Catcher of the Fly

BY JEFFREY KLUGER

Baseball, if you'll recall, was a game invented
to give schoolchildren something to do in the long
summer months, soldiers something to do in the long
days between maneuvers, and George Will something
to write about besides economic reform in Tajikistan. Recently, however, the
relationship between the sport and its spectators has grown more and more dys-
functional. And this past season, though teams have come up with increasingly imag-
inative ways to keep the fans in the stands
("The '95 Mets: No Pending Indict-
ments!")—millions simply decided to give
the whole nasty business a pass. • Grim
tidings at the turnstiles, of course, do not necessarily translate into equally gloomy
news on the field, and at stadiums around the country, excellent—if unwitnessed—
baseball continues to be played. Batters are still hitting balls into adjacent time
zones, pitchers are still throwing fastballs at speeds great enough to make their mass
increase, and outfielders are still snatching fly balls from the air with the nonchal-
ance of a chef plucking a can from a kitchen shelf.

Of all the skills a ballplayer needs to
make it in the major leagues, this ability to
intercept a fly ball might be the most re-
markable. How do outfielders regularly
manage such a feat of speed, grace, and co-
ordination? What is the subtle interplay
of timing, eye tracking, and naviga-
tional calculus that allows them to do the job with such bal-
letic ease? Why do they always pat each
other in unpattable places after they do?

The answers to at least the first two questions were provided this year by psy-
chologists Michael McBeath and Dennis Schaffer of Kent State University in
Ohio, and Mary Kaiser of NASA's Ames Research Center in Moffett Field, Cali-
ifornia. Working with nothing more com-
plicated than a couple of volunteer ballplayers and a few video cameras, the
researchers believe they have finally dis-
covered just how it is outfielders do what they do, at last explaining a skill that
made Reggie Jackson more famous than
Andrew Jackson, gave the magnificent
Mays so many magnificent Mays, and
made America—if only for a while—a
safe place to be named Mookie.

The first step in learning about Mc-
Beath, Schaffer, and Kaiser's work, of
course, was not to talk to McBeath,
Schaffer, and Kaiser themselves but to
spend some time in a major-league sta-
dium talking to the athletes for whom
catching fly balls is both calling and
career. For me, the
nearest big-league
venue was the New
York Mets' Shea
Stadium. All major-
league teams have
suffered a serious de-
cline in attendance
this year, but the
Mets, it appears, have
suffered more than
most. Earlier in the
season it was re-
ported that Fan Ap-
preciation Day had to
be canceled when the
Mets' fan—an 18-
to 24-year-old Cauc-
sian male believed to
answer to the name
Bob—could not be
located in time for the ceremony.

The day I visited, despite the forlorn
state of the stands, the Mets themselves
seemed enthusiastic, going through their
pregame workout with playoff-caliber in-
tensity. One of the hardest at work was
Brett Butler, a senior member of the ma-
ajor league's outfielding corps, and after he
finished his fielding drills I took a mo-
ment to ask him about his singular craft.

"A lot of variables go into fielding a
fly ball," he said. "The time of day is one
of the most important. If the game is at
night, it's relatively easy to see the white

Tracking a flying object? No need for radar
when you've got a Robinson or a Ruth.
ball against the black sky. If it’s during the day, it’s surprisingly easy to see it pop out against the blue. The only truly hard time to see the ball is twilight, perhaps because your eyes have a difficult time adjusting to such in-between lighting. Another factor in tracking a fly can be wind. Willie Mays, who used to play at Candlestick Park in San Francisco, taught me to study the outfield fences before I took the field. If there was a lot of trash blown up against the fence, it meant the wind was blowing out. If there wasn’t much, it meant it was blowing in."

Just as important as the wind and lighting, at least the way I’d always heard it told, is the ability of the fielder to gauge the likely trajectory of the ball the instant it leaves the bat. Some players appear to break in the direction of the ball’s flight from the very moment it’s hit, while only a few seem to wait until almost the last possible second before they begin to move. During my brief flirtation with organized high school sports, I adopted this more leisurely approach, often not sprinting off in the direction of a fly ball until I had taken the time to tap my glove, adjust my hat, and bake a Bundt cake to welcome its arrival. Former Met and Dodger and now Yankee Darryl Strawberry took this languid fielding style further still, and even today can sometimes be seen loping off in the general direction of a fly ball hit during the 1986 World Series. Surprisingly, according to Butler, such nonchalance may not be such a bad thing.

"It’s important to get a good jump on the ball," he says. "But you do have at least a little time before committing yourself. Sometimes it helps to count a full ‘one-one-thousand’ after a ball is hit in order to get a clear idea of which way it’s going to go. A second is a long time in a baseball game, but it takes a lot longer than that for the ball to get to you."

But if patience, a sharp eye, and little wind help explain how an outfielder manages to hie himself over to a fly ball’s general vicinity, they still don’t explain how he positions himself so precisely that he can snare the tiny three-inch-diameter sphere of horsehide in his ten-inch pocket of cowhide with a reliability bordering on 100 percent. When it came to explaining that degree of fielding precision, Butler—as well as some of his teammates—seemed to me as mystified as I.

"You just get a sense of where it’s going to fall," he said.

"You trust your instincts," Chris Jones, a rookie outfielder, offered.

"Beats me," said veteran Oriole and then-Met David Segui.

If this was the best the players could do, I knew science would have to carry the ball the rest of the way.

The puzzle of how a fly ball is tracked and caught had been explored before—as long ago as the 1960s—by a professor of aeronautics at the Cornell Aeronautical Laboratory in Buffalo, New York, who had come up with a theory known as the Optical Acceleration Cancellation model, or OAC. According to OAC adherents, an outfielder preparing to catch a fly runs along a path that cancels the apparent acceleration of the ball as gravity pulls it toward Earth. If the ball seems to be accelerating as it approaches, that means it’s following a path that will take it over his head. If it appears to be slowing, that means it will drop to the ground somewhere in front of him. Instantly—and unconsciously—the fielder gauges this apparent change in velocity and begins pedaling forward or backward in an attempt to neutralize it, so that he will be standing in exactly the right position to pluck the ball out of the air when it at last completes its plummet.

The OAC theory had one little problem: for trying to gauge how quickly something (other than your own body) is moving, your brain is a lousy accelerometer. Though nature has endowed some animals with an acute ability to track fast-moving prey, that gift is generally limited to creatures like hawks, falcons, pumas, and other high-speed hunters. Human beings, who these days do most of their hunting in the Lean Cuisine frozen entrée section, have no need for such perceptual precision.

"We’ve conducted tracking tests in laboratories in which subjects follow moving images across computer screens," says psychologist McBeath, "and we’ve found that until the velocity of the target changes by as much as 60 to 70 percent, people don’t notice that it’s speeding up or slowing down at all."

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Would a man concerned with RBIs give a second thought to OACs? I
To come up with more-illuminating answers, McBeath and his colleagues decided as the second part of their experiment to equip their subject outfielders with portable video cameras so that the researchers could see for themselves precisely what the players were seeing. The camera would be carried as unobtrusively as possible, mounted on a shoulder bracket so that it could move as the player's upper body moved, pointing in whatever direction he faced at a particular moment.

Positioning the players about 150 feet from the center of the infield, McBeath and his colleagues launched dozens of fly balls, each of which was tracked by a fielder's camera as he chased it down. When the tapes were examined, they once again yielded the unexpected.

"For virtually all the trials," McBeath says, "the trajectory of the ball as seen by the fielders was the same. Starting on the ground in roughly the center of the image, it appeared to rise more or less straight up, tilting to the right or left by no more than five degrees. Unlike a fly you see from the stands, however—which inscribes an arc on the way up and on the way down—the balls in our camera frame never came down, continuing to travel up into the air until they were caught at the very top of their flight."

A fly ball that flies forever without descending is, of course, an impossibility—at least without the aid of an extremely corked bat—and McBeath's fly balls were obviously doing no such thing. Instead, he explains, the unusual trajectory was the result of a common optical effect in which moving objects appear to rise as they approach the observer and fall as they retreat. The same phenomenon, McBeath explains, can be re-created with a simple saluting gesture.

"If you touch your fingertips to your forehead above one eye and then extend your arm straight out," he says, "your hand will appear to descend toward the center of your field of vision. If you bring it back to the saluting position, it will appear to rise. A fly ball growing larger and closer in a fielder's field of vision appears to rise constantly, too, even though it spends the entire second half of its flight moving in the opposite direction."

As long as a ball keeps rising in his field of vision, then, a fielder knows it's getting closer. The curved path the player follows as he races toward the fly appears to add to his accuracy in maintaining visual control. Viewed from the side, a ball that is going to fall short of the player doesn't appear merely to move slower—as it does all-but-indecently in the OAC model—but actually curves unmistakably downward. If it's going to fall behind him, it curves up. According to McBeath and his colleagues, as long as the player keeps the trajectory of the ball's image moving in a straight, climbing line—"nulling out" its curvature by means of his sidelong route—he is guaranteed to be in the proper position when it falls.

I wasn't the only one to wonder whether the players themselves would see things the same way as McBeath. Would an MVP agree with the theories of a Ph.D.? Would a man concerned with RBIs give a second thought to OACs? Frank Robinson, for one, doesn't. Robinson, a former outfielder for the Cincinnati Reds and the Baltimore Orioles, was elected to the Hall of Fame in 1982. A nine-man team can generate in a nine-inning game—and could they be paid to reach it already? Would it be possible for Lenny Dykstra to chew a plug of tobacco smaller than a Plymouth? Until these lingering riddles are answered, McBeath knows, his work will remain incomplete. Scientists may have figured out nine-tenths of the game, but as no less an authority than Yogi could tell you, that doesn't mean they understand the other half.