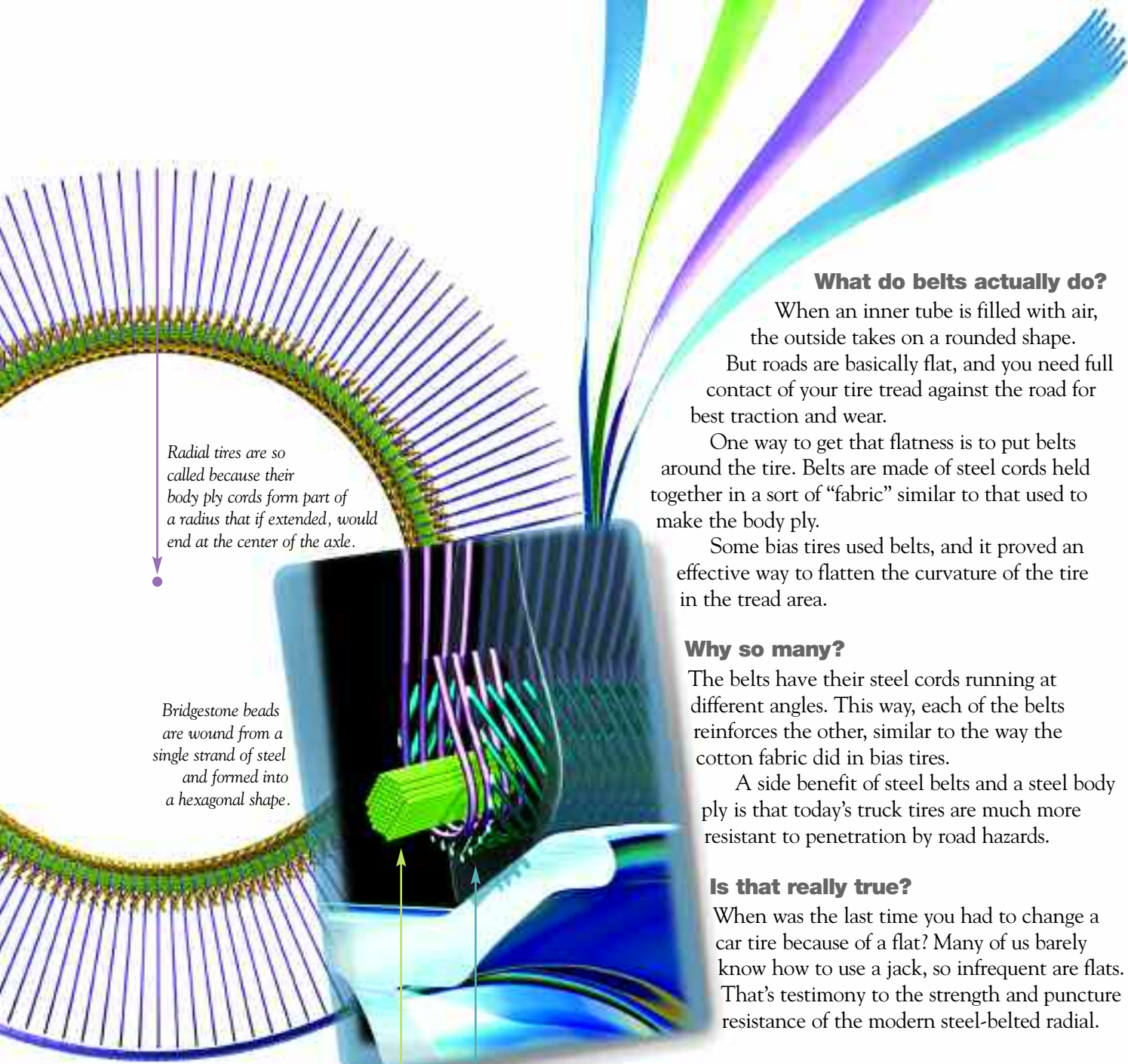
### What does the rest of the steel do?

Beads have been built of steel for a very long time. Each bead is made from a single strand of steel wire, wrapped many times around a form.

The steel cords of the body ply are wrapped around these bead "rings," which anchor them in place and add stiffness to the sidewalls near the beads, a point where a lot of flexing forces concentrate.

Bridgestone tires use beads wrapped into a sort of hexagonal shape.





*Radial tires are so called because their body ply cords form part of a radius that if extended, would end at the center of the axle.*

*Bridgestone beads are wound from a single strand of steel and formed into a hexagonal shape.*

*A flat bead surface helps lock the tire against the rim flange and seal in the air inside the tire.*

*Body ply cords actually bend around the beads and come partway up the sidewall of the tire. Chafers or "wire reinforce" units help protect bead areas from damage during mounting.*

### **What do belts actually do?**

When an inner tube is filled with air, the outside takes on a rounded shape.

But roads are basically flat, and you need full contact of your tire tread against the road for best traction and wear.

One way to get that flatness is to put belts around the tire. Belts are made of steel cords held together in a sort of "fabric" similar to that used to make the body ply.

Some bias tires used belts, and it proved an effective way to flatten the curvature of the tire in the tread area.

### **Why so many?**

The belts have their steel cords running at different angles. This way, each of the belts reinforces the other, similar to the way the cotton fabric did in bias tires.

A side benefit of steel belts and a steel body ply is that today's truck tires are much more resistant to penetration by road hazards.

### **Is that really true?**

When was the last time you had to change a car tire because of a flat? Many of us barely know how to use a jack, so infrequent are flats. That's testimony to the strength and puncture resistance of the modern steel-belted radial.

### **What's the purpose of that?**

The idea is to create a flat surface to press tightly against the wheel flange locking the tire onto the wheel and sealing in the air.

### **Are there other steel components?**

There are additional rubber and steel components used to reinforce the bead area and to protect it from damage that might occur during tire mounting.

These are called "chafers" or "wire reinforce" units. And, of course, there are the belts.

### **And the role of the rubber?**

We'll look into that next time. As we'll see, rubber and steel work together in a marriage so good you might almost say that they're "made for each other." 