



BY HOWARD JOHNSON, PhD

## Dangerous games

hope you fell off your bike when you were a kid. Maybe you broke your arm. I say this not because I'm a mean person, but because that early experience portends one of two things: either a lifetime devoted to the study of physical processes and their limitations or a fear of bicycles. If you are reading this magazine, I'll bet it's the lifetime of study.

You were the kid popping wheels, probing the limits of unstable equilibrium. On the playground swing set, you swung the highest because you understood resonance. Every time you jumped from that swing, you tested your knowledge of gravity, the nature

of inelastic collisions, and bruised ankles. Such doings shape the mind of a budding engineer. I mean that in a serious way.

Any kid who really rides a bicycle, and I mean slides, skids, hops over curbs, sails off ramps on one wheel—

### PLAYGROUND LESSONS

I recently visited a modern "kid-safe" playground. Gone is the old metal merry-go-round. The monkey bars now stand amid a spongy, rubber-filled pit. The swings have seat belts. Those changes have so watered down the playground experience that a child could hardly hurt himself there if he tried. How, then, can he learn anything important?

Lawyers and politically correct parents made all these changes. Resist them. Healthy children deserve the plea-

sure of laughing on the merry-go-round as they desperately claw their way toward the center, making the wheel spin faster and faster until the centrifugal force hurls the weakest child off into the dust. That's part of how we, as a species, learn.

People who spend their formative years huddled in the library searching for loopholes in the physical-education requirements for junior-high graduation should not design playgrounds.



always pushing the envelope—can become a terrific hardware designer. The visceral connection between your hands on the bars and the movement of the bike is probably more important to your understanding of dynamic systems than a graduate degree in differential equations. Of course, mastery of mathematical syntax helps quantify your work, but the fundamental principles behind most electrical circuits are as simple as riding a bike.

The connection between your direct physical knowledge and electrical-circuit operation shows up plainly in everyday engineering terminology. A power supply, for example, is "stiff" if you can "pull" a lot of current without "moving" its output. A large capacitor forms a "heavy" load. An electron "falls" into a potential well. These mechanical analogies depend upon shared cultural experiences from childhood. The experiences provide a rich tapestry of knowledge from which you can extract nuggets of wisdom later in life.

I asked my friend Bill Paseman what it takes to raise a great software engineer. He says that, under ideal conditions, the child would grow up in a house with large yellow footprints painted on the floor between the bed, bath, and kitchen. As long as the child keeps both feet centered on the footprints, all is well. If he steps off the path even once, the parents administer an electric shock sufficient to induce total blackout. The child then wakes up in bed, unable to recall what happened.

Bill says that this system, although obviously inhumane, would produce the greatest software engineer the world has ever seen. He's probably right, but it sounds brutal.

I'd rather break my arm.**EDN**

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