Tuesday, December 4, 2018

Technology to Take Racing into the Future

Speakers:
Dave Siegel: Chief Executive Officer, TrackMaster
Paul von Hippel: Associate Professor of Public Policy, Sociology, Statistics and Data Science, LBJ School of Public Affairs, University of Texas, Austin and Total Performance Data

Ms. Wendy Davis: Our next panel session, again, is going to — whoops, I've got to let them get their photos finished up here.

Our next session is about technology, and again, let me thank our session sponsor, Elite Turf Club, and the wrap-up party, the "Beers" to You Wrap Up party is sponsored by Sport-Tek.

That will be taking place immediately after — not before — this panel finishes up.

We've talked about how racing can move forward, what we can do for the customer — the current customer, our new customer, how we survive in this new environment where there are a lot more choices.

People can wager on horse racing and gaming.

What kind of technology is there to make our sport more appealing?

That's what these two gentlemen up here are gonna visit with you about today.

I'm gonna turn it over to you, and we can — I think this is, again, a very important topic of what we can do to make ourselves more competitive.

Thank you for being here, both of you.

Mr. Dave Siegel: Hello again. I am — can you bring up our slides, please?

Other set, please.

That's part — that's side B.

There we go. I'm here actually with my Equibase hat on.

The previous one was my TrackMaster hat on.

I'm gonna talk to you about GPS and GPS tracking of horses.

There are four key areas that the GPS system addresses, and I'm gonna talk to you about the tracks that have them and give you some more information about that.

Charting — so it's basically calling the chart that a human being does today — timing system, the generation of graphic based on the GPS positioning of those horses, and I'll talk to you about the use of workouts.

At Equibase, we have partnered with a company in the UK called Total Performance Data, and they are actually the engine behind the installations that we've done.

To best set this up and explain what the system kind of does — and then I'll go into detail — we're gonna run a short — it's four-minute long — video.

If you guys could put that on, please?

[Video playing 02:35]

I'm gonna talk about these four benefits quickly.

The first one that it mentioned in the video is creation of charts.

You should all pretty much know that when a chart caller looks at a horse at the top of the lane, you have this parallax problem.

It's pretty hard to know exactly where each horse is. Generally, it's — would be more accurate than a chart caller.

There's really infinite number of points of call because it's ongoing tracking, so we're not locked into the traditional points of call, and you can take deeper dives into the data.

If the device has an accelerometer in it, so you can measure stride length, how stride length is changing during the race, how horses are accelerating or decelerating during the race.

Obviously, you can compute things like distance traveled.

The second area to talk about is the infrastructure.

When the GPS system goes in, we have to go in and take a track survey.

It's basically measuring relative to the GPS system in the world where each point of call or various points of the race track is, measuring turf lanes, et cetera.

There's nothing that actually is on the track itself.

There are no wires.

There's no power requirement out there. What we have is, as the video mentioned, is a bay station up in the chart caller's office and also a computer down in the jock's room or somewhere near that where the trackers are being put on the horses in the saddle cloths.

You kind of see that position of a timing eye out there on one of the turf course — that's actually a live timing eye from Golden Gate Fields.

There's nothing to maintain out there.

There's a lot less things to go wrong. In particular with turf racing, when you have a rail moving in and out, you need more and more timing eyes for each position of the rail and for each distance.

In theory, you could need something like up to 80 timing eyes.

That's a pretty big maintenance task that doesn't have to happen with a GPS system.

As I said earlier, you can — there's really infinite places on the race track you could get data.

The third pillar, as I call it, for GPS is taking that data to drive graphics.

It could drive post-race graphics like a race summary that you can see and have instantaneous charts or anything derived from a chart, or you can derive real-time graphics.

This is still something that we are working on, and you've seen Trakus has the two-dimensional graphics that pass or a straight running order that would be a replacement for what the placing judges do today. Potentially, all the horses in a race rather than just the top four.

The last area that I'll talk about is workouts, and this is — technically speaking, workouts are actually really easy for us to do, but the integrity of workouts today with human clockers clocking multiple horses certainly — multiple horses is certainly questionable, and it brings into play the confidence that the public has in it.

When we track workouts, from our perspective, it's pretty much exactly like a race, so you can have infinite numbers of points of calls, same idea of acceleration, deceleration. You can look at times or speeds coming into the beginning of a workout.

You can look at speeds exiting a workout. We could even define the workout length by what the horse is doing, not necessarily what the trainer told us is going on.

As I said, there's software in place to measure the workouts.

You could potentially have this information available just to the trainer or to the public, but it's pretty transparent.

It would be a big improvement over a lot of, say, untrustworthy things that happen today with workouts.

We ran this test in September and October at Keeneland where not only we checked, test out the technical aspects, which were all fine, but the big challenges for workouts involved the logistics, actually getting the trackers onto the riders, making sure the riders pick them up, drop them off, and today, it's getting the identification of the horses in place which is also a very significant challenge and question for integrity today.

As the Jockey Club has mandated chipping of all horses coming up, similarly in the State of California, all horses have to be chipped by December 26th of this year.

That will make the marrying of the tracker to the identification of the horse much, much easier and not so open for people to play around with.

It's kind of a simple scan of the tracker, scan of the horse's neck, and now we know who the horse is.

We are currently the official timer at four racetracks — Laurel Pimlico will be the next one as part of the Maryland Jockey Club.

Woodbine and Golden Gate Fields — these are all current installations.

About six weeks ago, we installed at Mahoning and will be the official timing mechanism there on January 1st.

In the month of January, we'll be installing the GPS system at Penn Gaming.

It is also our plan to install between four and five additional race tracks in 2019. I just mention that.

The graphics is one of the key things that we are working on now to improve the accuracy of them.

We have the data to drive the graphics and third-party graphics houses like International Sound can take that data stream and put the graphics up as they like, but we are also working internally to be able to develop — excuse me, to deliver a finished product to the racetrack, so kind of a one-stop shop.

The data itself — which we would plan to make available to the public in some way, shape, or form — really gets valuable when we have enough critical mass from enough racetracks to be able to make it worthwhile for handicappers to look at.

Again, it's continuous data feeds, where every horse is, every point along the racetrack. You can kind of leave it up to the imagination of the users — and for third-party developers like Equibase or the Daily Racing Form on how they might wanna develop new products around that data.

As I said, our workout work is continuing.

Once those horses are chipped, which is the end of this year in California, we'll be running trials at Golden Gate Fields to try to work through the logistics to see that workouts can eventually become a reality.

That's all I have.

I will entertain questions after we're done.

I want to introduce you to Paul von Hippel, right?

Hippel, excuse me, who is a professor at University of Texas at Austin, and he's done more detailed work looking at the data that comes on the back end of the GPS system.

Dr. Paul von Hippel: Thanks.

In addition to the four areas that Dave highlighted, there's a fifth area, which is insight analytics, right?

There's a conversation that started in baseball and has now gone into basketball and tennis where much more detailed data is being provided to fans running these fantasy leagues and analysts like Nate Silver to provide more insights onto what makes a difference as to what athlete will win or lose an event.

I'm very excited about these GPS data because they provide insights into things that there have only been speculation about to date.

I'm putting a very simple equation — I promise there's only one equation in the presentation — maybe two — on the board.

This is not rocket science.

This is an equation that somebody could've come up with in the 19th Century, and it says that — why do some horses finish sooner than others?

Well, the finish time is a function of three variables.

It's the trip length, the distance that the horse runs around the track — which may not be exactly the posted distance of the race — it's the stride length — how long are the horse's strides, and let's say feet — and it's the number of strides that the horse is taking per second, the stride frequency.

This is a very simple relationship.

What we've lacked until this point is some insight into which of these variables really matters the most, what values are typical, and which of these variables really drives differences in finish times and determines who wins the race.

Let's start with stride length.

It's not like anybody's — nobody's ever thought about stride length before.

You do have claims that are made about stride length.

If you go to the Kentucky Horse Park, you'll see an exhibit claiming that Secretariat's stride was 24 feet long and John Henry's was 23 feet long, but the origin and the sample size that's behind those numbers is not entirely clear, and it's also not clear if those are extraordinary numbers because we don't have a lot of data on ordinary horses to compare them to.

People have tried to collect data on stride length.

People look at — what happens if I press this?

Yeah. People look at still photographs, and they'll look at, say, the stride angle, and from that, you could infer the length of the stride, but this is a very limited sample, right?

This is one stride that each of these horses took in some event, and they're not even actually necessarily shot at the same point in the stride, so this is a very small and possibly non-representative sample, and it's not even a great measure of what it is.

You can do better things.

There are a few old studies where veterinarians will take a group of horses — including Riva Ridge and Secretariat — down to a track, have them run workouts at various paces, and then go down and measure the distance between steps on the track.

That's great.

It's not under racing conditions.

It's a relatively small sample of horses, but it's something.

Then you can look at videos of typically famous horses and famous races is when people bother to do this, and from those, you can, let's say, count the number of strides that a

leading horse like American Pharaoh or Secretariat takes between furlong posts and you can develop some inferences about stride length and stride frequency from those.

These are all options for stride length.

For stride frequency, you only have these options.

The still photographs don't do you much good.

It's not gonna do you much good for stride length anyway, and this is basically where things stood until this wonderful new geolocation data arrived.

On trip length, also, there's a lot of interest in trip length.

One of the reasons people care about post position is that it's predictive of how long a horse goes around the track, so horses that start from an outside post will predictably take a longer trip around the track than horses that start from an inside post.

Then you have these colorful trip notes that you're — wonderful trip notes from Mine That Bird's triumph going down the rail to win the 2009 Kentucky Derby, but it's hard to put numbers on these, right?

How many extra feet does a horse have to run if it starts from the outside post, and how many fewer feet did Mine That Bird run for having gone to the rail when he did?

I was thrilled when Will Duff Gordon, who you saw — president of Total Performance Data — shared with me these data — he shared races on — he shared data from over 2000 races, over 20,000 starts, run at Laurel, Golden Gate, Wolverhampton.

I'm just gonna scratch the surface of this data, both in terms of what I'm doing analytically and in terms of the part of the sample that I'm using.

I'm gonna look at 123 mile-long races that were run at Laurel Park in Maryland in 2007, 2018.

Here it is.

These are stride lengths, trip lengths, finish times, and stride frequencies on over 1,000 horses — not just a few famous horses at the Kentucky Horse Park.

This data's now collected routinely where this technology is in place.

If you look, for example, the finish time — this is — you see the average finish time in a mile race at Laurel is about 100 seconds.

Standard deviation is 2.7, so that means the coefficient of variation — which is the standard deviation relative to the mean — is about 2.7 percent.

The difference between a fast time and a slow time in these races is about three percent.

Well, the difference between a fast time and an average time's about three percent, and the difference between a fast and a slow time's about six percent.

You see the trip length.

You might remember that there are 5,280 feet in a mile, but not every horse goes exactly that distance.

The average distance traveled in these races is about 5,297 feet with a standard deviation of 20 feet.

The coefficient of variation is quite small, less than half a percent.

Then down here, we have the stride length in feet.

The average stride length is 23 feet which is what John Henry's accredited with at the Kentucky Horse Park, so you see that's not necessarily an extraordinary number, and 24 feet is on the long side, but there are a lot of horses in these races that can do 24 feet.

If that was really Secretariat's average stride length, it wasn't the reason that he got such extraordinary results.

The coefficient of variation on this is about four percent.

Then over here, stride frequency, where the average stride frequency is about 2.3 strides per second, standard deviation is less than a tenth of a stride per second.

The coefficient of variation again is about three percent.

The first thing I notice here is that the variation in trip length is really not enough to explain much of the variation in finish times.

The finish times has a coefficient of variation of three percent.

The trip lengths have a coefficient of variation of 0.3 percent, so that can't be where the action is.

That's gotta be the least important variable, but let's have a look.

We can look at — directly at the bivariate relationships between these variables.

My students tell me that this is a lot of information to present in one slide, but I hope you'll bear with me a little bit. Let's look.

This is a set of scatter plots.

Let's look at the upper left scatter plot here, which is finish time.

The times are along the horizontal axis running from looks like 90 to 120 seconds, and then the stride length running from a little more than — about 22 feet to about 26 feet.

Is this laser pointer still working?

You don't see anything on the screen, do you?

Well, that's a shame.

Okay.

Laser pointer's not working.

Basically, there's a strong negative relationship between the stride length and the finish time.

It's about a negative 0.7 correlation for those of you who are keeping score at home.

It's the strongest relationship on this screen.

There's also a negative relationship between stride frequency and finish time, so if you've got faster strides and longer strides, you tend to have shorter finish times.

It makes sense.

There's practically no relationship — no visible relationship between the trip length and the finish time — or between trip length and the other two variables.

If you look at the upper right scatter plot — oh, there we go.

It's working again.

If you look at this one here, you see there's also a tradeoff where there's a negative relationship between stride length and stride frequency, so the longer the horse's strides are, the fewer strides it can take per second.

There's a tradeoff.

You see this with — you see this in human racing, also, with Usain Bolt, for example, who's got long legs and a long stride but he takes fewer strides than competing racers do, which is why he typically comes from behind — or did before he retired.

You can put all these — so those are the bivariate relationships.

We wanna look at a multivariate relationship.

Here, we've got some standardized regression coefficients.

You can see which of these variables predicts most the outcome — the finish time of the race.

Stride length gets the strongest coefficient at 1.44, and it's negative because the longer your stride is, the shorter your race time is.

Strides per second is next at about 1.2, and then trip length has a standardized coefficient of just 0.14, means it's about one-tenth as important as stride length.

When these data became available, there was some speculation about being able to relate trip length to finish time.

We can do that.

It turns out, it's not the most important variable.

The most important variable is stride length followed by strides per second.

By the way, I think Will Duff shared with me this — oh, there's a couple of things we can do.

We can correlate trip length to post position.

It turns out post position does predict trip length, and that in these races, at least, that seems to be the primary reason why post position is important for the outcome of the race at all.

Post position has a relatively small effect, and it's because it influences trip length primarily.

It'd be important to look at the consistency of stride length and stride frequency, so you might think from these results that you just want a horse with a long stride, but to what degree stride length is maintained through different parts of a race and from one race to the next is not clear.

The same is not clear for stride frequency.

That could be looked at.

Also, looking at that picture of Barbaro with is 105-degree stride angle worried me a little bit.

It'd be important to look — and you could do that by linking these data to this — let's say the equine injury database.

It'd be important to look at whether stride length — In addition to being correlated with race — with winning races — is also correlated with soundness of the horses.

Then finally, let me just show you something that Will shared with me.

This is the typical six-furlong race at Newcastle, and this relates to the question of being able to do mid-race betting which is an important application of these technologies.

You can see that the winning horse — who's the blue curve — really only pulls away from the losing horse — the last-place horse, who's the orange curve — around two-thirds of the way through the race.

You can take that — this is a nice business application.

You can take that it's about two-thirds of the way through a six-furlong race and not just before the gate goes up.

That's it.

Thank you.

Mr. Dave Siegel: Okay.

There we go.

Before we close out and Wendy comes up to dismiss everybody from class, are there any questions for either of us? Yes, Jeff.

Audience Speaker 1: I'm interested if you think there's any difference in the effectiveness of your system you described between quarter horse racing versus Thoroughbred versus harness?

Mr. Dave Siegel: We've only done harness racing as a test at Woodbine.

We did it to see if the Equibase system could coexist with Trakus to make sure that we would not interfere with them and they would not interfere with us.

There was no cross interference, but the charting was fine.

Harness racing will probably be much, much, much easier to do.

You don't have the turf courses.

Horses are further apart, front to back, side to side, so there'd be absolutely no issue there.

I'd see no issue for quarter horse races, either.

Obviously, we have one little difference in that — if I know my racing right — the timer starts when the gate goes rather than from a starting pole, and that's something that we have in the works to develop — basically a start timer on the gate.

Obviously, the races are timed differently, as I understand them, in quarter horse races that we use the gate and the photo finish to do that.

I should also make clear that GPS is not designed to replace photo finish.

The accuracy is not there.

It will never be there to get down to the millimeter, so this doesn't — no replacement there.

It's just for the — for all the other points on the racetrack.

Audience Speaker 1: Would you imagine that charting a quarter horse race would be less effective in this scenario because you have to include the photo finish time, and that's too hard to chart?

Mr. Dave Siegel: No.

The way the system would work — no, the times that are recorded by the official time — whatever that is — so in this case, photo finish are the ones that would go into the chart, and I would think it would be ultimately more effective because in the quarter horse race, that charter is looking — every horse is basically coming down the stretch, and I know they get used to seeing those odd parallax angles and adjusting for it, but I think it will get better.

The other thing is with respect to GPS accuracy — people ask me that question all the time — it'll only — it's pretty darn good right now, and it'll only get better, just like our own personal experiences with our phones over the last five years.

It has improved, and it will just continue to get better, but it'll — I don't believe I'll be alive when it gets better to see a half an inch that you need the photo finish camera for.

Audience Speaker 1: Sorry to monopolize your time, but one more question.

Mr. Dave Siegel: That's okay.

Audience Speaker 1: Do you think this is a better system than the parallel — the perpendicular camera?

Mr. Dave Siegel: From the perpendicular camera?

You mean the beams for timing system?

Audience Speaker 1: At Los Alamitos, for example, they have cameras looking straight across the rails, and they use those cameras in their charts.

Mr. Dave Siegel: The answer is no.

Those cameras, which are effectively like photo finish cameras — those will be better than using a GPS at that particular point.

Obviously, GPS can do it anywhere along the racetrack, but no, the camera eye will be better than GPS will be.

Audience Speaker 1: Thank you.

Mr. Dave Siegel: Sure.

Yes?

Audience Speaker 2: Did the research at the mile races at Laurel look at pace?

In other words, was the stride length and the average number of strides longer or shorter at any point of the race rather than the last part?

Dr. Paul von Hippel: Yeah, that's something I can look at next.

As I said, I was just scratching the surface today.

The data are there to do that.

Mr. Dave Siegel: Yeah, that's one of the huge pluses about GPS with the general question is that there's all this data there that's kind of left up to the imagination how one might be able to mine it and use it.

Yes?

Audience Speaker 3: Do you imagine that the footnotes on the charts will eventually be automated from the data and the tracking, or will there still be a human to write them?

Mr. Dave Siegel: Yes.

Yes, is the answer to both sides of that question.

We can absolutely imagine more comments coming from the GPS that the human eye may not be able to see, but there are absolutely comments that the — only the human eye can see.

The best extreme example of that is the rider dropped his whip, so I don't know how the GPS will ever be able to pick that one up.

But there may be changes in speed that it would be worth noting in the chart.

We do not see chart callers being replaced.

We do see that the actual charting part of the race that they're doing to be replaced, and that would also have the effect of potentially enhancing the commentary because they can be focused on those kind of actions and not the position of the horse.

Audience Speaker 3: Thank you.

Mr. Dave Siegel: Sure.

Audience Speaker 4: What's the snapshot of time in the data that you're getting?

If you've got a two-minute race, how many points of data do you get?

Mr. Dave Siegel: I believe that the sampling rate — it's either 10 per second or 5 per second.

I don't remember which of those two.

If we use 10 — let's use the high end of 10 per second in a 100-second race, you have 1,000 readings per horse.

It's actually more than that 'cause you actually can see what they do before the race and after the race, if that mattered.

Obviously, before the race doesn't matter that much, but — in a Thoroughbred race.

In a harness race, it would matter, and in a workout, it matters a lot, but then after the race, if that matters to somebody — and I can't tell you if it does or not — you can see how the horses run out and slow down after a race.

I wouldn't say it's infinite, but it's more sampling than anybody would know what to do with.

Dr. Paul von Hippel: The data that I have only has a sample every half furlong, and that's already plenty of information to mine important insights from.

Mr. Dave Siegel: We record that data, as I said, 5 or 10 times a second.

What we actually process right now and that we're holding kind of inside of Equibase — and what we pass along to the racetrack, and if you watch the screen of the cumulative times, it's every half a — every half furlong.

Question?

Audience Speaker 5: What's the actual accuracy right now for the GPS location?

What's the tolerance?

Mr. Dave Siegel: I had a feeling I'd get that question.

I'm gonna quote it exactly.

Let me get that answer for you.

I kinda know it off the top of my head, but I wanna be certain I get it correctly.

We express it in standard deviations.

I'll just convert that into human talk.

We're accurate within a fifth of a second 95 percent of the time, and we're accurate within two-fifths of a second 99 percent of the time.

That's current.

I will also tell you — since I'll be asked — how do you measure that?

Well, we measure it two ways.

The lousy way is against the existing timing systems when we are there and the existing timing system is there.

That happens when we first install.

That's the lousy way because we don't know that the existing timing system is right.

The best measurement is against the photo finish camera, and while that's not timing the race, we're measuring the time between — we measure the time between the first horse and the second horse, the first horse and the third, the first and the fourth, and so on and so forth.

We'll call it the interval times.

That's what the photo finish camera measure — and we believe — with perfect accuracy.

Both of these sets of numbers kinda hold up there.

These will be the worst numbers we will ever see because, as I said, chip technology and more satellites and other things that we are doing with the data — like potentially using multiple trackers on a given horse — will only improve from there, but this is where we are right now, today.

Audience Speaker 5: Then I have a follow-up.

You mentioned having an interface to a TV department.

What does that look like?

Is that just a data stream?

Mr. Dave Siegel: You're probably — you're beyond my technical abilities, but yes, there is a stream — 'cause I've seen it at Golden Gate Fields — of data packets that come out and flow into the TV department.

Specifically, at Golden Gate, it's split.

It goes into the tote room which is the only way, at Golden Gate Fields, to get it on an old-fashioned tote board which has light bulbs.

It's not an LED display.

Then it goes out over the television network.

I know the newer tracks that have basically a video board, and it's just kind of the single feed of data.

Audience Speaker 5: Well, just combining that with the accuracy, and as it gets better, I'm thinking one of the applications could be to automate the judges' process where the judge — so the horses cross the finish line.

You could automate the process which is now done by hand where the judge keys in the order of finish. I'm just wondering how accurate that is so that there's minimal changes.

Mr. Dave Siegel: You would never use it for that.

You would use the photo finish camera for that.

Yeah, because the photo finish is, I don't know, a thousandth of a second accurate.

It's incredibly accurate, and that's what would be used.

He also mentioned the value of in-race betting.

You kind of saw some of the derivative data that he got from that.

One of the big uses is to be able to do real-time updates of horses' positions, not just watching, but even in theory, like updated speed ratings, rates of acceleration or deceleration or actually showing a race where the video is not available, so you're showing images of where the horses are, and that we know that there are locations like that — not so much here — and I know the TPD folks are particularly keen on that for — we don't do

in-race betting here — at least, not yet — but where they have fixed odds in doing that, they're — they see big potential for it.

Wow, this is great. Yeah.

Audience Speaker 6: This is more of a curiosity thing, and **[unintelligible 34:50]**, but I noticed that in the video that the video **[unintelligible 34:57]** but when you listed the tracks that are currently using the system **[unintelligible 35:03]**.

Mr. Dave Siegel: That's correct.

We used Arlington Park as a secondary test site when Golden Gate Fields was closed.

They closed down during the summer, and we wanted to continue testing there, so I think we will return to Arlington Park, but we — these other tracks were higher in demand than Arlington Park was for us, and we will get back there.

Audience Speaker 6: So, you are going back there?

Mr. Dave Siegel: They have not formally told us, but we wanna go back there, and — but I — frankly, I expect all the tracks to eventually adopt — whether it's not our technology, it will be somebody's, but the fact that Equibase is industry-owned and the monies that we earn go back to the industry and the racetrack, we would think we would be the preferred vendor for — not only from that purpose that we think we have with our partners at TPD, the best system that's out there.

We have not — while there are other systems in Europe and we've read and heard about them, we haven't seen anything that out-performs us, and TPD has, I believe, eight working racetracks and 16 installations in the UK now.

Even a lot of our improvement comes from stuff that they do over there, and a lot of the testing is happening over there. Sure.

Audience Speaker 7: Using a six-furlong race as an example, and good horses, at what point of the race was the horses' maximum stride, and how sustainable is that maximum stride **[unintelligible 36:33]**?

Mr. Dave Siegel: That's all yours.

Dr. Paul von Hippel: The stride length?

Yeah.

The results that I showed you related to velocity.

I'm gonna look at stride length in part two of the articles that I'm gonna write.

Sorry I don't have a ready answer for that.

Mr. Dave Siegel: Any other questions?

Yeah.

Audience Speaker 8: A lot of professional sports teams have started with the GPS tracking to help prevent injuries.

Do you see this as a future tool in this area of horse racing to prevent horses from catastrophic —

Mr. Dave Siegel: My answer is honest, which I have no idea.

I've never even considered that or thought about it.

If you could elaborate on how one might even think about using that, I'd be interested.

Audience Speaker 8: I know the doctor had brought this up previously in his presentation, and maybe there's things that are picked up in strides or in workouts and so forth that maybe would alert the track that — or something in that regard, but something that would be the indicator to say, maybe this horse shouldn't be on the track **[unintelligible 37:47]**.

Mr. Dave Siegel: Yeah.

One of the things that I could see — so now, I'm purely speculating — is that besides — so our system — the position of the horse in real time is being tracked by GPS and then being transmitted for real-time data flow by radio — some kind of radio wave — at the racetrack.

To the extent that you could put other devices on the horse and still piggyback off that same information — you heard earlier that the chips in the horse is gonna have temperature.

You'd be able to — with a scanner — have a temperature readout.

Now, that's not connected to the GPS transmitter right now, but you would think other kind of vital signs, that if there is a device — and I'm sure there are devices that you can strap onto the horse to do that — then I would imagine that you could piggyback off the data collection system that we have.

That's what we're doing.

We're collecting this data, that they could have those vital signs of respiration rate, heart rate, blood pressure, temperature, those things transmitting. Maybe then that would be an area that could be used — but that's pure speculation on my part.

Audience Speaker 8: But even with that data, if you had a baseline idea of what a horse's average stride was, and suddenly, for the first time, it was shortening its stride far below it ever had before, that horse might go on the vet list.

Mr. Dave Siegel: That could be.

These are great other uses of GPS.

I'll have to go amend my slides and add a fifth bullet point.

Yes?

Audience Speaker 9: The tracks that use your system — is your system used for the final time of race?

Mr. Dave Siegel: Yes.

Yes, other than — it hasn't happened yet, but as Jeff asked, it would not be used in quarter horse races that way.

Audience Speaker 9: You go out to the hundredths place?

Mr. Dave Siegel: Yes.

Audience Speaker 9: Which the accuracy's only go up to a fifth?

Mr. Dave Siegel: The numbers that I said, yes.

Audience Speaker 9: How can you tell when the photo finish?

Mr. Dave Siegel: No, I'm saying the finish — the actual finish and the placement of the horses — that's done by the photo finish camera.

It is not determined by the GPS system.

The timing is.

If you're asking could the time — could the final time be — actually be off by the fifth of a second, yes, it could be, but it could be today, okay?

I'll also make the point that when you talk about final time in horse racing — since there's — nobody bets on it, is what's the relevance of a fifth of a second when you have things like turf rails moving in and out, different circumference of track — you have run-ups into — even into a constant dirt track that is being estimated at its distance, and its distance is changing.

The fact that a horse runs a two-minute mile and a quarter — even on a specific track — and another horse — to me, this part is what's the kind of ridiculous part if you're gonna

go by time — and another horse runs 1:59 and nine-fifths, and you see that the run-ups were different, you really are comparing apples to oranges in there.

Audience Speaker 9: Okay.

It doesn't seem like you should go out to the hundredths place, then.

Maybe you should go out to the tenth place.

Mr. Dave Siegel: Well, even the current systems that go out to the hundredth place — they are not — we know from looking at the data — they are not absolutely perfect.

Dr. Paul von Hippel: If I can paraphrase what you're saying, the — you may be able to get the distance between horses as they finish accurate to within a hundredth of a second.

It's just that the actual finish time will be accurate to within a fifth.

Mr. Dave Siegel: No.

Dr. Paul von Hippel: No?

Mr. Dave Siegel: No, that's not correct.

The current variance is, as I stated — whatever it is — to the actual time — however that is measured, if you just knew what it was, 95 percent of the time, it will be within a fifth of a second.

Audience Speaker 10: Is some of that difference because of the location of the GPS?

Mr. Dave Siegel: Well, one thing is — of course, this is why, when you ask, "Could GPS ever be used," we can't put GPS on the end of the horse's nose.

Doesn't look very nice.

That might be a slight — no, it's just the built-in, inherent variation of a GPS signal.

The technology is not there today to get it down to, you know, an inch.

The question really becomes — and yeah, this can be a hot topic, is what's reasonable for the variation in timing.

What I'm asserting is that right now, the timing systems — they're not exact, and some of them are way whack off, particularly in turf races where rails move, and they don't have infinite numbers of timing eyes.

Right away, they're making some kind of mathematical estimate about, "Oh, we'll take a second off the race because we moved the rail out and we moved the start line up."

This is actually a significant improvement in that.

Then you look at the number of races, and I said, "Well, if you had 80 timing eyes where timing eyes don't work," either they're broken or they fog up. Golden Gate Fields has this problem in particular, so — is it — I won't sit here and say GPS is exactly perfect.

It's not like Olympic timing systems.

In fact, I was watching the Olympics — the last winter Olympics, and I watched a downhill ski thing where — I don't know who it was, Longines or some fancy-dancy million-dollar timing system and saw errors.

None of them are going to be perfect.

This one is really, really good.

Great questions.

Any others?

Wendy, are you here?

There you are.

Thank you very much.

[Applause]

Ms. Wendy Davis: Thank you very much, and special thanks to Paul, who I understand traveled with freshly-broken ribs to be here with you.

On behalf of the faculty, staff, and students of the Race Track Industry Program, thank you so much for being here.

We look forward to hosting you right here back at Lowe's Fantana Canyon next year, this same week in December.

We'll see you then.

Enjoy, "Beers" to You.