

Harvey Miller Uses New Mobilit...tand Cities and Transportation

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SPEAKERS

David Staley, Harvey Miller, Eva Dale, Janet Box-Steffensmeier

- E** Eva Dale 00:00

From the heart of the Ohio State University on the Oval, this is Voices of Excellence from the College of Arts and Sciences, with your host, David Staley. Voices focuses on the innovative work being done by faculty and staff in the College of Arts and Sciences at The Ohio State University. From departments as wide ranging as art, astronomy, chemistry and biochemistry, physics, emergent materials, mathematics and languages, among many others, the college always has something great happening. Join us to find out what's new now.
- D** David Staley 00:32

Harvey Miller is the Reusche Chair in Geographic Information Science in the Department of Geography, and the Director of the Center for Urban and Regional Analysis (CURA) at The Ohio State University College of the Arts and Sciences. He serves as Chair of the Mapping Science Committee of the U.S. National Academies National Research Council. He is on the leadership team of the Sustainable and Resilient Economy Discovery Themes group, and is an Affiliate Faculty of the Translational Data Analytics Institute at Ohio State. Welcome to Voices, Dr. Miller.
- H** Harvey Miller 01:05

Thanks for having me.
- D** David Staley 01:06

So, please start with a definition of geographic information science.

H

Harvey Miller 01:10

Right. Well, we're experiencing a revolution right now in geography, which are geographic information systems, which is taking data that we map normally, just using a paper map, or parchment, whatever we've used traditionally, and putting this into information systems, into computers and databases. This allows us to visualize the data creatively, flexibly, interactively, and also run analysis and simulations of data that otherwise would be locked on paper maps. Geographic information science is the science behind these systems. How do we represent the earth digitally, how do we convey information about the Earth in digital form, how do we analyze and model these data? That's geographic information science.

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David Staley 01:55

So your research might be located at the intersection between geographic information science and transportation science. What does this mean?

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Harvey Miller 02:04

It is, yes. Fundamentally, I'm a transportation geographer, I'm interested in how we move peoples, things, and information across space. The intersection of geographic information science and transportation is in the area of mobility analytics. So we have all kinds of new mobility data we've never had before: from GPS, global positioning systems, from smartphones, from social media check-ins, from sensors in the built environment. And we now have fine grained data, how people and objects move through cities. So mobility analytics is an attempt to build techniques that can help us make sense of this, really, flood of data we're receiving about cities and transportation systems.

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David Staley 02:47

What sorts of insights can we draw from these various data?

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Harvey Miller 02:50

Well, two things. One is that... one's not surprising, that people are very territorial. People, people relate, you know, this is something that's that's really not surprising, how much time people spend really at home and work and in between those places. But also, what's very surprising, is the complexity of travel outside that regular pattern. So we're only used to handling modeling that simple pattern, commuting patterns, for example, are people going to work in the morning, and then coming home in the evening? And that's really where we spend most of the last century in transportation science, is trying to model that major flux everyday in a city. Well, city transportation problems are much more complicated than that, human activity patterns are much more complex than that. So we're really seeing some surprising behaviors that we haven't seen before.

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David Staley 03:40

D David Staley 03:40
Such as...?

H Harvey Miller 03:41
Such as, well, one is that cities are very segregated. That's one thing that, you know, we always knew they were segregated residentially, one of the things that we're discovering from a social perspective, is that people really live separate lives throughout the entire day. Their, their movement through space is really completely separate from each other. People experience different cities, fundamentally.

D David Staley 04:04
Different how, segregated in what ways?

H Harvey Miller 04:07
Well, it's segregated socially, as I mentioned, and ethically, of course. You know, people live and work in different locations, but also where they spend their time outside of their homes and work are very different places as well. So really, the type of Columbus that you and I experience versus somebody else, you know, let's say somebody who lives in the Linden area or Hilltop and has a different socio-economic circumstance, their daily experience of Columbus is very different than what we experience.

D David Staley 04:36
So you work with a perspective known as time geography.

H Harvey Miller 04:41
That's correct.

D David Staley 04:42
Tell me what time geography refers to time. It sounds like a fascinating concept.

H Harvey Miller 04:46
Oh, it is, it's fascinating. It's actually not mine, originally, it dates back to a Swedish geographer named Torsten Hägerstrand who worked in the mid-20th century, and he conceptualized time geography as looking at where people spend time basically, literally where. Where in geographic space do people allocate time? And he was also concerned about the use of transportation and telecommunication technology and allowing people to trade time for space

in conducting daily activities. One of the main focuses of time geography is looking at the constraints that time and space impose upon people: where and when they can spend time, how are they constrained, and where they can spend time. And as a transportation scientist, I'm often more interested in that than I am in trying to predict where people will actually travel. I'm more concerned about their accessibility. I want to make sure people have access to jobs, health care, you know, social support services, friends, opportunities, education. So I'm concerned about relaxing the constraints on people's spacetime accessibility more than I am about predicting exactly where they're going to travel, I'm just trying to give people the widest range of choices when it comes to pursuing opportunities in their environment.

D David Staley 05:59

So the title of a recent article you just authored is "Measuring the impacts of new public transit services on space-time accessibility". Can you tell us a little bit about your findings here? My understanding is you were using Columbus, or at least, transit in Columbus as a kind of case study?

H Harvey Miller 06:16

Yeah, as a matter of fact, we were looking at the CMAX in northeast Columbus, and one of the...

D David Staley 06:20

CMAX, it's a bus line, correct?

H Harvey Miller 06:22

Right. It's what COTA likes to call "bus rapid transit", running along Cleveland Avenue from downtown up to the northeast. It's actually bus rapid transit light because it doesn't have its own dedicated bus lane. A European would not recognize it as bus rapid transit, but here in America, we call it bus rapid transit. But what we looked at is we have now have new transportation data available, and this is a good example of... COTA now publishes their detailed transit schedules, using something called the General Transit Feed Specification, GTFS. And that is basically a way that Google provided a data standard for transit agencies to share their data and make it available for apps. So COTA publishes their detailed transit schedules and also publishes the real time location of buses, and we've been working with both datasets. In this particular paper, we looked at the scheduled services for the new CMAX, and we wanted to know whether or not it would improve access to jobs and health care, which was a major concern in Columbus establishing CMAX. They explicitly wanted to improve the social and health outcomes in northeast Columbus, which is a very deprived part of the city. And what we found out is that the combination of CMAX along with the transit system redesign, which is COTA's reworking of the entire schedule to make it more simple, but also more frequent and longer span service - we found that it dramatically improved access to jobs and health care, in particular, during evening and weekend hours when they weren't providing regular bus service.

D David Staley 07:56

What's that mechanism look like? How does a change in the transit system effect these outcomes?

H Harvey Miller 08:02

Well basically, it gives people more reachability. So if we have better transportation services, people, the trading of time for space becomes more favorable. So it simply requires less time to acquire more space when we have good transportation services. That's exactly what COTA did, they basically enabled better trading of time for space for mobility in that part of Columbus.

D David Staley 08:24

That's a fascinating concept: trading time for space.

H Harvey Miller 08:27

Right.

D David Staley 08:27

Unpack that for us.

H Harvey Miller 08:29

Okay, yes. All mobility involves trading time for space. So when I'm walking, I have a certain speed, which allows me to trade time for space. Biking improves that, driving, public transit: all these things are basically transportation technologies that allow me to trade time for space in different ways. One of the things that we're facing right now in most of our cities is how we have, our cities are becoming so crowded that the trading of time for space have become problematic, because of congestion. So one of the things we're trying to do is to try to provide alternative mobility technologies that allow a much more flexible, resilient, and ultimately sustainable trading of time for space and mobility. So that's basically what, what something like a public transit system does. It's not just the speed of the buses, but it's where the bus stops are, the frequency of service, the timespan of service, how early in the morning, how late in the evening does it run. All of that gives people different abilities to trade time for space and movement and accessing things such as jobs and health care, that varies by day of the week, you know, and also time of the day.

D David Staley 09:41

This sort of analysis, say prior to GIS, this sort of analysis wouldn't have been possible? Could you've done this with paper maps?

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Harvey Miller 09:49

Very difficult, very difficult. That's why I mentioned you know, Torsten Hägerstrand, the founder of time geography.

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David Staley 09:55

Was he working with paper maps?

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Harvey Miller 09:56

Yes, he was working with paper maps and one of his PhD students created the first ever computer simulation in this area, which is way back in 1970 when computers were very, very crude compared to what we have nowadays. And that's what makes this conceptualization so amazing, is that he was, at least, Hägerstrand was, 50 years ahead of his time in conceptualizing a way of thinking about human mobility and activity in space and time, that we were half a century away from having the data and technology to actually collect and analyze these data, this type of mobility. So I basically have come along and now, in this modern era, and part of my research agenda is to reinvent time geography to make it suitable for the type of data and technologies we have available nowadays.

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David Staley 10:41

So the article we were just talking about uses Columbus as a case study, and Columbus is becoming sort of a hub or a center for experiments, I guess, in transportation. We know that Columbus won the Smart Cities Challenge, for instance, from the Department of Transportation. And this Smart Columbus initiative, just recently, I think, yesterday or late last week, launched its first autonomous shuttle, the Circuit, downtown. So, I'm interested in your assessment of the implications of autonomous vehicles for mobility or livability or sustainability.

H

Harvey Miller 11:14

I'm a big fan of autonomous vehicles.

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David Staley 11:16

You are? Okay.

H

Harvey Miller 11:17

A big fan, but a cautiously optimistic fan.

D

David Staley 11:21

Alright, explain what that means.

H

Harvey Miller 11:22

I'll explain why I'm optimistic, then I'll explain why I'm cautious. The optimism is that, well, humans did not evolve to drive. We are terrible drivers, we are. I mean, 44,000 Americans died in automobile accidents last year, and we don't even like to call them accidents anymore, because the vast majority were actually due to human error, they were preventable. So that's, you know, what, roughly it's over 100 people a day dying in automobile crashes, I should say, across the country. If this happened in any other form of transportation, like commercial aviation, for example, we'd be outraged, if planes were crashing everyday like that. But somehow we accept it because it's, it's automobiles. So we've gotten used to it. This is one of the biggest things that autonomous vehicles can solve, is that we take humans out of the equation of driving and relegate to a machine, which may not be perfect, but already can do better than humans in many circumstances. Not all of them, but many of them. So that's why I'm a big fan of autonomous vehicles, is just the safety thing. Cities are very dangerous because of automobiles. But the other reason I'm optimistic about autonomous vehicles is because they allow us to share cars, and one of the big problems we're facing right now in sustainable transportation, besides the energy and efficiency of reliance on personal automobiles, is that they're also very inefficient when it comes to space. They take up too much room in our roads, they take up too much room to be stored and parked in cities. So if we could share automobiles, then that allows us to use that resource much more efficiently and much more effectively. So that's why I'm optimistic, I think it solves two problems that we have with automobiles in our contemporary society. Why am I cautious? What I'm cautious about is that it's going to reinforce automobile dependence. In many ways, I think that a lot of proponents of autonomous vehicles are overselling the technology.

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David Staley 12:02

How so?

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Harvey Miller 12:52

They seem to think that it's going to solve all of our transportation problems, and it's not. It's physically impossible for everyone to own autonomous vehicle and to use them like we use automobiles nowadays. There's too many people crowding into too many small spaces on our planet, which are cities. We are now an urban species for the first time in our history as humans, this century we've become majority urban, and by the end of the century, we'll have 10 billion people on the planet - 80% will live in cities, and we cannot accommodate 10 billion vehicles inside cities, they simply cannot fit. So my fear is that autonomous vehicles will actually make driving even more favorable, that people will say, oh, you know, now I have... I've seen designs, for example, of like, autonomous vehicles where the inside are like mini hotel rooms, or mini offices. I've seen one case where I've seen like an exercise bicycle design, where you actually can pedal on an exercise bicycle while being driven to work. This is wonderful for multitasking, but on the other hand, it can make longer commutes even less

onerous than they are now, and that means cities will sprawl, will have more traffic, will have less physical activity, will have more separation, more social isolation. So that's the fear of autonomous vehicles, is that they will basically reinforce this automobile-dominated transportation system which is common in most U.S. cities.

J Janet Box-Steffensmeier 14:53

I'm Janet Box-Steffensmeier, Interim Executive Dean and Vice Provost for the Ohio State University College of Arts and Sciences. Did you know that 23 of our programs are nationally ranked as top 25 programs with more than ten of them in the top ten? That's why we say the College of Arts and Sciences is the intellectual and academic core of the Ohio State University. Learn more about the college at artsandsciences.osu.edu.

D David Staley 15:18

So, with autonomous vehicles, Columbus is clearly experimenting with different kinds of travel, different modes of travel. Aside from autonomous vehicles, do you have a preference, or are there other things that we could be experimenting with?

H Harvey Miller 15:32

Right. What we really need is a seamless, integrated, multimodal transportation system.

D David Staley 15:37

Okay, what does that mean?

H Harvey Miller 15:38

That means that it's not just one mode, like automobiles, it's actually several modes, and we can operate them in a intermodal way that we can transfer from mode to mode easily. So the modes I'm talking about are walking and biking for short distances, public transit for longer distances, and using automobiles to solve the first mile/last mile problem for public transit.

D David Staley 16:01

So what does that mean, first mile/last mile?

H Harvey Miller 16:04

First mile means getting people to and from public transportation, and we can't put high frequency long timespan service everywhere, it's just impossible. But what we can do is figure out ways of getting people to public transit lines easily and efficiently, and that's where

automobiles should come in. They often come in for special purpose travel, like for example, people with special needs, perhaps older people, perhaps you're parent shuttling your kids and their sports equipment around - then driving makes sense. But ultimately, what we want is a balanced transportation system where most people do not use an automobile for most trips. I'm not saying all people for all trips, we're not talking about banning cars, we're talking about using them a little more carefully, a little more thoughtfully. I like to say that automobiles are like beer or ice cream, that they're great, they're fun, but in moderation. And right now we have binge automobility in our American cities, and that's a major problem.

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David Staley 17:02

So, this city seems to be swarming with scooters. How do you feel about scooters as a mode?

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Harvey Miller 17:08

I'm in favor of scooters as well, because I think scooters can substitute for automobile travel. There is a question about whether or not they're substituting for walking and biking, are people who would normally walk and bike using scooters instead? The evidence is still not clear, but it seems that a lot of people are using it to substitute for driving. And most importantly, if we provide technologies such as scooters, and also electric bikes, bike share, people can think twice about whether they even need to own a car in the first place, especially if you live in the center city. I think the moves that Columbus made to regulate scooters is great, keep them off the sidewalk, and they're also forcing the scooter companies to put them in deprived areas, which I agree, as a social goal. I think what we're not doing though is providing space for them. One of the reasons why scooters are problems is because we allocate so little space to anything but automobiles. If you think about it, the most contested resource in our contemporary cities is our shared mobility space. When you look at a road like High Street, look at the corridor from sidewalk to sidewalk as public space, which it is, it's our shared public mobility space. Look at how much of that is devoted towards automobiles and how little towards walking, biking, and scooters. That's part of the reason why people have trouble with bikes and scooters is because, basically, drivers are eating the cake and the rest of us are fighting over the crumbs. If we would allocate space for these alternative forms of mobility, they wouldn't be a nuisance, and in fact, they'd be much more effective. I feel the same way about public transit, by the way, we should be talking very seriously in this city about dedicated bus lanes, to have our public transit system work more efficiently and be more attractive to people.

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David Staley 18:54

Light rail, that always seems to come up in discussions about Columbus.

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Harvey Miller 18:58

Yeah, well, I'm a big fan of rail. Rail is the most energy efficient way to move people. Actually, I should say it's the second most, the first most is water, but we can't build canals everywhere, they're a little bit too expensive and hard to upkeep. But we can build rail, not everywhere, but

in a lot of places. And rail is very energy efficient, much more energy efficient than buses. So if we can, like, we want to build those in places where we want to encourage high density development. That being said, we can build a bus rapid transit network in Columbus much more quickly and cheaply in our existing road network, as long as we're willing to allocate road space away from cars and towards public transit. And that's the difficult part technically, even financially, it's not hard. Politically, taking away lanes from drivers is really, really hard for politicians to do.

D David Staley 19:51

On Fourth Street that happened, right? So some of the space allocated to cars was given over to dedicated bike lanes.

H Harvey Miller 19:58

Yes, but there's two problems with that. One is that - well, Summit and Fourth should be two-way streets, that's a big problem. They're like urban freeways now, which really cuts down on walkability and the pleasantness of living alongside those roads. I think it's on Fourth, where you have the two way bike lane, is that Summit or Fourth? I think it's Summit, one of those, yeah, one of those two streets has a two lane bike way. You generally don't want to design bike lanes like that, you want them to be on both sides of the street going in the direction of traffic. So that's the fundamental problem there, is we're trying to retrofit a bike lane in a place which is really not very conducive to bike lanes. If I was the King of Columbus, I would make Summit and Fourth two-way streets and put bike lanes on both sides, and that would be... and the other thing we need to do is to float the cars and have the bike lane be next to the curb. Because right now, we have the cars and then we have moving vehicles and we have squishy soft, you know, cyclists, in between the two. That's a bad bike lane design, we need to float the cars and put the bike lanes next to the curb. That's the standard design for that.

D David Staley 21:00

So I was going to ask you to sort of assess or to give your overall assessment of transportation mobility of Columbus, and it sounds like you've done that. But I wonder how Columbus compares to other cities that you've studied?

H Harvey Miller 21:12

American cities or European cities?

D David Staley 21:14

I'll leave that to you.

H Harvey Miller 21:15

H Harvey Miller 21:13

In terms of American cities, we're typical. I mean, outside of New York, public transit does not move many people in the United States unfortunately, at this point in time. We used to, up until the 1940s, but not anymore. So most American cities are automobile-dominated like Columbus. On the other hand, you go to European cities where they didn't tear up their trolley tracks and they kept their passenger rail, and it's a completely different situation. Even in places where they did do that, like Copenhagen, for example, they tore up a lot of their trolley tracks, but people there, the citizens fought against turning those over to drivers, and instead, those lanes were turned over to cyclists, which is why Copenhagen has, like, a 60% bike split, you know, in terms of commuting every day. They basically built the infrastructure. So, we're typical in the United States and Columbus, but we're way behind really some of the more advanced transportation cities in the country. In the world, I should say. Many of which are in Europe. Another place we're falling behind, not just in Columbus, but in the United States is in high speed rail. And if you've been to China, and you've been on the high speed rail system there, it is absolutely beautiful and wonderful and pleasant. Meanwhile, here, we're talking about pipe dreams like Hyperloop.

D David Staley 22:29

So you are Director of CURA, the Center for Urban and Regional Analysis. Tell us a little bit more about the mission of CURA.

H Harvey Miller 22:36

Right. CURA is basically the hub for data-driven urban science and geographic information systems on campus. What we're trying to do is trying to harness the revolution that's occurring right now in urban science. Again, just like transportation, we have so much data about cities that we've never had before, that this, roughly two century old science of urbanity is being totally rewritten now. It truly is a scientific revolution. And at CURA, we're trying to be the vehicle for Ohio State to harness that data-driven urban science revolution. And so we do work a lot with urban data, we're working a lot with like, as I mentioned, some of the COTA data. We're also collecting data about Columbus and building a, we built a data dashboard, actually you can go to our website and see a dashboard that displays all the publicly available geographic data about Columbus and get a sense of the pulse of the city and how it, how it operates. That's what we're trying to do. We're basically trying to be a part of the research infrastructure for Ohio State and data-driven urban science. The other thing we do is we do outreach events. So, we try to foster community discussions both on campus and off campus, on issues that are important to cities in Ohio and beyond. So for example, this last semester, we had events surrounding the idea of mobility and social equity. Can transportation make Columbus a more socially just city? We've done work on water and cities in Ohio in the era of climate change. We've done work on Smart City, healthy city, will the Smart City Challenge make Columbus a healthier city? So these are the time we usually organize panel discussions, bring in outside experts and have lectures on campus and community roundtables in the community so that we can break down the barrier between the university and the broader community, and just have a conversation about issues which Columbus is facing.

D David Staley 24:32

What's next for your research?

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Harvey Miller 24:36

The big project I'm working on right now is to create a data observatory for Columbus, so this is kind of an extension of the data dashboard we recently built. It's called CURIO, again, you can go to our website, or you can go to curio.osu.edu to check out the dashboard. This is the next step in that process. What we want to do is we want to create an open-ended database, where we pull in data about Columbus and put it into a easily computable, digestible data warehouse that will allow researchers to explore the data, to build new models, to conduct new science using this. So we want this to be like an open-ended longitudinal dataset. The example I like to use is the example of like a biological research station, like biologists will pick a tropical rainforest and just observe it on an open-ended way and collect data and allow the science to emerge. That's what we're trying to do for Columbus. Columbus is a very interesting city, it's a very dynamic city, it's a very typical city in the United States. So there's reasons for us to study this city. So we're going to be pulling in all this data and creating, basically, this research data infrastructure that will enable new forms of urban and transportation science. The other thing we're going to do is more of an outreach component of it, is that we want to develop a set of sustainability and equity indicators and we want to measure the progress of Columbus towards being a more sustainable and equitable city and provide these indicators in a way that people can understand it easily, not just for experts or scientists, or people who know how to work with the data. We want to provide visualizations, maps, dashboards, and things like that, so anyone can look at how Columbus is doing and drill down to the neighborhood level, and really provide a common platform for community conversations about how to progress Columbus to be a more sustainable and just city.

D

David Staley 26:29

Harvey Miller, thank you.

H

Harvey Miller 26:31

You're welcome. Thanks for having me.

E

Eva Dale 26:33

Voices is produced and recorded at The Ohio State University College of Arts and Sciences Technology Services Studio. Sound engineering by Paul Kotheimer, produced by Doug Dangler.