The team player

For Nasser Al-Rayes (BS ’17), who now plays professional basketball in his native Qatar, college was always equally about basketball and academics. He chose Caltech because he wanted a challenging and fulfilling academic environment. He chose to play basketball at Caltech with, he says, “the vision of leading the team to its first SCIAC [Southern California Intercollegiate Athletic Conference] title in over 50 years.” Although that did not happen, the team did shatter many program records during his tenure, including finishing fifth in the conference in back-to-back years.

Collaboration was a way of life for Al-Rayes at Caltech, where he pursued an option in mechanical engineering. “The very basic idea of collaboration, that two brains are better than one, has become very important to me, whether it’s a group project or seeking another perspective on a big life decision,” he says. “I always want to know others’ perspectives since there is a good chance someone else will have looked at a situation in a different way than I have and can offer a varying perspective that I would not have considered on my own.”

Surprisingly, he says, that sort of mindset is rare in professional basketball, despite it being a sport predicated on the ideas of teams and teamwork. “Many athletes are quite headstrong and don’t seek or want other perspectives, especially during times of adversity. I firmly believe that only when the ability to collaborate fails does adversity prevail. This is especially true when working on a team trying to achieve a common goal, like, in my case, winning a game.”

The other big takeaway from Caltech for Al-Rayes was the importance of grit. “I remember upperclassmen warning me that this place would make it very hard to maintain a high-level training regimen in basketball and that I could run the possibility of burning out,” he says. “I never got discouraged. I kept my nose to the grindstone. Caltech taught me to be tough.”

Al-Rayes’s dream of playing professionally began in high school and, after signing with an agent while at Caltech, he fielded interest and offers from teams in Denmark, Portugal, and Spain. Ultimately, he signed with the Al Sadd Sports Club in Doha soon after graduation, happy to be able to spend time back where he grew up but also preparing for his post-basketball life by taking online classes to continue his education. Al-Rayes admits the first few months of playing professionally were hard: his coaches expected more from him and were even harder on him than he was used to. Still, he says, “I never got discouraged. I kept my nose to the grindstone. Caltech taught me to be tough.”

The free safety

That ingrained ethos of hard work, of doing whatever it takes to get the job done, would benefit a Caltech alum in any profession. As Collin Murphy (BS ’13) found, it is particularly helpful in the grueling and unpredictable environment of a start-up company.

A software engineer for the Pasadena-based BallerTV, a subscription streaming service for amateur-athletics events, Murphy spends his days putting out fires large and small. Though he gets to show up for work close to noon and wear flip-flops in the office, the work is demanding, he says. When not refining apps or working on coding, Murphy might be traveling to Dallas to guide a team contracted to broadcast a game, designing an email template for a colleague, or reviewing statistics for the weekend’s events to make sure they make sense, “because sometimes data can be a little wonky.” He also meets with coaches, knows how to set up a camera, and, as he puts it, “pretty much just kind of a free safety covering anything that needs to be done.”
The digital storytellers

Arian Forouhar (PhD'06), who founded MOCAP Analytics in 2012 with fellow Caltech alumn Eldar Akhmetgaliyev (PhD '16), spent a lot of time "thinking of ways to apply the innovative technologies developed in the lab to sports" while pursuing his doctorate.

The Silicon Valley start-up (which was acquired by sports-data company Sporttrader in 2017) focused on making sense of tracking data on professional players. "MOCAP's mission was to become the world's best sports data storytellers," says Forouhar. "What the pair developed, explains Akhmetgaliyev, 'was a way to use machine learning and artificial intelligence to extract insights from tracking data.'"

In basketball, for example, they came up with a way to measure the quality of shot selection by estimating how much each team or player should have scored on those shots. By comparing actual scores with expected scores, they could estimate the amount of luck contributing to an outcome. MO-CAP developed algorithms to measure on-court chemistry between players, create video-game-style player profiles, and describe similarities between players based on skill or style.

They started with the Golden State Warriors and have worked with other professional teams as well as leagues, data collectors, and athlete-management systems to process data from thousands of games. In football, for example, they are using data collected from RFID tags underneath player shoulder pads to build the most accurate model to predict a run or pass before the snap.

"During my doctoral work at Caltech, we used novel imaging tools and techniques to gain insights into heart development," says Forouhar. "The interesting thing is that we gained these insights about the system by studying moving dots—flowing blood cells and pumping myocardial cells."

In our work at MOCAP and Sporttrader, we've been able to make sense of sports systems by studying other moving data—"in this case, player- and a ball."

The scientist-analyst

The field of sabermetrics—which involves the analysis of data gathered during a sports game as a way to improve player value and game strategy—has grown by leaps and bounds since the early 2000s, gaining national recognition with Michael Lewis's 2001 book Moneyball: The Art of Winning an Unfair Game.

A decade ago, when huge amounts of new data on baseball pitching—detailing everything from how the ball spins to how hard it is hit—became available, Ari Kaplan (BS '92) saw an opportunity to use that information to provide valuable insights to major league teams. "For me, the fun is doing something that hasn’t been done before, innovating," says Kaplan, who started his baseball career with a SURF project and then co-founded the sports-analytics company AriBall (now Scoutable). Kaplan, who has worked with two-thirds of Major League Baseball’s teams, was recently hired by the Chicago Cubs to launch and run their analytics and research-and-development departments, helping the organization to become World Champions in 2016 for the first time since 1908. He is now special consultant to the general manager of the Baltimore Orioles.

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In addition to being involved with player recruitment, Kaplan also developed software to automate scouting reports and to use data to enhance game strategy on the field.

Lately, Kaplan has dived into the vast amounts of information available on fielding: "I’m trying to understand what the meaning of that information is," says Kaplan. "It’s easy to get data, but it’s hard to put meaning behind it and take action on it." He also is looking at behavioral science and the intangibles of personality, and how people work together as teammates.

"I like to try to use that innovative spirit that I experienced at Caltech," says Kaplan. "It’s not just tweaking information at hand to be made available, it’s thinking of ways to apply that information to make something new." In 2012, with fellow alum Eldar Akhmetgaliyev, Kaplan founded Scoutable (now MOCAP Analytics) to "connect the dots across all the systems by studying moving data—flowing blood cells and pumping myocardial cells."

The data visionary

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