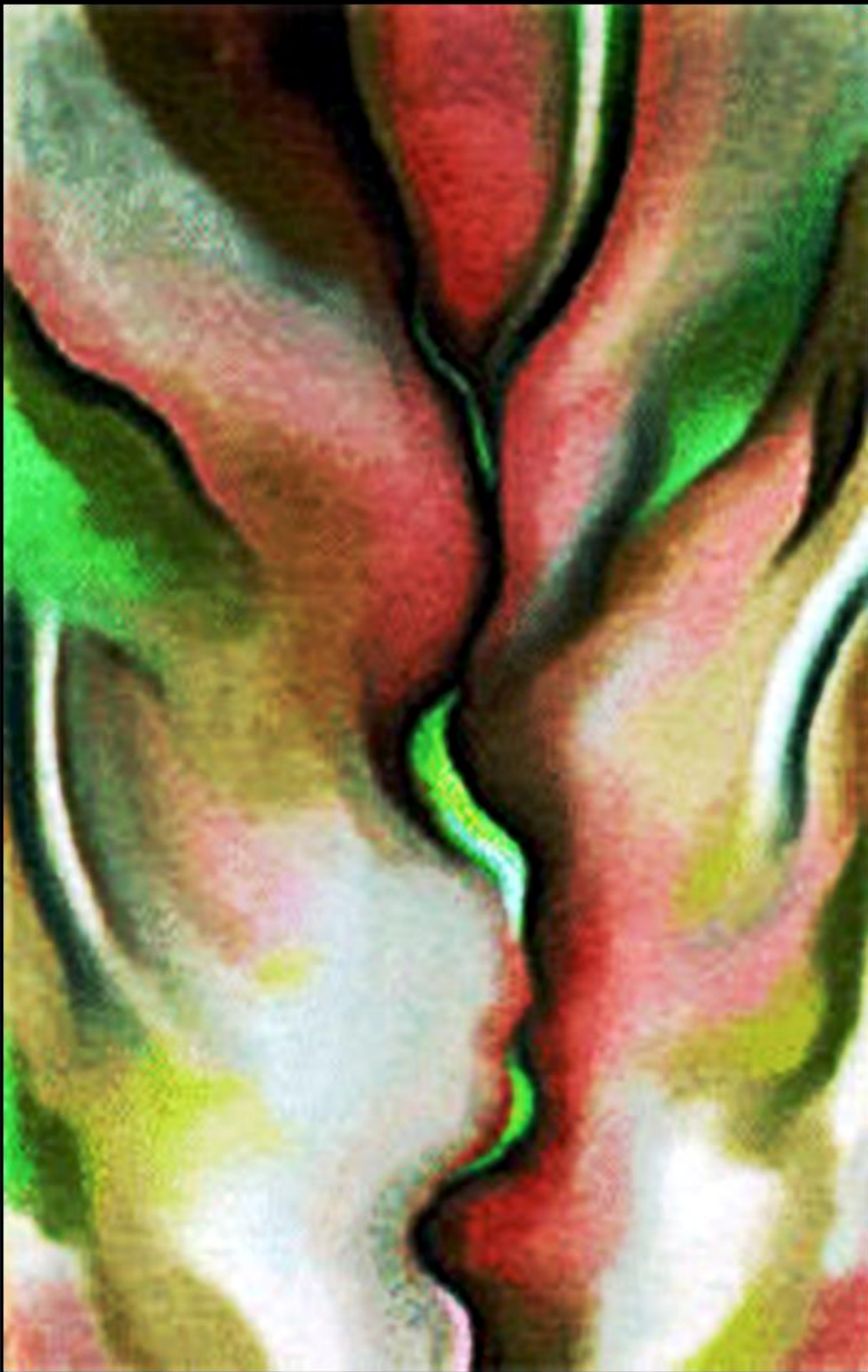
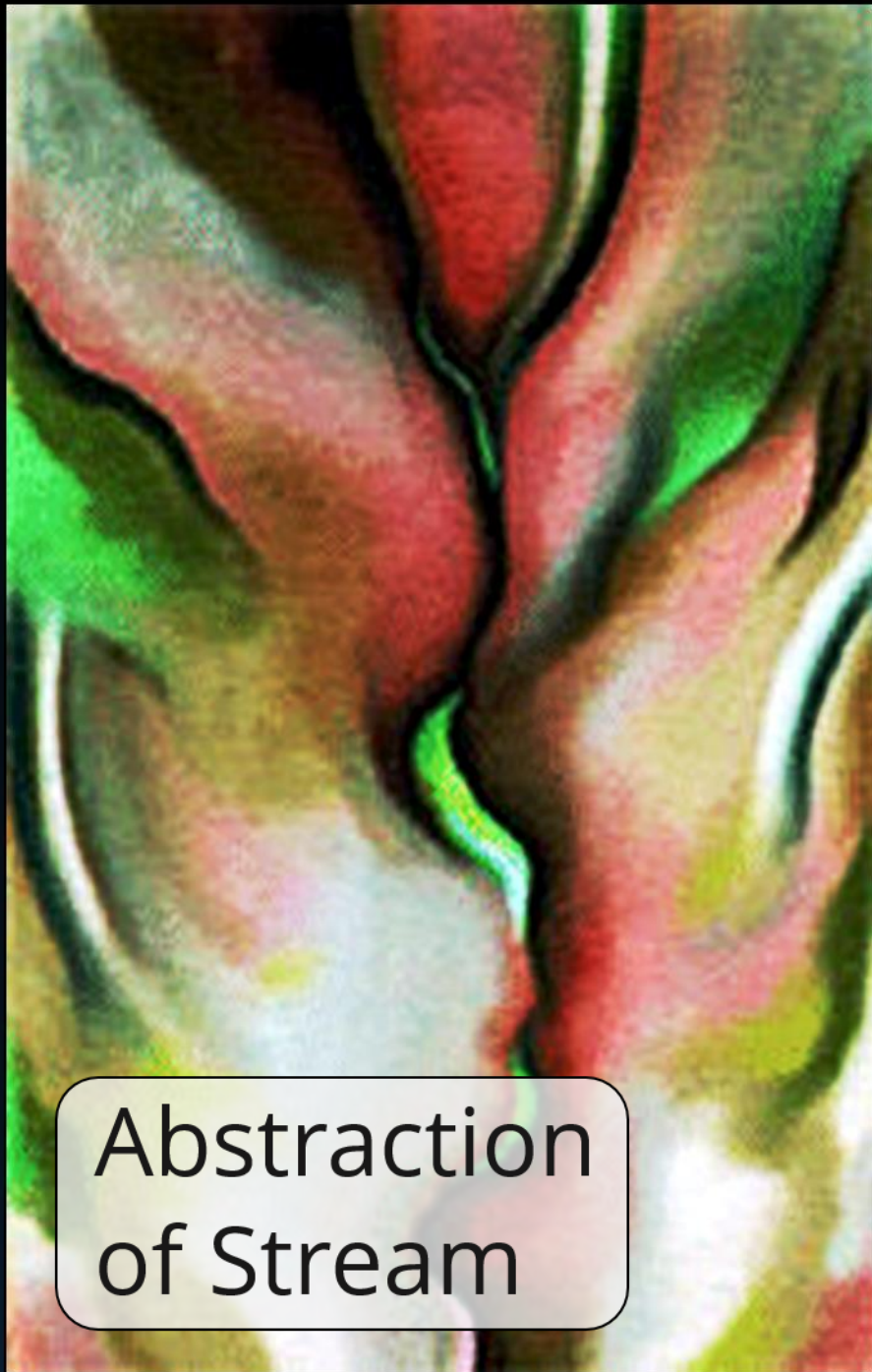




Defending public health models in the courtroom

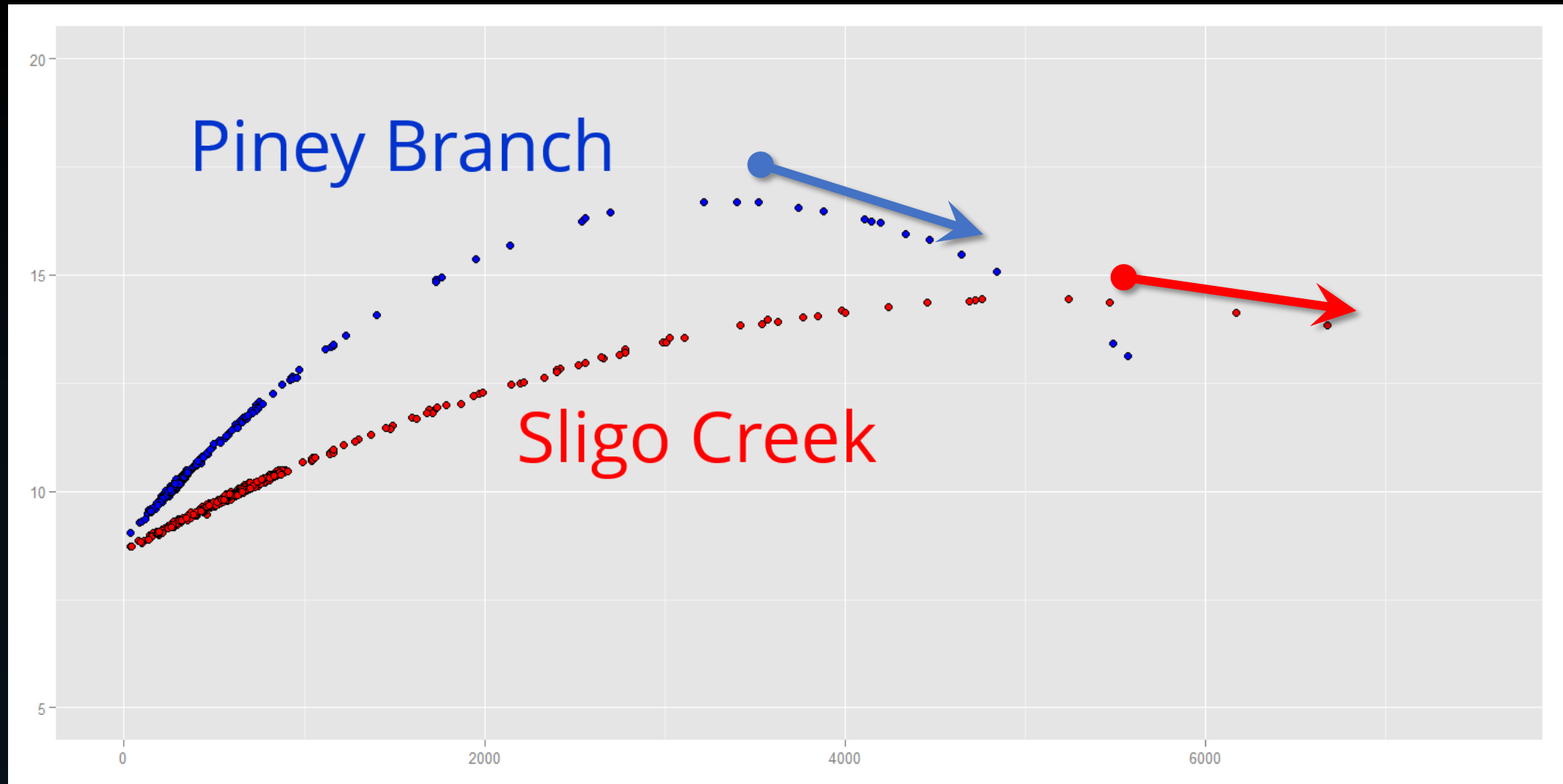
<pasky pascual>



Abstraction
of Stream

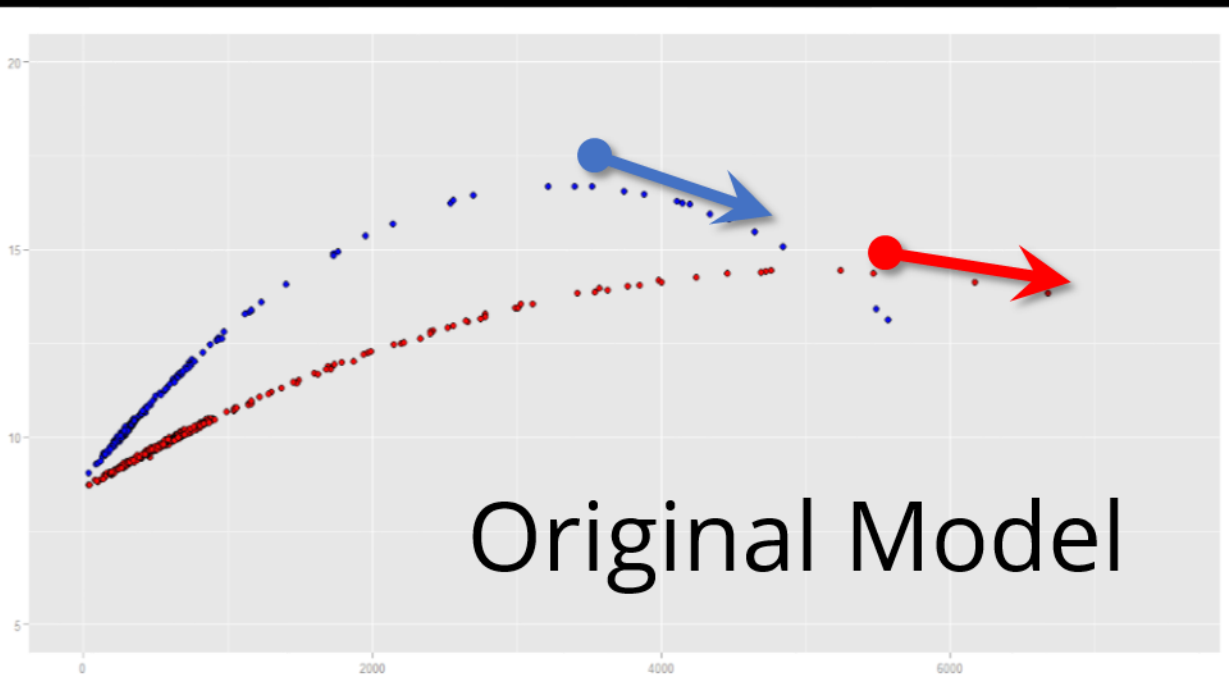
It is only
by selection,
by elimination,
by emphasis,
that we get at the
real meaning of things.

oxygen



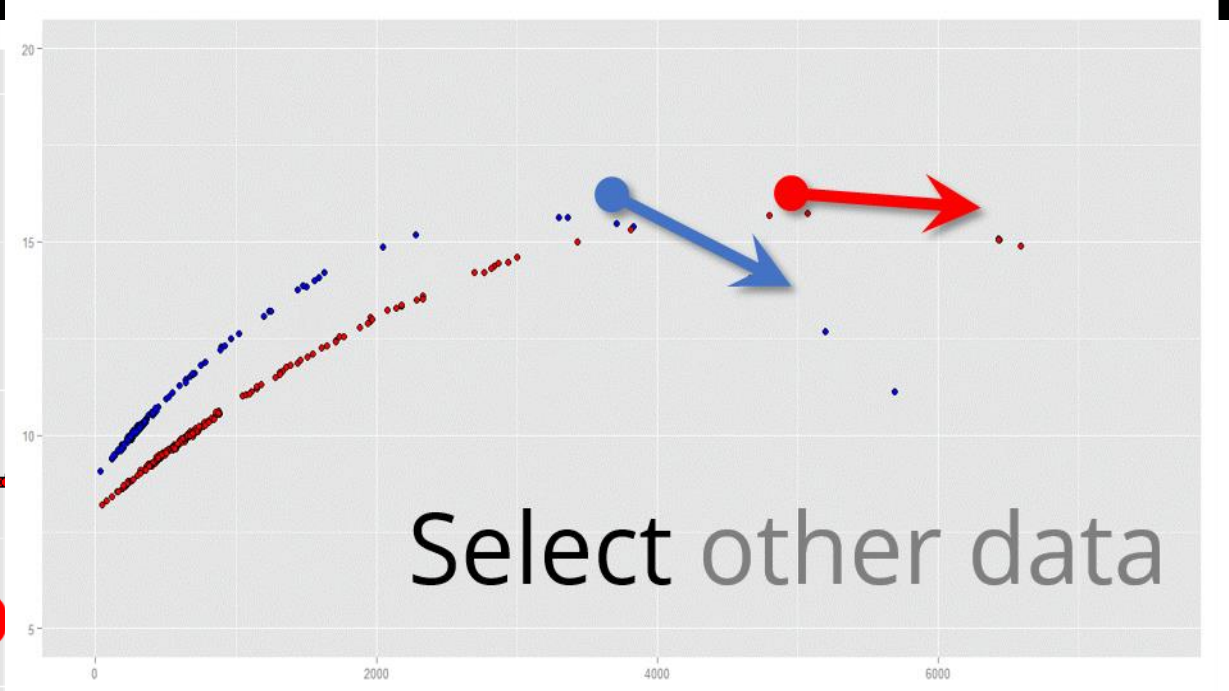
Abstraction of
Stream

charged particles



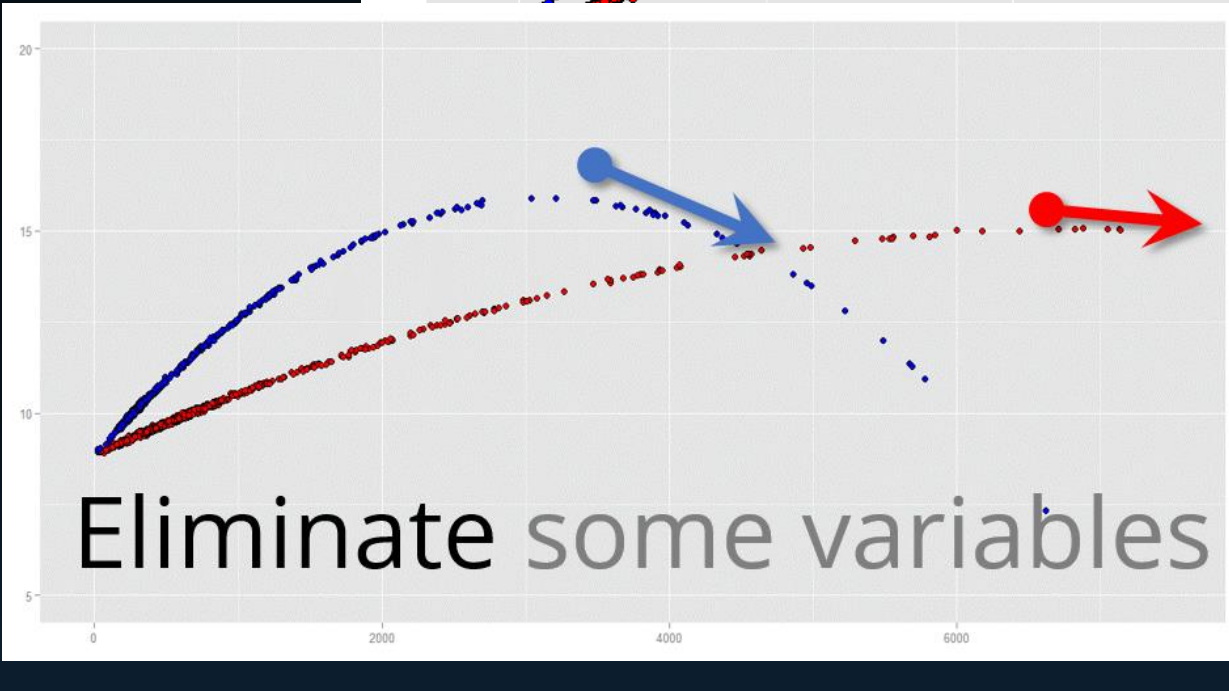
A scatter plot with a light gray grid. The x-axis ranges from 0 to 6000 with major ticks at 0, 2000, 4000, and 6000. The y-axis ranges from 5 to 20 with major ticks at 5, 10, 15, and 20. There are two data series: blue dots and red dots. Both series show an upward trend that levels off. A blue dot at approximately (3500, 17.5) has a blue arrow pointing to a red dot at approximately (5500, 14.5). The text "Original Model" is centered at the bottom.

Original Model



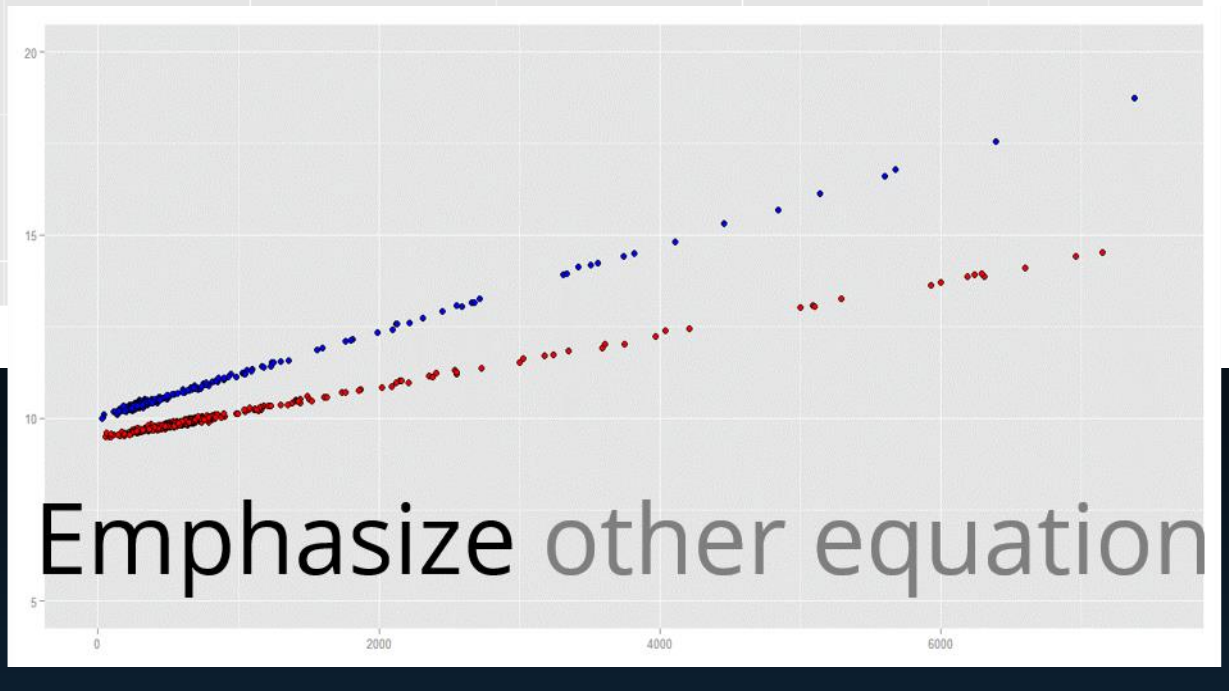
A scatter plot with a light gray grid. The x-axis ranges from 0 to 6000 with major ticks at 0, 2000, 4000, and 6000. The y-axis ranges from 5 to 20 with major ticks at 5, 10, 15, and 20. There are two data series: blue dots and red dots. Both series show an upward trend that levels off. A blue dot at approximately (3500, 16.5) has a blue arrow pointing to a red dot at approximately (5000, 16.5). The text "Select other data" is centered at the bottom.

Select other data



A scatter plot with a light gray grid. The x-axis ranges from 0 to 6000 with major ticks at 0, 2000, 4000, and 6000. The y-axis ranges from 5 to 20 with major ticks at 5, 10, 15, and 20. There are two data series: blue dots and red dots. Both series show an upward trend that levels off. A blue dot at approximately (3500, 17.5) has a blue arrow pointing to a red dot at approximately (4500, 14.5). The text "Eliminate some variables" is centered at the bottom.

Eliminate some variables



A scatter plot with a light gray grid. The x-axis ranges from 0 to 6000 with major ticks at 0, 2000, 4000, and 6000. The y-axis ranges from 5 to 20 with major ticks at 5, 10, 15, and 20. There are two data series: blue dots and red dots. Both series show an upward trend that levels off. A blue dot at approximately (3500, 14.5) has a blue arrow pointing to a red dot at approximately (6500, 14.5). The text "Emphasize other equation" is centered at the bottom.

Emphasize other equation

#ModelsAreEverywhere

Models establish
rights and obligations
in public health and
environmental law.

(Fisher, Pascual, Wagner 2010)

#ModelEvaluation

Models are neither
'truth machines' nor
completely malleable.

(Wagner, Pascual, Fisher 2010)

#ModelTransparency

Models must arise from
transparent, appropriate
methods and **epistemic
frames.**

(Pascual, Wagner, Fisher 2013)

#DefensibleModels

Model transparency yields
legal **accountability** and
defensibility.

(Fisher, Pascual, Wagner 2015)

Air Quality Standards

- protect public health
- based on latest science
- reviewed by science panel
- subject to judicial review



‘ controlled human exposure studies
... engender the highest level of
confidence ... about the
causal relationship
between ozone exposure and health
effects... ’

Mississippi v. EPA (2013)

Controlled human studies or
observational studies that rule out chance

Causal

Observational studies with possible
confounders and animal toxic studies

Likely Causal

High quality study shows association or
suggests effect

Suggestive of
Causal

Insufficient quality, quantity, consistency
or statistical power

Inadequate to
infer Causal

Multiple studies show no effect

Not likely Causal

Causal / Likely Causal

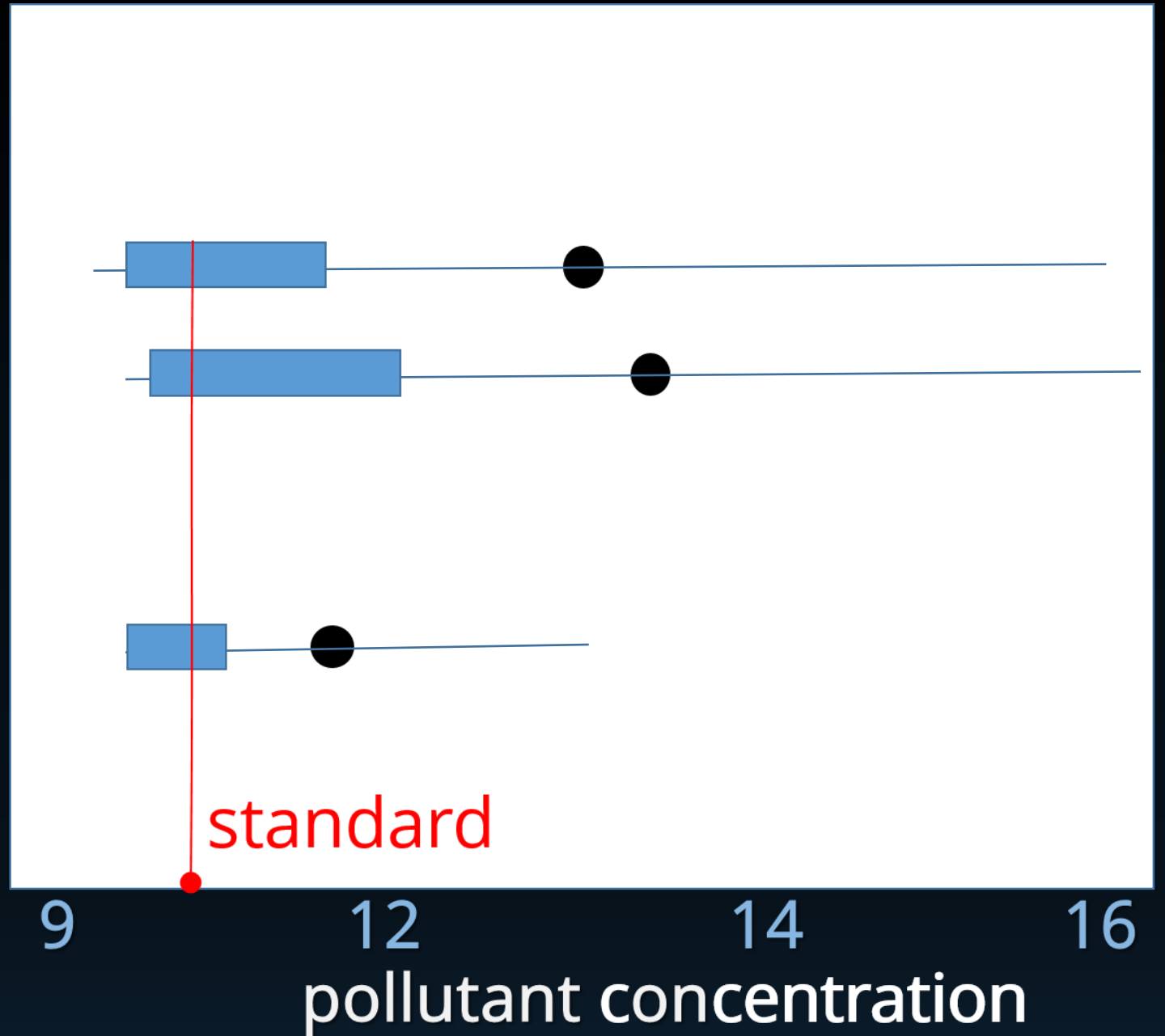
mortality (Miller 2007)

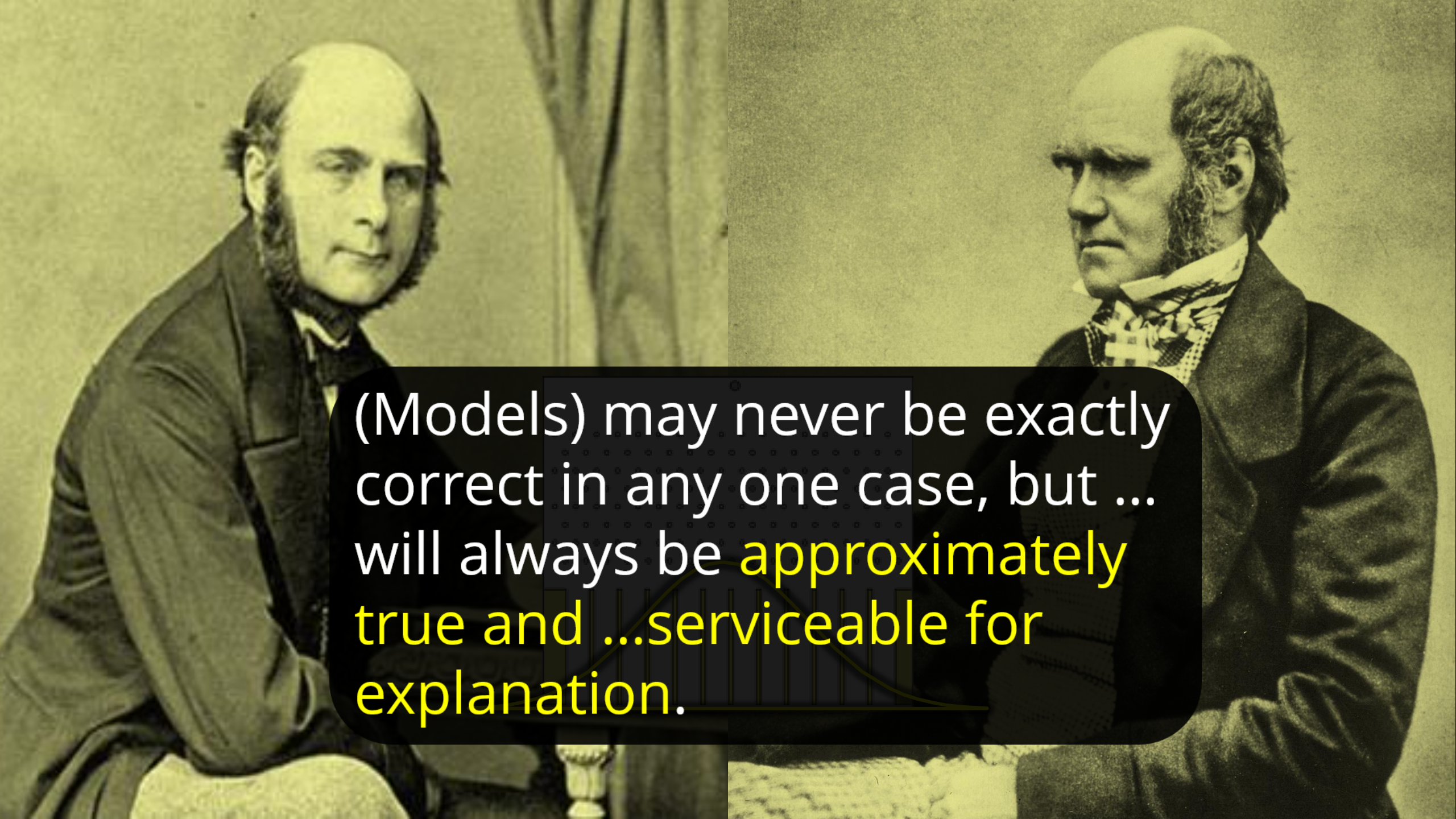
mortality (Krewski 2009)

Suggestive of Causal

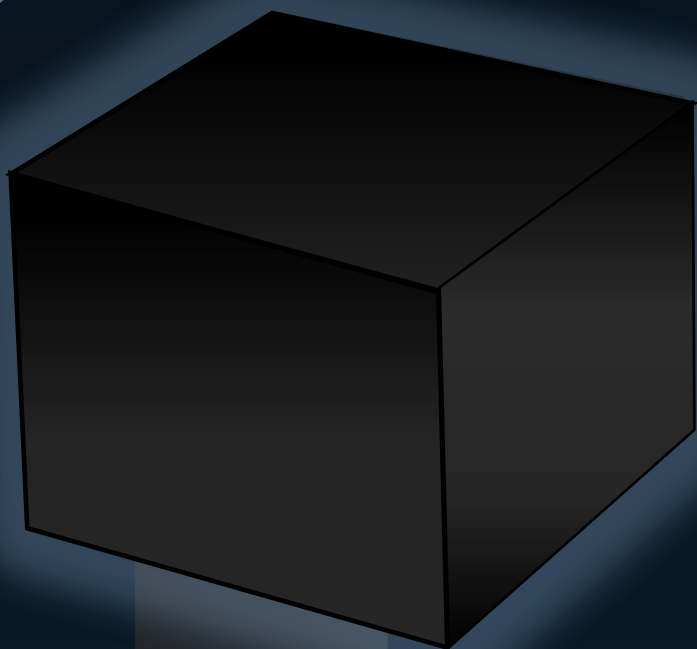
hospitalization (Bell 2009)

etc.



The background of the slide features two sepia-toned portraits of Charles Darwin. On the left, a younger Darwin is shown in a three-quarter view, looking towards the right. On the right, an older Darwin is shown in profile, looking to the left. Both are wearing dark suits and cravats. A semi-transparent black rounded rectangle is centered over the image, containing white and yellow text.

(Models) may never be exactly correct in any one case, but ... will always be approximately true and ...serviceable for explanation.



Model
Evaluation

Expert
Panel

Court

Stakeholders

What we observe
is not nature in
itself but
nature
exposed to our
method of
questioning.

