

Working

for the Win

A player runs the football toward the end zone. **Defenders** clear the way. Fans cheer him on. When the game ends, the roof over the field slowly closes.

This scene is fun. It also shows how science and technology are a part of football.

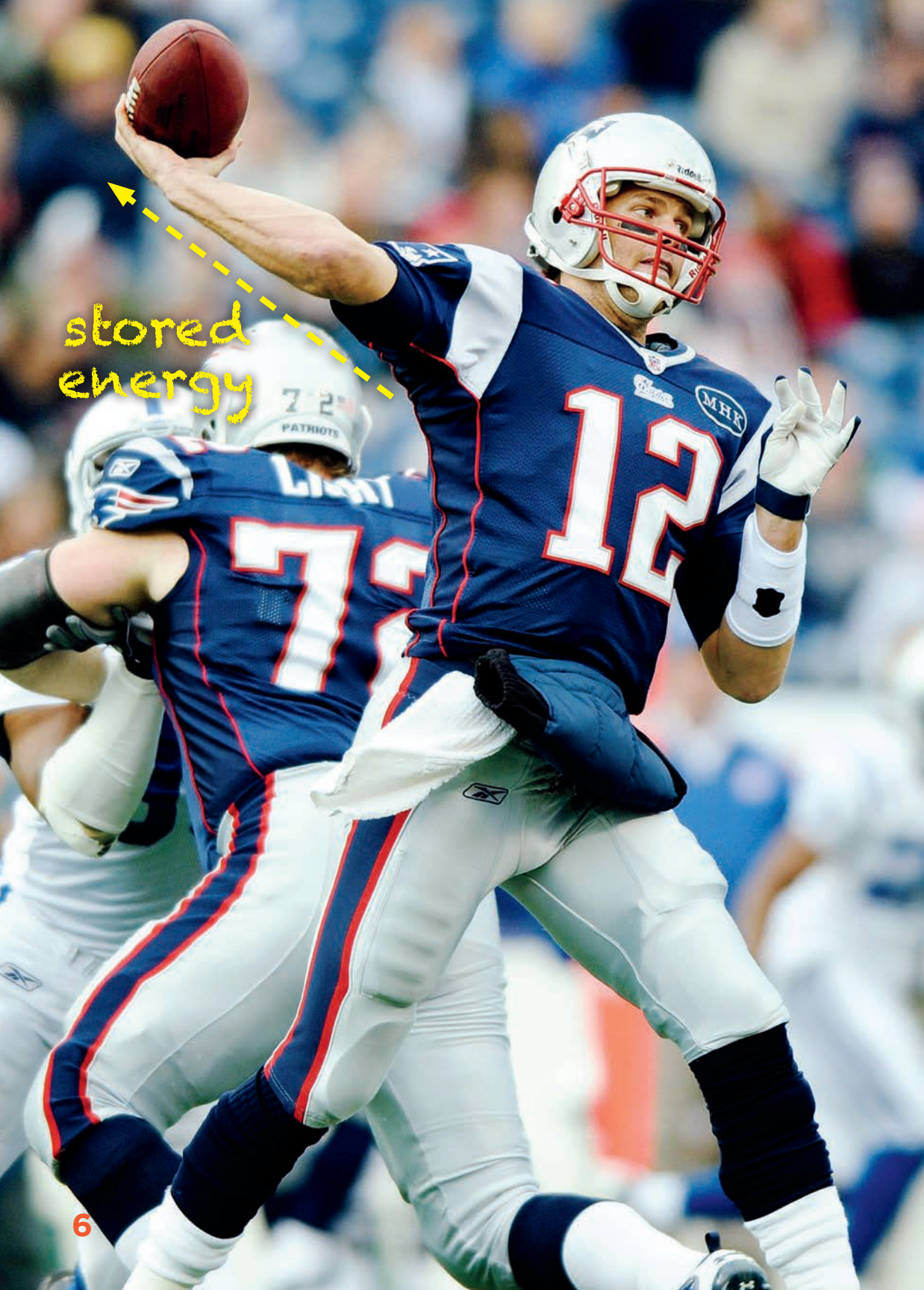


All Kinds of

Energy



Energy is how things change and move. Tom Brady brings his arm back to throw the ball. He has stored energy. He then uses that energy to change the ball's position. He throws a perfect spiral.



Potential and Kinetic Energy

Kicker Adam Vinatieri prepares to kick the ball. The ball isn't moving. Just like Brady's arm, the ball has **potential** energy. Vinatieri kicks. As the ball moves, it has **kinetic** energy.



J. J. Watt
needs up to
9,000
calories
a day.

That equals
about:

20
chicken breasts



50
strips of bacon



12
avocados



Food Energy

Football players tackle, catch, run, and pass. They need a lot of energy. When they eat, their bodies change food to chemical energy. That energy gets them up and running.



Game-Changing

Technology

Thanks to technology, football has become safer. In the early 1900s, players wore leather pads. Some wore soft caps.

Players now wear hard helmets and pads. Helmets have padding inside. They also have masks to protect players' faces.



HELMET

SHOULDER
PADSTHIGH
PADS

KNEEPADS

CLEATS

Engineered

for a Win

The Dallas Cowboys play at AT&T Stadium. It is the largest column-free room in the world. Columns help hold up roofs. Without columns, engineers had to find other ways to hold up the roof.



Room For Fans

Giants' and
Jets' MetLife
Stadium

82,500
seats

Cowboys'
AT&T
Stadium

80,000
seats

Panthers'
Bank of America
Stadium

75,419
seats

Seahawks'
CenturyLink
Field

68,000
seats

Steelers'
Heinz Field

65,500
seats

University of Phoenix Stadium

BY THE NUMBERS

19 million pounds
(8,618,255 kilograms)
weight of the field

234 feet
(71 meters)

WIDTH OF THE FIELD

403 feet
(123 m)
LENGTH OF THE FIELD

Grass Tech

The Cardinals play at the University of Phoenix Stadium. The roof there doesn't let in enough sunlight to grow grass. Engineers came up with a solution. The stadium uses grass grown on a large tray. Workers roll it outside between games.

75 MINUTES
time it takes to roll the field into place



Science in Football

Football has changed a lot over the years. Players and scientists have created today's exciting game. Technology will continue to change football. But one thing won't change. Science and math are always at work on the field.

calorie (KAH-luh-ree)—a unit used to indicate the amount of energy foods will produce in the body

defender (de-FEN-dur)—a player who works to stop the other team from scoring

kinetic (ki-NEH-tik)—relating to the movement of objects

potential (po-TEN-shul)—capable of becoming real

reflect (ree-FLEKT)—when light or sound hits a surface and quickly bounces off in another direction

retractable (ree-TRAKT-uh-buhl)—able to be pulled back

sensor (SEN-sor)—a device that detects heat, light, sound, motion, or other things

solar (SO-lur)—relating to the sun

vocal cords (VO-kul KORDZ)—the thin pieces of tissue in a person's throat that make sounds

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