MAJOR LEAGUE BASEBALL IS A PROUD SUPPORTER OF THE SABR ANALYTICS CONFERENCE
Welcome!

Welcome to the ninth annual SABR Analytics Conference — at a new venue, the Renaissance Phoenix Downtown in Phoenix, Arizona!

In 2020, we have invited another top group of speakers from throughout the baseball industry, including MLB Network host Brian Kenny; T.J. Barra, Jason Bernard, Greg Cain, Ben Jedlovec, Clay Nunnally, and Daren Willman of Major League Baseball; Rob Arthur of Baseball Prospectus; Arizona Diamondbacks broadcaster Mike Ferrin and coach Jonny Gomes; Chicago Cubs mental skills coordinator John Baker; former San Francisco Giants GM Bobby Evans; former major-league infielder Rickie Weeks Jr., *SABRcast* host Rob Neyer; *Intangibles* author Joan Ryan; former SABR Board President Vince Gennaro; Meredith Wills of SportsMEDIA Technology, Seth Daniels of Rapsodo; and more. We’ll also have many research presentations with a wide-ranging, diverse group of speakers throughout the conference.

Each year, the top minds of the baseball analytic community gather to discuss, debate and share insightful ways to analyze and examine the great game of baseball. The event is a natural for SABR. The Society for American Baseball Research has a long and storied history with baseball statistical analysis, evidenced by the link between our name and sabermetrics.

This year’s conference will include a combination of guest speakers, panels, and cutting-edge research presentations — plus the unique Diamond Dollars Case Competition, in which undergraduate, graduate, and law school students from across the country analyze and present a real baseball operations decision. We will begin programming early Friday afternoon on March 13 and will run through Sunday afternoon on March 15. Lunch, which is included in your conference registration, will be served at noon on Friday — before the regular programming begins — and also on Saturday between the morning and afternoon sessions.

SABR’s long history in this area of baseball research, coupled with our mission of advancing the understanding and the knowledge of baseball, makes us the perfect choice to coordinate and host such an important baseball industry event.

Once again, we want to thank all of our attendees and our sponsors, which include Major League Baseball, Baseball Info Solutions, Rawlings, SMT, KinaTrax, Rapsodo, Blast Motion, Baseball-Reference.com, Inside Edge, Pocket Radar, and the following MLB teams: the Arizona Diamondbacks, Chicago Cubs, Cleveland Indians, Colorado Rockies, Los Angeles Angels, Los Angeles Dodgers, Milwaukee Brewers, San Francisco Giants, and Toronto Blue Jays.

You can visit SABR.org/analytics during and after the conference for complete coverage of the 2020 SABR Analytics Conference, including stories, multimedia highlights, and photo galleries.

Scott Bush, SABR Chief Executive Officer

*Cover photo: Courtesy of the Oakland Athletics*
Events Schedule

All programming will take place at the
Renaissance Phoenix Downtown, 100 N. 1st St., Phoenix, AZ 85004.

FRIDAY, MARCH 13

♦ 8:30-8:50 a.m.: Introduction to Diamond Dollars Case Competition
(Salon 2, 2nd floor)
SABR Chief Executive Officer Scott Bush will introduce the 2020 Diamond Dollars Case Competition, with presentations to follow.

♦ 9:00 a.m.-12:00 p.m.: Diamond Dollars Case Competition
(Salon 2, 4, 6, 8, 2nd floor)
Presentations of the Diamond Dollars Case Competition. See pages 21-22 for more information.

♦ 9:30 a.m.-6:00 p.m.: Registration open
Pick up your SABR Analytics Conference registration packet in the Grand Ballroom Foyer (3rd floor) of the Renaissance Phoenix Downtown.

♦ 12:00-12:45 p.m.: Lunch
(Grand Ballroom South, 3rd floor)
Analytics Conference registration includes lunch. Due to inclement weather, lunch has been moved inside.

♦ 1:00-1:05 p.m.: Conference Welcome: Scott Bush
(Grand Ballroom, 3rd floor)
SABR CEO Scott Bush will welcome attendees.

♦ 1:05-1:20 p.m.: The State of Analytics
(Grand Ballroom, 3rd floor)
Speaker: Brian Kenny, MLB Network.

♦ 1:20-1:35 p.m.: Diamond Dollars Case Competition winners
(Grand Ballroom, 3rd floor)
Scott Bush will announce the winning schools from the morning’s Diamond Dollars Case Competition.

♦ 1:45-3:15 p.m.: Research Presentations 1-3
(Grand Ballroom, 3rd floor)
RPs 1-3 will take place consecutively in a single session.
RP1—Alex Caravan, “Swing Adjustments”
RP2—Russell Eassom, “Strength of Players Faced — A WAR Analysis”
RP3—Ken Kauffman, “Beating Boudreau: Measuring Success Against the Shift”

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Events Schedule

♦ 3:30-4:30 p.m.: MLB Statcast Update
(Grand Ballroom, 3rd floor)

♦ 4:35-5:35 p.m.: Intangibles: How do Teams Evaluate, Value, and Encourage Team Chemistry?
(Grand Ballroom, 3rd floor)
Speakers: Author Joan Ryan; Jonny Gomes, Arizona Diamondbacks; Rickie Weeks Jr., former MLB infielder. Moderator: Vince Gennaro, former SABR Board President.

SATURDAY, MARCH 14

♦ 7:45-8:15 a.m.: Networking Coffee Talk, presented by Rapsodo
(Grand Ballroom, 3rd floor)
Grab a cup of coffee while we discuss career paths and network. Networking coffee talks are for industry executives and students looking to get into the game and will include industry job postings.

♦ 8:00 a.m.-5:00 p.m.: Registration open
Pick up your SABR Analytics Conference registration packet in the Grand Ballroom Foyer (3rd floor) of the Renaissance Phoenix Downtown.

♦ 8:30-9:30 a.m.: The Changing Baseball: What We Know, What We Think We Know, and What It Means (Grand Ballroom, 3rd floor)
Speakers: Rob Arthur, Baseball Prospectus; Meredith Wills, SMT. Moderator: Mike Ferrin, Arizona Diamondbacks.

♦ 9:35-11:05 a.m.: Research Presentations 4-6
(Grand Ballroom, 3rd floor)
RP4—Gregory Dvoroscik, Eno Sarris, and Joe Camp, “Using Clustering to Find Pitch Subtypes and Effective Pairings”
RP5—Patrick Brennan, “Measuring the Impact of Pitch Location on a Player’s Performance”

♦ 11:15 a.m.-12:15 p.m.: Technology Panel
(Grand Ballroom, 3rd floor)
Speakers: T.J. Barra, MLB; Scott Coleman, KinaTrax; Seth Daniels, Rapsodo. Moderator: Brian Kenny.

♦ 12:15-1:00 p.m.: Lunch
(Skyline Terrace, 5th floor)
Analytics Conference registration includes lunch.

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Events Schedule

♦ 1:15-1:45 p.m.: SABR Analytics Conference Award Presentation (Grand Ballroom, 3rd floor)
Sabermetric pioneer Sean Forman will be honored with the 2020 SABR Analytics Conference Lifetime Achievement Award. The winners of the 2020 SABR Analytics Conference Research Awards will be announced and presented.

♦ 1:45-3:15 p.m.: Research Presentations 7-9 (Grand Ballroom, 3rd floor)
*RP7—Mark Simon and Brian Reiff, “The Fielding Bible: Repositioning Defensive Runs Saved”
*RP8—Glenn Healey, “Modeling and Projecting Offensive Value Using Combined Hit-Tracking and Speed Measurements”
*RP9—Bill Leisenring, Josh Myers, Justin Orenduff, “Using Pitching Mechanics Analytics to Predict Injury and Improve Performance”

♦ 3:30-4:30 p.m.: Diamond Dollars Case Competition (Grand Ballroom, 3rd floor)
Encore presentation from the winning team of the Diamond Dollars Case Competition.

♦ 5:00-7:00 p.m.: Networking Reception with Baseball Industry Network (Skyline Terrace, 5th floor)
The networking reception will be an opportunity for conference attendees to meet some of our panelists, speakers, writers and others working throughout the baseball industry. Light hors d’oeuvres served with a cash bar.

SUNDAY, MARCH 15

♦ 7:45-8:15 a.m.: Networking Coffee Talk, presented by Rapsodo (Grand Ballroom, 3rd floor)
Grab a cup of coffee while we discuss career paths and network. Networking coffee talks are for industry executives and students looking to get into the game and will include industry job postings.

♦ 8:00 a.m.-1:00 p.m.: Registration open
Pick up your SABR Analytics Conference registration packet in the Grand Ballroom Foyer (3rd floor) of the Renaissance Phoenix Downtown.
Events Schedule

♦ 8:30-10:00 a.m.: Research Presentations 10-12
(Grand Ballroom, 3rd floor)
*RPs 10-12 will take place consecutively in a single session.*
RP10—Jason Themanson, “Examining Neural Activity to Pitches and Feedback at the Plate: Psychological and Performance Implications”
RP12—Alex Vigderman, “Fundamentals of Projecting Defensive Performance”

♦ 10:05-11:05 a.m.: Automated Strike Zone: Perspectives on the Technology and How it May Affect the Game (Grand Ballroom, 3rd floor)

♦ 11:15 a.m.-12:45 p.m.: Research Presentations 13-15
(Grand Ballroom, 3rd floor)
*RPs 13-15 will take place consecutively in a single session.*
RP13—Meredith Wills, “The 2019 Baseball, and the Unanticipated Consequences of Change”
RP14—Michael McBride, “Introducing SRC and OSWC: Using Game Theory to Assign Credit for Offensive Outcomes”
RP15—Scott A. Brave, “Can an Across-the-Board Increase in Minor League Pay Reduce PED Use?”

♦ 12:45-1:00 p.m.: Conference wrap-up
(Grand Ballroom, 3rd floor)
SABR Chief Executive Officer Scott Bush.

*Please note: All speakers and panelists are subject to change due to availability.*
Speakers/Panelists

Conference Welcome: Scott Bush
1:00 p.m., Friday, March 13, Grand Ballroom, 3rd floor

Scott Bush is SABR’s Chief Executive Officer. He joined the organization in 2018 after serving as the Senior Vice President for Business Development with the Goldklang Group. Since graduating from the University of Minnesota, Bush held positions with increasing responsibilities in both sports and media, including a five-year stint as Assistant General Manager for the St. Paul Saints, where he played a key role in establishing CHS Field in St. Paul, Minnesota.

The State of Analytics
1:05 p.m., Friday, March 13, Grand Ballroom, 3rd floor

Brian Kenny is a host at MLB Network, where he appears across the network’s studio programming, including “MLB Now” and “MLB Tonight.” He is also the author of Ahead of the Curve: Inside the Baseball Revolution. A 25-year national TV and radio veteran, Brian joined MLB Network from ESPN, where he was a “SportsCenter” anchor, host of the “Brian Kenny Show” on ESPN Radio and an Emmy Award-winning anchor for “Baseball Tonight.”

MLB Statcast Update
3:30 p.m., Friday, March 13, Grand Ballroom, 3rd floor

Jason Bernard is a Baseball Research Analyst at Major League Baseball, where he has worked since 2015. He is also an adjunct professor at the NYU-Tisch Institute for Global Sport. He earned a bachelor’s degree in sports management from St. John’s University and a master’s degree in sports business from New York University.

Greg Cain is Vice President of Baseball Data for Major League Baseball. Since joining MLB in 2011, he has been instrumental in the development of the Statcast system, leading to its league-wide launch in 2015. He holds a degree in Management Information Systems and Services from the University of Oklahoma.

Clay Nunnally is a Baseball Scientist at Major League Baseball. Between 2008 and 2018, he served as the Chief Operating Officer at Applied Physical Electronics. He holds a bachelor’s degree in physics from Abilene Christian University, a master’s degree in engineering physics from the University of Virginia, and a Ph.D. in electrical engineering from the University of Missouri.

Daren Willman is the Director of Baseball Research and Development for Major League Baseball, where he spearheads socially fan driven content featuring Statcast in his work. He developed the popular data websites BaseballSavant.com, MLBfarm.com, and NFLSavant.com. Previously, he was the lead software architect at the Harris County District Attorney’s Office in Houston.
Speakers/Panelists

Intangibles: How do Teams Evaluate, Value, and Encourage Team Chemistry?
4:35 p.m., Friday, March 13, Grand Ballroom, 3rd floor

Jonny Gomes is a coach in the Arizona Diamondbacks organization following a 13-year major-league playing career spent with the Tampa Bay Rays and six other teams. He made his MLB debut in 2003 and finished third in AL Rookie of the Year voting in 2005. He was a key contributor to the Boston Red Sox’s 2013 World Series championship team, appearing in 15 games that postseason and hitting a go-ahead, three-run home run in Game 4 of the fall classic. He helped the Cincinnati Reds win the NL Central division in 2010, appeared in the postseason twice with the Oakland A’s in 2012 and 2014, and received a World Series ring with the Kansas City Royals in 2015.

Joan Ryan is an award-winning journalist and author of five sports books, including the upcoming *Intangibles: Unlocking the Science and Soul of Team Chemistry* and *Little Girls in Pretty Boxes: The Making and Breaking of Elite Gymnasts and Figure Skaters*, a groundbreaking exposé that was named by *Sports Illustrated* as one of the top 100 sports books of all time. She spent more than 25 years with the *San Francisco Chronicle* and *San Francisco Examiner* and was one of the first female sports columnists in the country, covering every major sporting event from the World Series and Super Bowl to the Olympics and championship fights.

Rickie Weeks Jr. spent 14 seasons as a second baseman in the major leagues with the Milwaukee Brewers and three other teams from 2003 to 2017. He made the National League All-Star team in 2011 and hit two home runs for the Brewers in the NLCS against the Cardinals. He was drafted No. 2 overall by the Brewers in 2003 from Southern University, where he was the Golden Spikes Award winner and the Baseball America Player of the Year as a junior, and a two-time NCAA batting champion. He and his brother Jemile, who played six seasons in MLB, now run the Weeks Brothers Foundation to provide a platform for underserved youth through sports and education.

Moderator: Vince Gennaro is the former President of SABR’s Board of Directors and co-founder of the SABR Analytics Conference. He is the author of *Diamond Dollars: The Economics of Winning in Baseball* and host of a weekly national radio show, *Behind the Numbers: Baseball SABR Style on SiriusXM*. He is also the Associate Dean and Clinical Associate Professor of NYU’s Preston Robert Tisch Institute for Global Sport. He is a consultant to MLB teams and appears regularly on MLB Network. He is also the architect of the Diamond Dollars Case Competition series, which brings together students and MLB team and league executives and serves as a unique learning experience, as well as a networking opportunity for aspiring sports executives.
Speakers/Panelists

The Changing Baseball: What We Know, What We Think We Know, and What It Means
8:30 a.m., Saturday, March 14, Grand Ballroom, 3rd floor

♦ Rob Arthur is a freelance writer and data scientist whose articles have appeared at Baseball Prospectus, the Wall Street Journal, the New York Times, VICE News, and many other outlets. He is also a consultant for major-league teams. From 2015 to 2018, he was a staff writer at FiveThirtyEight, covering baseball and criminal justice. His research on changes in the seams of MLB’s baseballs helped explain the home run surge in recent seasons. He received his Ph.D. in evolutionary genetics from the University of Chicago.

♦ Dr. Meredith Wills is a Sports Data Scientist for SportsMEDIA Technology (SMT) and a contributing writer for The Athletic, whose independent research on the composition of the baseballs helped shed new light on the home run surge in recent seasons. In her spare time, she is also a knitting designer, working in partnership with both the Baseball Hall of Fame and the Negro Leagues Baseball Museum to create reproductions of vintage baseball sweaters. She received her B.A. in Astronomy and Astrophysics from Harvard University, and her M.S. in Physics and Ph.D. in Physics from Montana State University-Bozeman.

♦ Moderator: Mike Ferrin is entering his fifth season on the Arizona Diamondbacks radio broadcast team, as the pre- and postgame show host and secondary play-by-play announcer on Arizona Sports 98.7 FM and the Arizona Diamondbacks Radio Network. Since 2007, he has worked as a nationally renowned broadcaster on SiriusXM MLB Network Radio as the host of “Power Alley” and the on-site host in the MLB postseason and Winter Meetings. Previously, he was the play-by-play announcer for the Double-A Bowie Baysox and a sports producer and reporter for WGN Radio in Chicago.

Technology Panel
11:15 a.m., Saturday, March 14, Grand Ballroom, 3rd floor

♦ T.J. Barra is a Senior Baseball Data Quality Analyst at Major League Baseball. He spent 12 seasons in the New York Mets front office, most recently as Director of Baseball Research and Development and as Manager of Minor League Operations for seven years. From 2005 to 2007, he worked with the Washington Nationals, where he was the Coordinator of Scouting/ Baseball Analysis. He earned a bachelor’s degree in psychology from Wake Forest University.

♦ Scott Coleman is a Biomechanist at KinaTrax, and he has been working with motion capture technology for more than 20 years on the clinical and research side. He has also worked with the Department of Orthopedics at A.I.duPont Hospital for Children and Baylor University Medical Center, as well as Motion Analysis Corporation and Qualisys. He has a master’s degree in Biomechanics and an MBA from the University of Delaware.

♦ Seth Daniels is the Director of Sales and Marketing for Rapsodo, where he focuses on building data-driven technologies to provide players and coaches with real-time tracking solutions and helps develop market strategies for the North American market. He holds a bachelor’s degree in marketing communications and an MBA from Anderson University.

♦ Moderator: Brian Kenny
Speakers/Panelists

Automated Strike Zone: Perspectives on the Technology and How it May Affect the Game
10:05 a.m., Sunday, March 15, Grand Ballroom, 3rd floor

♦ John Baker is the Coordinator of the Chicago Cubs’ Mental Skills Program. He spent parts of seven seasons as a catcher in the major leagues from 2008 to 2014 with the Florida Marlins, San Diego Padres, and Cubs before moving into the front office. He holds the distinction of becoming the first position player in Cubs history to record a win as a pitcher in 2014. He played college baseball at the University of California at Berkeley and was drafted in the fourth round by the Oakland A’s in 2002 — a draft made famous by Michael Lewis’s best-selling book Moneyball.

♦ Ben Jedlovec is Director of Engineering, Data Quality, for Major League Baseball. Previously, he served as President of Baseball Info Solutions, managing the company’s day-to-day operations and data collection efforts. After his graduation from Rice University with degrees in kinesiology and statistics, he was hired as the first employee in the BIS Research and Development department. He is the co-author (with John Dewan) of Volumes III and IV of The Fielding Bible.

♦ Bobby Evans spent 25 seasons in the San Francisco Giants front office and served as the team’s Senior Vice President and General Manager from 2015 to 2018. During his tenure in baseball operations, he helped lead the organization to three World Series titles and qualify for eight postseason berths. The Giants were named Baseball America’s Organization of the Year in 2010, when they won their first championship since moving to San Francisco.

♦ Moderator: Rob Neyer is the host of the weekly podcast, SABRcast with Rob Neyer. He has written or co-written seven baseball books, including most recently Power Ball: Anatomy of a Modern Baseball Game, which won the 2019 CASEY Award. He was also the recipient of SABR’s Henry Chadwick Award, honoring baseball’s top researchers and analysts, in 2019. He has worked as a writer and editor for ESPN.com, SB Nation, and FoxSports.com, and he began his career as a research assistant for groundbreaking baseball author Bill James.
Research Presentations

SABR and Baseball Info Solutions are pleased to announce the research presentations that will be delivered at the ninth annual SABR Analytics Conference.

All presentations will be held in the **Grand Ballroom on the 3rd floor** of the Renaissance Phoenix Downtown and will be delivered consecutively in single sessions. Here is the schedule:

**Research Presentations 1-3**

**1:45-3:15 p.m., Friday, March 13**

*RP1-RP3 will take place consecutively in a single session*

RP1—Alex Caravan, “Swing Adjustments”

The influx of more technical measurement of baseball performance has led to more availability and freedom to refine the definition of hot and cold zones beyond its vague place in sabermetrics. In this paper we use the full extent of 2008 to 2019 MLB (PITCHf/x; Statcast) data to devise three separate methods to interpret hot and cold zones and see what sort of reliability each method has in teaching us about what’s behind a hot and cold zone, and what type of hitters are especially prone to hot and cold zones. This paper demonstrates several controls and rigors to enact when studying zone discretization, and points to the idea of higher swing percentages and Isolated Power (ISO) being important variables in determining a hitter’s likelihood of running hot or cold.

**Alex Caravan** (acaravan@gmail.com) is a quantitative analyst in Driveline Baseball’s R&D department, where he has co-authored multiple peer-reviewed studies through publications like PeerJ, individual research pieces on the Driveline Baseball blog, and worked on various software features both internally and externally (Driveline EDGE). He graduated from University of California Berkeley and now lives in Seattle, where he splits his free time recording the Driveline Research & Drinks Podcast, training for the next big Spikeball tournament with his roommate Anthony Brady, and searching the near metropolitan district for the cheapest bulk sushi roll deals.

RP2—Russell Eassom, “Strength of Players Faced — A WAR Analysis”

In the last few seasons we have seen some of the biggest variance in team performance. Last season the Minnesota Twins had a strength of schedule (SOS) of -0.5 and the Milwaukee Brewers had a 0.3 (SOS). Meaning there was a 0.8 run differential between the teams that the Twins played compared to the Brewers. I looked to see if this strength of teams faced translated down to the player level and it showed a growing variance in strength of player faced over the last couple of seasons. Given that both FanGraphs and Baseball-Reference WAR calculations for position players use a hitter’s wOBA performance and compare it against league average wOBA to generate batting runs, should we be accounting for strength of players faced like BRef does for its pitching WAR? This presentation will look into that and show the potential changes to players seasonal and career WAR values.

**Russell Eassom** is a Data Scientist for Algomi, a FinTech in the fixed income bond world. He is also a writer for Bat Flips & Nerds, a British take on baseball, where he uses skills learned as a data scientist to investigate the analytical side of baseball. His particular passion is defensive analysis of players and the shift.
Research Presentations

RP3—Ken Kauffman, “Beating Boudreau: Measuring Success Against the Shift”

Infield shifts against pull hitters have become ubiquitous in today’s game. However, little quantitative information is available on what types of hits are most effective against it. Using MiLB FIELDf/x ball- and player-tracking data ([x, y, z] coordinates at 20 or 30Hz), we develop “Beats”—a hitting metric that incorporates exit velocity, spray angle, and launch angle to determine offensive success against the shift. We find a contiguous range—or Beat Box—in which shifted batting averages are higher than unshifted ones.

Applying this new metric, we find that certain hit contact zones are more likely to produce Beats. We also look at Beats in the context of landing location and discover that launch angle plays a key role in the overall effectiveness of the shift.

Ken Kauffman is a Data Scientist for SportsMEDIA Technology (SMT), focused primarily on FIELDf/x and other baseball products. He received his B.S. in Industrial Engineering with minors in Statistics and Psychology from California Polytechnic State University (SLO), and he is currently pursuing his M.S. in Analytics at Georgia Institute of Technology. Prior to SMT, Ken worked at Zebra Technologies, where he worked on analytics projects for their RFID-based NFL player/ball tracking product.

Research Presentations 4-6
9:35-11:05 a.m., Saturday, March 14
RP4-RP6 will take place consecutively in a single session

RP4—Gregory Dvoroscik, Eno Sarris, and Joe Camp, “Using Clustering to Find Pitch Subtypes and Effective Pairings”

Using Statcast data, it is now possible to compare individual pitches across baseball based on characteristics like movement, velocity, and spin rate, which are all measurements that become obvious and meaningful even in a single outing. Various research has used those physical characteristics to classify pitches and define optimality in isolation. However, even an elite pitch has to be mixed with less optimal ones, especially for starting pitchers. Therefore, it is imperative to study the interactions between pitches to fully understand the best shape a particular pitch should have — how a pitch is paired with others can be as important as its own characteristics.

In this work, we find effective and ineffective subtype pitch pairings. To do so, we first attempt to understand how many different subtypes exist of a Statcast pitch classification by using k-means clustering of vertical and horizontal movement, velocity, and spin rate data for the entire 2016 and 2017 seasons. For both left-handed and right-handed pitchers, we find 30 subtypes within the 9 prominent Statcast pitch types. Using these subtype clusters, we consider resulting performance based on swinging strike rate, exit velocity, and extreme launch angles (popup and ground ball percentage). We then consider the effectiveness of each subtype (which we refer to as the reference subtype) when paired with each of the other 29 subtypes. Next, we consider the gain or loss for all pitchers who include both the reference subtype and paired subtype in their pitch arsenal from the average performance of the reference subtype.

As a result, we find that the average gain across all subtypes by the most effective pairing increases swinging strike rate by almost 2 percent, raises extreme launch angle outcomes by over 4 percent, and reduces exit velocity by more than 1 MPH — all amounts that are similarly lost by the worst pairing. We also present specific pitcher examples of effective and ineffective pairings. Our work has potential impact...
Research Presentations

on pitch design, player development, and scouting. For the former, teams could focus efforts on teaching young pitchers new pitch subtypes that have specific shapes according to the characteristics of the best pitches already thrown by that pitcher. For the latter, with very little in-game data, teams could seek to add pitchers that already possess effective pairings or avoid pitchers with ineffective pairings.

**Gregory Dvorocsik** is a junior at Wake Forest University majoring in mathematical business. He has worked with the school’s baseball analytics department creating scouting reports and other deliverables for the coaching staff to improve game preparation and player development. He is seeking an analytics internship or apprenticeship with a MLB team this summer.

**Eno Sarris** is a staff writer for The Athletic, where he specializes in pitching analytics. He takes the best public analytics findings to the players in the clubhouse to get their reactions. He has also been a contributor to FanGraphs, ESPN, MLB.com, Fox Sports, SB Nation, The Hardball Times, and others.

**Joe Camp** is an Associate Professor in Electrical and Computer Engineering (ECE) at Southern Methodist University (SMU). While his research efforts focus on wireless systems and drone communications, his hobby is baseball analytics and has collaborated with the Texas Rangers in recent years to give a SABR 101 talk to fans before games.

**RP5—Patrick Brennan, “Measuring the Impact of Pitch Location on a Player’s Performance”**

Pitch location plays a massive role in the performance of both pitchers and hitters. This is obvious. The issue is isolating and measuring the skill/luck/impact of pitch location and converting it into a single number is tough. For pitchers, the skill of locating the ball is defined by the term “command.” It’s an extremely integral part of scouting, but other than just using our eyes and making assumptions, there’s no mainstream quantifiable number for the important skill. In this research, quantifying command will be done by breaking the strike zone (and the space outside the strike zone) to detailed areas and evaluating league-average offensive production (wOBA) in each of those areas. Pitch type and pitcher/batter handedness will also be taken into account. With this information, each pitcher will be assigned a value and subsequently averaged out to create a final number.

**Patrick Brennan** is an analytical assistant for the baseball team at Kansas State University. In addition, he has published research at various sites, such as The Hardball Times, Beyond the Box Score, and Royals Review.

**RP6—Colton Cronin, “Scoring Reversals Revisited: The Mutability of MVP Voting”**

Each fall, the Baseball Writers’ Association of America announces Most Valuable Players for the American League and National League. To determine the MVP, a group of voters individually rank their top ten players, and then each player is assigned points based on each ranking; the player with the most points is named MVP. However, this point scheme has an interesting feature: The 10th-ranked player receives 1 point, the ninth player receives 2 points, and so on up to the second-ranked player who receives 9 points, but the first ranked player receives 14 points. Consequently, this method greatly rewards receiving first-place votes. But what if a different point scheme was used? In this presentation, I illustrate that MVP results are greatly impacted by the points scheme used. Using ballot results from all 58 NL and AL awards from 1990 to 2018, I apply 10 alternate point schemes to each election and find that not only would the rankings of one or more players change in all 58 elections, but also that in six of these elections, a different MVP would have been named. The results also suggest that, depending on the scheme, appearing on multiple voters’ ballots in lower rankings can be as important as receiving a few first-place votes.
votes. My goal of this presentation is not only to demonstrate an interesting facet of MVP voting but also to illustrate how, player performance and voter preferences aside, the construction of analytical systems can impact outcomes. It is perhaps unsurprising that the results of a subjective award like MVP are somewhat mutable, but the designers of any form of metric should be aware of how seemingly minor structural choices — like point schemes — can reflect the values of the metric’s designers and can influence who we perceive as the best.

Colton Cronin is a junior at Vanderbilt University (home of the 2019 College Baseball World Series champs!) He is majoring in mathematics and economics, and he is interested in how economic theory can examine what we consider “best” and “fair” in various competitive scenarios, including baseball.

Research Presentations

Research Presentations 7-9
1:45-3:15 p.m., Saturday, March 14
RP7-RP9 will take place consecutively in a single session

RP7—Mark Simon and Brian Reiff, “The Fielding Bible: Repositioning Defensive Runs Saved”

Baseball Info Solutions (BIS) has recently announced significant upgrades to the Defensive Runs Saved methodology. In particular, the Range & Positioning component of DRS (formerly known as the Plus/Minus System) is being replaced by the PART System. This presentation will highlight the new data and methodologies that allow us to explore some of the biggest trends and storylines arising from the new numbers.

PART stands for Positioning, Air balls, Range and Throwing. At its core, the system’s goal is to split a fielder’s contributions into its individual components. The PART System offers numerous additional advantages, the most notable being the consideration of positioning when assigning credit or debit to fielders and the ability to evaluate all plays, including ones in which the defense was shifted, which were previously excluded from DRS. The result is a better understanding of a player’s defensive performance.

Mark Simon is a Senior Research Analyst for Baseball Info Solutions. He previously worked as a researcher at ESPN, including nine years on “Baseball Tonight.” He now writes regularly about defense and other topics for The Athletic.

Brian Reiff is a Research Analyst at Baseball Info Solutions. He initially joined the R&D group as an intern during his senior year at Lehigh University and became a full-time member of the staff after graduating in May 2017.

RP8—Glenn Healey, “Modeling and Projecting Offensive Value Using Combined Hit-Tracking and Speed Measurements”

Outcome-based statistics for representing batter and pitcher skill have been shown to have a low degree of repeatability due to the effects of multiple confounding variables such as the defense, weather, and ballpark. Statistics derived from pitch and hit-tracking data acquired by the Statcast system have been shown to provide greater repeatability and predictive value than outcome-based statistics. The wOBA cube representation uses three-dimensional hit-tracking data to compute intrinsic batted ball statistics for batters and pitchers. While providing more reliable measures than outcome-based statistics, this representation also revealed that running speed is an important determinant of batter success. We address this issue by building a four-dimensional model for a batted ball’s value as a function of its physical contact parameters and
Research Presentations

the batter’s time-to-first speed. The model uses a Bayesian framework that employs a kernel method to generate nonparametric probability density estimates using a large set of sensor data provided by MLB. A cross-validation scheme allows the algorithm to adapt to the size and structure of the data. The result is a learning algorithm that generates a continuous mapping from batted-ball and time-to-first sensor measurements to run value defined using linear weights. Separate mappings are built to accommodate the effects of batter handedness. We show that the four-dimensional model provides more accurate predictions than the three-dimensional wOBA cube. Visualizations illustrate the dependence of batter performance on the 4-D measurement vector. We also present leaderboards showing the batters with the most significant gains and losses in offensive performance due to time-to-first speed. We show that the new model improves our ability to analyze other factors that affect batter performance including susceptibility to shifts, the ballpark, and the weather.

Glenn Healey is a professor of electrical engineering and computer science at the University of California, Irvine where he is director of the computer vision laboratory. He received the B.S.E. degree in Computer Engineering from the University of Michigan and the M.S. degree in computer science, the M.S. degree in mathematics, and the Ph.D. degree in computer science from Stanford University. Dr. Healey’s professional life is dedicated to combining physics, statistical signal processing, and machine learning methods for the development of algorithms that extract information from large sets of data.

RP9—Bill Leisenring, Josh Myers, Justin Orenduff, “Using Pitching Mechanics Analytics to Predict Injury and Improve Performance”

Baseball pitching imposes significant stress on the upper extremity and can lead to injury. In 2019, MLB teams spent over $390 million on pitchers while on the injured list for a total of 22,700 days missed. Many studies have attempted to predict injury through pitching mechanics, most of which have used laboratory setups that are often not practical for population-based analysis. This presentation will detail the findings of a study that sought to predict injury risk in professional baseball pitchers using a statistical model based on video analysis evaluating delivery mechanics in a large population. This model can be used to assess injury risk of professional pitchers and may be expanded to pitchers at other levels. The United Shore Professional Baseball League (USPBL) is an independent professional baseball league in metro Detroit, Michigan, and provides development opportunities for former college and minor league players to sign with an MLB organization. A systematized pitching development program derived from this analysis of pitching delivery mechanics has been implemented for all teams in the USPBL. The league also uses pitching mechanics analytics as one factor in making personnel decisions. This presentation will also discuss research findings from the USPBL including increased arm health, more innings pitched, increased velocity, and over 35 USPBL players signing with MLB teams since the league’s inception in 2016.

Bill Leisenring is the Chief Technology Officer at DVS Baseball. Bill has a M.S. in Electrical Engineering from The Ohio State University where he was a Center for Automotive Research Fellow. In 2009, he founded Control-Tec, an automotive data analytics company, that was later sold to Delphi in 2015. A spin-off from Control-Tec, Novation Analytics, was sold to IHS Markit in 2019. Leisenring is now responsible for product development and technology at DVS Baseball. His passion for baseball analytics started with studying baseball cards and The Sporting News during his youth and winning a regional high school essay contest with research on the physics of pitching.
Research Presentations

Josh Myers is a co-founder of DVS Baseball and serves as the Director of Statistics. Josh handles all data analytics and statistical analysis for DVS, including the pitching injury risk model. He also runs a successful statistical consulting business in the field of property tax assessment. Josh graduated from the University of Virginia in May 2005 with a B.S. in Physics and Mathematics, all while pitching for the varsity baseball team. He then earned a Master of Science degree in Statistics in January 2007, also from the University of Virginia.

Justin Orenduff is a co-founder of DVS Baseball and creator of the DVS Scoring System. The scoring system was built as a product of Justin’s pitching career, research into throwing patterns among pitchers, and hours of testing and validating the scoring system over a five-year period. Justin also serves as the Director of Baseball Operations for the United Shore Professional Baseball League. Before DVS, Justin co-founded and authored The Baseball Pitching Rebellion and was the Head Pitching Instructor at I.T.S. Baseball. Justin was an All-American pitcher at both George Washington University and Virginia Commonwealth University. He was a member of the 2003 USA Collegiate National Team and a 2004 first round draft pick of the Los Angeles Dodgers. After his playing career, Justin returned to Virginia Commonwealth University in 2009 and earned his B.S. in Business Management.

Research Presentations 10-12
8:30-10:00 a.m., Sunday, March 15
RP10-RP12 will take place consecutively in a single session

RP10—Jason Themanson, “Examining Neural Activity to Pitches and Feedback at the Plate: Psychological and Performance Implications”

In an effort to gain a competitive edge, teams have begun to examine hitters’ neural activity while they classify different pitch types. That research is useful in learning the time course and neural structures utilized in pitch recognition processes, but it does not account for the influences of pitch decisions and performance feedback on the psychology and behavior of hitters throughout a plate appearance or beyond. We can obtain valuable insight into hitters’ behavior and their psychology, including their expectations, attentional focus, and self-regulatory learning processes, by examining the dynamic distribution of pitch-by-pitch neural activity in conjunction with neural activity to the performance feedback hitters receive between pitches. To examine this topic, collegiate baseball players and non-players (novices) completed a computerized video task assessing whether pitches were balls or strikes. Following each pitch, hitters received feedback on the accuracy of their decision before the next pitch was thrown. Participants’ neural activity was recorded throughout the task. Results indicated relationships were present between college players’ neural activity to feedback, their neural activity to the pitches, and their performance in the task. These relationships were not present in the novices. This finding suggests that players associated the information received in their performance feedback to their processing of the task and ultimately their task performance. Neural activity can index many psychological processes that underlie task performance and self-regulatory efforts to improve behavior, including information evaluation, focused attention, and the monitoring and control of motor performance. Implications and uses for this research include assisting in scouting evaluations and player development procedures. Obtaining this level of psychological data, when combined with advanced analytic data and physiological data, could provide new insights into performance modeling and player development plans and evaluations.
Research Presentations

Jason Themanson is a Professor in the Department of Psychology and the Neuroscience Program at Illinois Wesleyan University. He received his B.S. in Psychology from the University of Illinois, his M.A. in Social Psychology from the University of Connecticut, and his Ph.D. in Kinesiology (with an emphasis in exercise psychology) from the University of Illinois. Dr. Themanson’s research utilizes both neuroelectric and behavioral measures to examine self-regulation and cognitive control processes during task execution.


The “hanging pitch” is a colloquial phrase used by media pundits and fans alike, although a precise definition does not seem to exist. Presently, hangers are mostly defined via the eye test, creating opportunities for subjective classification differences. Using Statcast pitching data from 2015-2018, this paper applies empirical techniques to propose an objective definition for a hanging pitch, and then uses that definition to analyze pitchers based on their hanging pitch tendencies. We start by modeling the probability that any given slider or curveball is barreled, given the pitch is put in play, and based on characteristics of the pitch. Based on the density of expected barrel rates returned by the model, we identify an expected barrel rate threshold, approximately 8%, and set that as our hanging rate criteria. We then use our classification to test if there are any internal or external factors that impact the probability of throwing a hanging pitch. We identify that pitcher usage plays a role; pitchers are less likely to throw hanging pitches the more they throw in a season, game, or at bat. We also identify that there is some season-to-season pitcher-specific correlation for giving up hanging pitches, although the driver of that correlation has yet to be determined.

Jeremy Losak is an Assistant Professor in the Department of Sport Management at Syracuse University, serving as a faculty member for the sport analytics bachelor’s degree program. He earned a Ph.D. in economics from Clemson University, where his research focused on the economics of sports, particularly baseball labor markets and daily fantasy betting markets. Jeremy is assisted by Gareth Jobling, originally from Cleveland, Ohio, who is a senior Sport Analytics and Economics double major with an interest in business analytics.

RP12—Alex Vigderman, “Fundamentals of Projecting Defensive Performance”

Thanks to the interest that comes from fantasy sports, yearly projections of hitting and pitching statistics are quite easy to find. Less attention is paid to the prospect of projecting defensive performance, especially considering the perception that defensive metrics are unreliable. This presentation will dig into the considerations involved in projecting defensive performance.

This presentation will discuss the stability of defensive metrics compared to offensive and defensive statistics, particularly focusing on the new version of Defensive Runs Saved featuring the PART System (featured in another presentation at this conference). Additional factors like player aging, the relative difficulty of different positions, and minor league performance will also be discussed, with some specific examples of how they come into play when evaluating a player’s future prospects defensively.

Alex Vigderman is a Senior Research Analyst at Baseball Info Solutions, where he takes proprietary baseball and football charting data and bakes it into exciting analysis. He was previously an intern with the Boston Red Sox in their analytics department after graduating from the University of Pennsylvania with a degree in Psychology and working in the healthcare software industry.
Research Presentations

Research Presentations 13-15
11:15 a.m.-12:45 p.m., Sunday, March 15
RP13-RP15 will take place consecutively in a single session

RP13—Meredith Wills, “The 2019 Baseball, and the Unanticipated Consequences of Change”

2019 holds a unique place in baseball history; never before has the ball undergone two dramatic changes in one calendar year. The regular-season ball showed an unexpected decrease in drag — lower even than 2017 — leading to a season in which any number of home run records were shattered. Then, in the postseason, the ball changed again, demonstrating drag that was both higher and more erratic.

Having previously looked at the baseball’s construction and how it may have contributed to the 2017 Home Run Surge, I performed similar studies on balls from the 2019 regular season and postseason. The regular-season ball showed a number of physical differences — including seam height, leather smoothness, and spherical symmetry — some of which were consistent with improved aerodynamics. As with the 2017 ball, the changes were consistent with standard manufacturing improvements. Meanwhile, the balls used in the postseason appear to have come from both 2018 and 2019 regular-season populations — a mix that could account for unpredictable drag variability.

The introduction of 2018 balls in the postseason may be connected to higher regular-season ball usage rates. In its first season with the Major League baseball, Triple-A exceeded projected usage by roughly 30%. In addition, MLB went through >25% more regular-season balls than in previous years. These increases appear to have depleted the 2019 surplus to the point that balls from previous seasons were required to supply the postseason.

Dr. Meredith Wills is a Sports Data Scientist for SportsMEDIA Technology (SMT) and a contributing writer for The Athletic, whose independent research on the composition of the baseballs helped shed new light on the home run surge in recent seasons. In her spare time, she is also a knitting designer, working in partnership with both the Baseball Hall of Fame and the Negro Leagues Baseball Museum to create reproductions of vintage baseball sweaters. She received her B.A. in Astronomy and Astrophysics from Harvard University, and her M.S. in Physics and Ph.D. in Physics from Montana State University-Bozeman.

RP14—Michael McBride, “Introducing SRC and OSWC: Using Game Theory to Assign Credit for Offensive Outcomes”

How should individual baseball players be credited for the collaborative outcomes of their teams? My work proposes a new framework for assigning individual credit that is theoretically grounded and easy to interpret and use by baseball specialists and everyday fans. I utilize the Shapley Value concept from coalitional game theory to create two new offensive credit measures: Shapley Run Credits (SRC) and Offensive Shapley Win Credits (OSWC).

The Shapley Value is a mathematically-defined solution concept that calculates a fair allocation of credit for the gains realized from team collaboration. When applied to runs, SRC partitions the credit for each run scored among the players who contributed to the production of that run in proportion to each player’s importance in the scoring. When applied to offensive wins, OSWC splits a win credit among the players in proportion to how much each helped the team outscore the opponent. Calculating SRC and OSWC is not trivial because it requires the play-by-play computation of counterfactual innings for each
Research Presentations

possible subset of the team members, and this in turn requires the explicit programming of human judgments about how each player’s offensive event would hypothetically impact all base-out states, not just the base-out state in which the event actually occurred. However, because the total SRC and OSWC will equal the number of actual runs scored and wins achieved, these measures have straightforward interpretations and require no technical sophistication to use once calculated.

This presentation introduces SRC and OSWC, illustrates their calculation, compares them with existing measures, and demonstrates one application, namely, the evaluation of MVP candidates. I calculate SRC and OSWC for all players in the 1990-2018 World Series, ALCS, and NLCS and identify which MVP awards went to players with the most (or not the most) impactful offensive performance. SRC and OSWC have other potential applications, including the estimation of how a player’s offensive contributions are hindered or enhanced by teammate quality.

Michael McBride is Professor of Economics at the University of California, Irvine and Founding Director of the Experimental Social Science Laboratory. He received B.A. and M.A. degrees from the University of Southern California and M.Phil. and Ph.D. degrees from Yale University. His research uses game theory and experimental methods to study conflict, cooperation, and strategic interaction.

RP15—Scott A. Brave, “Can an Across-the-Board Increase in Minor League Pay Reduce PED Use?”

In March 2019, the Toronto Blue Jays unexpectedly increased minor league pay across-the-board by 50 percent. We provide evidence that a potentially unintended byproduct of this policy change may be a reduction in the incentives for players to use performance-enhancing drugs (PEDs). Using the universe of minor league PED suspensions and a statistical model of minor league level assignments that accounts for endogenous player performance and PED suspensions, we show that a 50 percent increase in minor league-wide pay could reduce PED use by a significant amount. Our model suggests that much of this impact will occur among players near promotion and demotion thresholds, where a small boost in performance can have a significant impact on level assignment and consequently on pay as well. Moreover, much of the impact arises at the lower levels, where salaries are especially low and PED use is more common. A large across-the-board pay increase for these players reduces the relative return of minor league level progression thereby resulting in lower PED use. However, if MLB were to announce an across-the-board increase in minor league pay concurrently with the elimination of a large number of minor league affiliates, as has been recently reported, our results also suggest that any positive effect on PED use may not immediately materialize. In this case, a decline in roster spots at the lower levels where contraction is expected will likely only amplify the benefits to PED use for those players now at risk of falling into the independent leagues.

Scott A. Brave is a senior policy economist in the economic research department of the Federal Reserve Bank of Chicago, where his responsibilities include the releases for the Chicago Fed’s National Activity, National Financial Conditions, Brave-Butters-Kelley, Midwest Economy, and Detroit Economic Activity Indexes. Brave received a B.A. in economics with honors from the University of Chicago and an M.B.A. with concentrations in economics, statistics and finance from the University of Chicago Booth School of Business. His research on the competitive effects of performance-enhancing drugs and team synergy in major league baseball has been published in the Journal of Sports Economics and the Journal of Sports Analytics.
Diamond Dollars Case Competition

The SABR Analytics Conference is pleased to host the unique Diamond Dollars Case Competition. Undergraduate and graduate students from colleges and universities across the country will compete against each other by preparing an analysis and presentation of a baseball operations decision — the type of decision a team’s GM and his staff is faced with over the course of a season. The case was developed by Vince Gennaro, former president of SABR’s Board of Directors, co-founder of the SABR Analytics Conference, author of Diamond Dollars: The Economics of Winning in Baseball, and consultant to MLB teams. The Case Competition is the first national competition to be based solely on baseball operations issues.

Four- to five-person student teams will be asked to evaluate a baseball operations case problem. Once the student team has prepared its case, they will have the opportunity to present their analysis and recommendations to a panel of judges, which will include MLB front office executives. They will have a dialog, receive feedback and ultimately be evaluated based on the quality of their insights and analysis.

The competition will be divided by room, and winners will be recognized from each room. The competition will take place beginning at 8:30 a.m. on Friday, March 13 on the 2nd floor at the Renaissance Phoenix Downtown.

Participating schools
Friday, March 13

♦ Elon University (Elon, NC)
♦ Johns Hopkins University (Baltimore, MD)
♦ Maggie L. Walker Governor’s School (Richmond, VA)
♦ NYU-Tisch Institute for Global Sport (New York, NY)
♦ St. John Fisher College (Rochester, NY)
♦ Syracuse University (Syracuse, NY)
♦ University of Massachusetts-Amherst (Amherst, MA)
♦ Villanova University (Philadelphia, PA)
♦ Virginia Polytechnic Institute and State University (Blacksburg, VA)
♦ Washington University in St. Louis (St. Louis, MO)
Diamond Dollars Case Competition

Schedule of presentations
Friday, March 13

Opening remarks/introduction by Scott Bush at 8:30 a.m. in Salon 2 (2nd floor).
Results/winners announced at 1:20 p.m. in the Grand Ballroom (3rd floor).

Salon 2, 2nd floor
♦ Syracuse University #1, 9:00-9:30 a.m.
♦ Maggie L. Walker Governor’s School #1, 9:35-10:05 a.m.
♦ University of Massachusetts-Amherst, 10:10-10:40 a.m.
♦ BREAK, 10:40-10:55 a.m.
♦ St. John Fisher College #2, 10:55-11:25 a.m.

Salon 4, 2nd floor
♦ Villanova University, 9:00-9:30 a.m.
♦ Syracuse University #2, 9:35-10:05 a.m.
♦ Johns Hopkins University, 10:25-10:40 a.m.
♦ BREAK, 10:40-10:55 a.m.
♦ Virginia Polytechnic Institute and State University, 10:55-11:25 a.m.
♦ Maggie L. Walker Governor’s School #5, 11:30 a.m.-12:00 p.m.

Salon 6, 2nd floor
♦ Elon University, 9:00-9:30 a.m.
♦ Maggie L. Walker Governor’s School #3, 9:35-10:05 a.m.
♦ Syracuse University #3, 10:10-10:40 a.m.
♦ BREAK, 10:40-10:55 a.m.
♦ Maggie L. Walker Governor’s School #2, 10:55-11:25 a.m.
♦ NYU-Tisch Institute for Global Sport, 11:30 a.m.-12:00 p.m.

Salon 8, 2nd floor
♦ Maggie L. Walker Governor’s School #4, 9:00-9:30 a.m.
♦ St. John Fisher College #1, 9:35-10:05 a.m.
♦ Maggie L. Walker Governor’s School-A, 10:10-10:40 a.m.
♦ BREAK, 10:40-10:55 a.m.
♦ Syracuse University #4, 10:55-11:25 a.m.

Presentations marked in red will be delivered virtually via Zoom video link.
SABR Analytics Conference Research Awards

The SABR Analytics Conference Research Awards recognize baseball researchers who have completed the best work of original analysis or commentary during the preceding calendar year. Winners will be announced from 1:15-1:45 p.m. on Saturday, March 14. Here are the 2020 finalists:

Contemporary Baseball Analysis

- Meredith Wills, “Yes, the Baseball is Different — Again. An Astrophysicist Examines This Year’s Baseballs and Breaks Down the Changes,” The Athletic, June 25, 2019.

Contemporary Baseball Commentary

- Emily Waldon, “I Can’t Afford to Play This Game: Minor Leaguers Open Up About the Realities of Their Pay and the Impact on Their Lives,” The Athletic, March 15, 2019.

Historical Analysis/Commentary


Voting for the winners was conducted online at SABR.org, BaseballProspectus.com, FanGraphs.com, HardballTimes.com and BeyondtheBoxScore.com, with results weighted equally at 20%. Links to read the finalists can be found at SABR.org/analytics.
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