ADDENDUM 1

Why Geography Is A Key Part Of Fighting The COVID-19 Coronavirus Outbreak

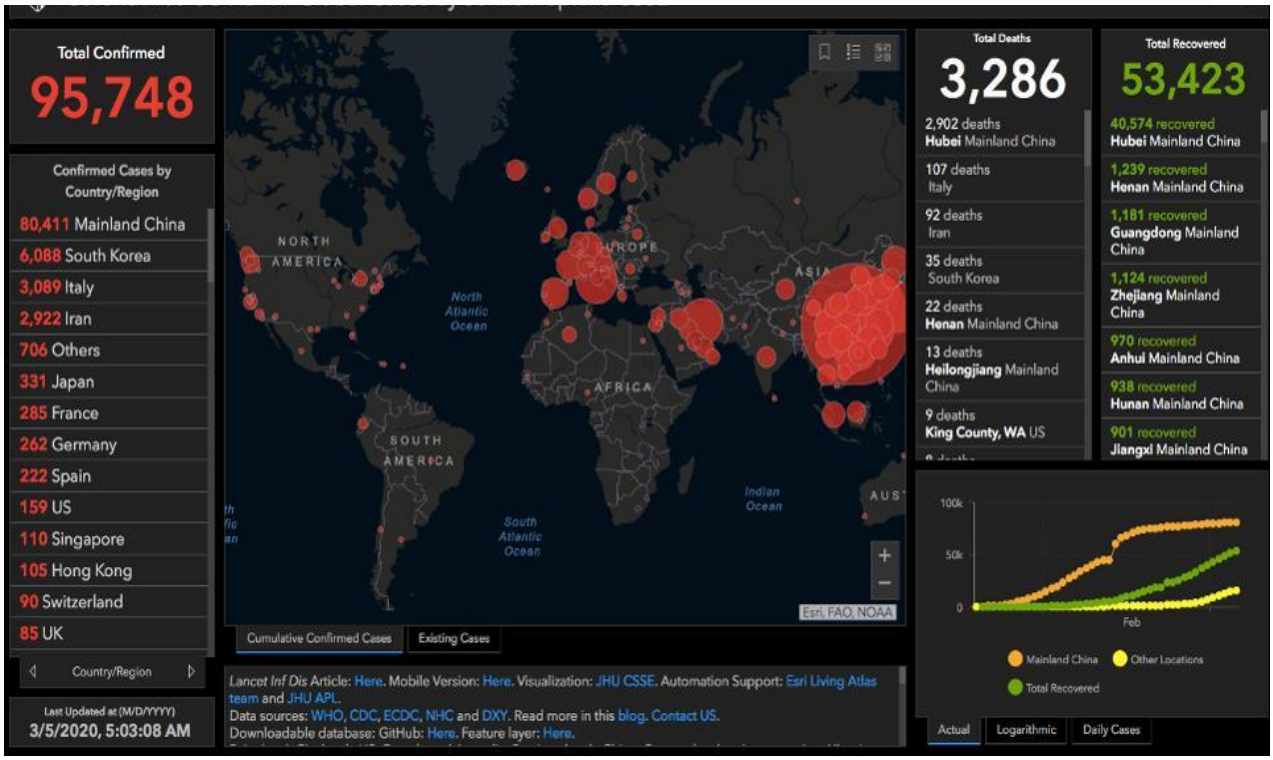
Marshall Shepherd Senior Contributor
Science

I am an atmospheric scientist with three degrees in meteorology. However my tenured home at the University of Georgia is the Department of Geography. Like many of you reading this, I had a rather narrow understanding of geography when I left NASA to join the faculty at the university. Over the years, I have certainly heard people describe geography as maps, capitals, rivers, and so forth. While these things are definitely a part of the discipline, there is far more complexity and rigor than memorization of facts or your recollections of the elementary Geography Bee.

Geography is unique in bridging the social sciences and the natural sciences. There are two main branches of geography: human geography and physical geography. Human geography is concerned with the spatial aspects of human existence. Physical geographers study patterns of climates, landforms, vegetation, soils, and water. Geographers use many tools and techniques in their work, and geographic technologies are increasingly important for understanding our complex world. They include Geographic Information Systems (GIS), Remote Sensing, Global Positioning Systems (GPS), and online mapping such as Google Earth.

American Association of Geographers (AAG) website

I have noticed very important roles that the discipline of geography is playing in the fight against the virus SARS-CoV-2, which causes coronavirus disease (COVID-19). Here are some of them.

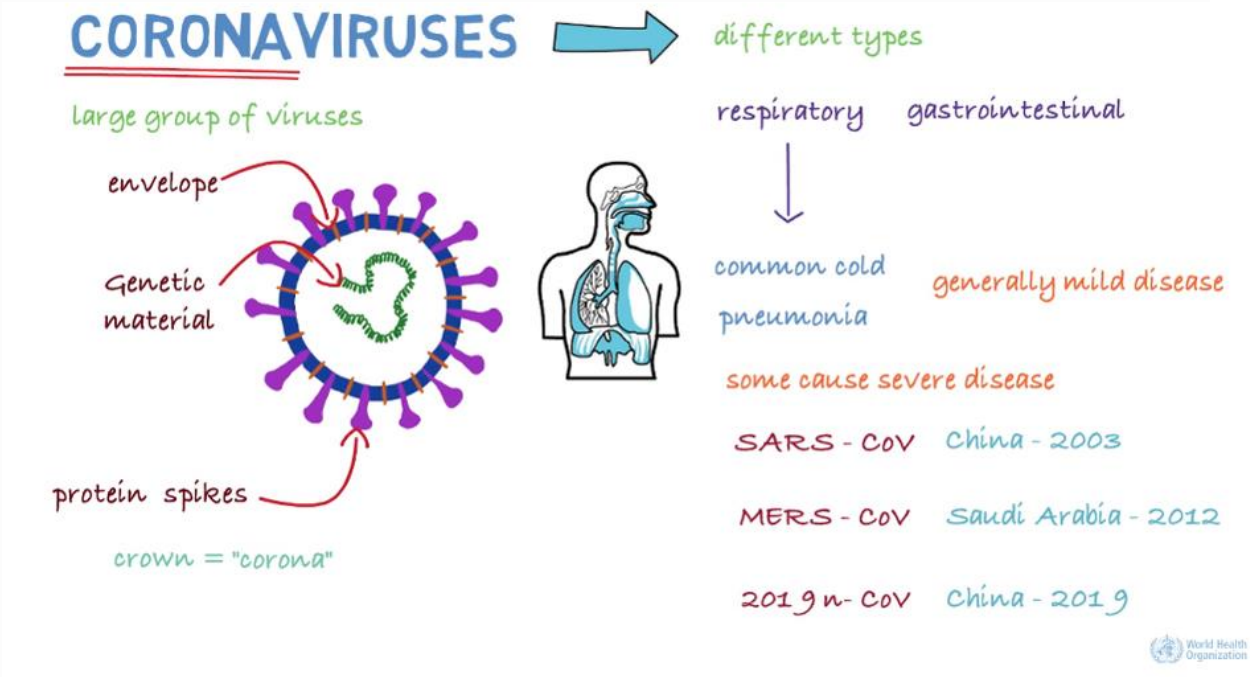


Tracking Coronavirus. An example from The Johns Hopkins University

JOHNS HOPKINS UNIVERSITY WEBSITE

Geographic Information Systems (GIS) are ways to organize, present, and analyze spatial and geographic data. You probably don't realize it, but *Waze* or *Google Maps* fall within the realm of GISscience. Both of these apps likely benefit you daily. The Johns Hopkins University is maintaining an excellent Coronavirus tracking website, which gathers information from multiple data sources. The disclaimer on the website notes, "The Johns Hopkins University hereby disclaims any and all representations and warranties with respect to the Website, including accuracy, fitness for use, and merchantability." They are cautioning that the website should *not* be used for medical guidance. Researchers at other institutions including the University of Washington and the University of Georgia have also developed publicly-available "tracker tools."

ESRI is a leading organization within the geography field and a provider of GIS resources. I found a compelling coronavirus tutorial authored by Miss Bytheway on the *ESRI* website with very instructive lessons and activities. Kenneth Field also offers an excellent blog post at the ESRI website about mapping coronavirus responsibly. My friend and colleague Dr. Dawn Wright is Chief Scientist at ESRI. She recently tweeted a fantastic website with a plethora of geographic information about coronavirus outbreak in Singapore.



Coronaviruses 101

WORLD HEALTH ORGANIZATION (WHO) VIS ESRI WEBSITE

Many high school students, including my daughter last year, take AP Human Geography. I am thrilled because it is exposing students to aspects of the discipline that shatter the “maps and capitols” misperceptions. The AP College Board website states that in human geography scholars “Explore how humans have understood, used, and changed the surface of Earth.” Topics might include migration patterns, population, political ecology, environmental justice, urbanization, and more.

A Royal Geographic Society website pointed me to some interesting research that encompasses human geography aspects of the discipline and Coronavirus. A 2011 study entitled, "The scalar politics of infectious disease governance in an era of liberalised air travel" was published in *Transactions of the Institute of British Geographers*. While that study was more focused on Ebola, it has timely connections to the coronavirus problem.

Steve Hinchliffe is Professor or Human Geography at the University of Exeter and an expert on biosecurity, food risk, human-nonhuman relations and nature conservation. He and colleagues published a book entitled *Pathological Lives: Disease, Space, and Biopolitics*. He wrote in a 2016 blog post, "I call entanglement of microbes, hosts, environments and economies 'pathological lives.'"

The term (pathological lives) allows us to investigate how these lives have become dangerous to themselves in a world of accelerated throughput and biological intensity.

Steve Hinchliffe, Professor or Human Geography at the University of Exeter.

There is also a significant body of scholarly research at the intersection of geography and infectious disease disciplines. For example, a 2019 study in the journal *Infections, Genetics, and Evolution* examined the geographic structure of bat SARS-related coronaviruses. One conclusion was that SARSr-CoVs have a distinct geographical structure in terms of evolution and transmission.

Of course, physical geography also plays a role in Coronavirus. In a previous *Forbes* article, I discussed potential climatological implications of the disease and whether warm season transition in the Northern

Hemisphere would halt the spread of coronavirus. The short answer from the Centers for Disease Control and Prevention (CDC) was “we don’t know,” especially since the disease has thrived in warm, humid locations so far. The longer answer was a discussion of emerging literature suggesting that influenza, coronaviruses, and related diseases might thrive in new places and for longer periods of time as climate continues to warm.

There are numerous examples that I could have given, but my underlying goal was to use coronavirus as a teachable moment about the discipline of geography. Now go wash those hands thoroughly with soap and be careful out there.

Full coverage and live updates on the Coronavirus

Follow me on Twitter. Check out my website.

Marshall Shepherd

Dr. J. Marshall Shepherd, a leading international expert in weather and climate, was the 2013 President of American Meteorological Society (AMS)