Rules of Thumb

No unjustified 3d

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Eyes beat memory

No unjustified 3d

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Resolution ever Immersion

No unjustified 3d

Eyes beat memory

Resolution ever Immersion

Overview First, Zoom and Filter, Detail on Demand

No unjustified 3d

Eyes beat memory

Resolution ever Immersion

Overview First, Zoom and Filter, Detail on Demand

Responsiveness is Required

No unjustified 3d

Eyes beat memory

Resolution ever Immersion

Overview First, Zoom and Filter, Detail on Demand

Responsiveness is Required

Get in right in Black & White

No unjustified 3d

Eyes beat memory

Resolution ever Immersion

Overview First, Zoom and Filter, Detail on Demand

Responsiveness is Required

Get in right in Black & White

Function first, Form next

No unjustified 3d

Why?

Deal with 3d all our lives

Reasons - Depth perception is poor

Remember Steven's Law - Depth perception less accurate than area perception

Occlusion hides information

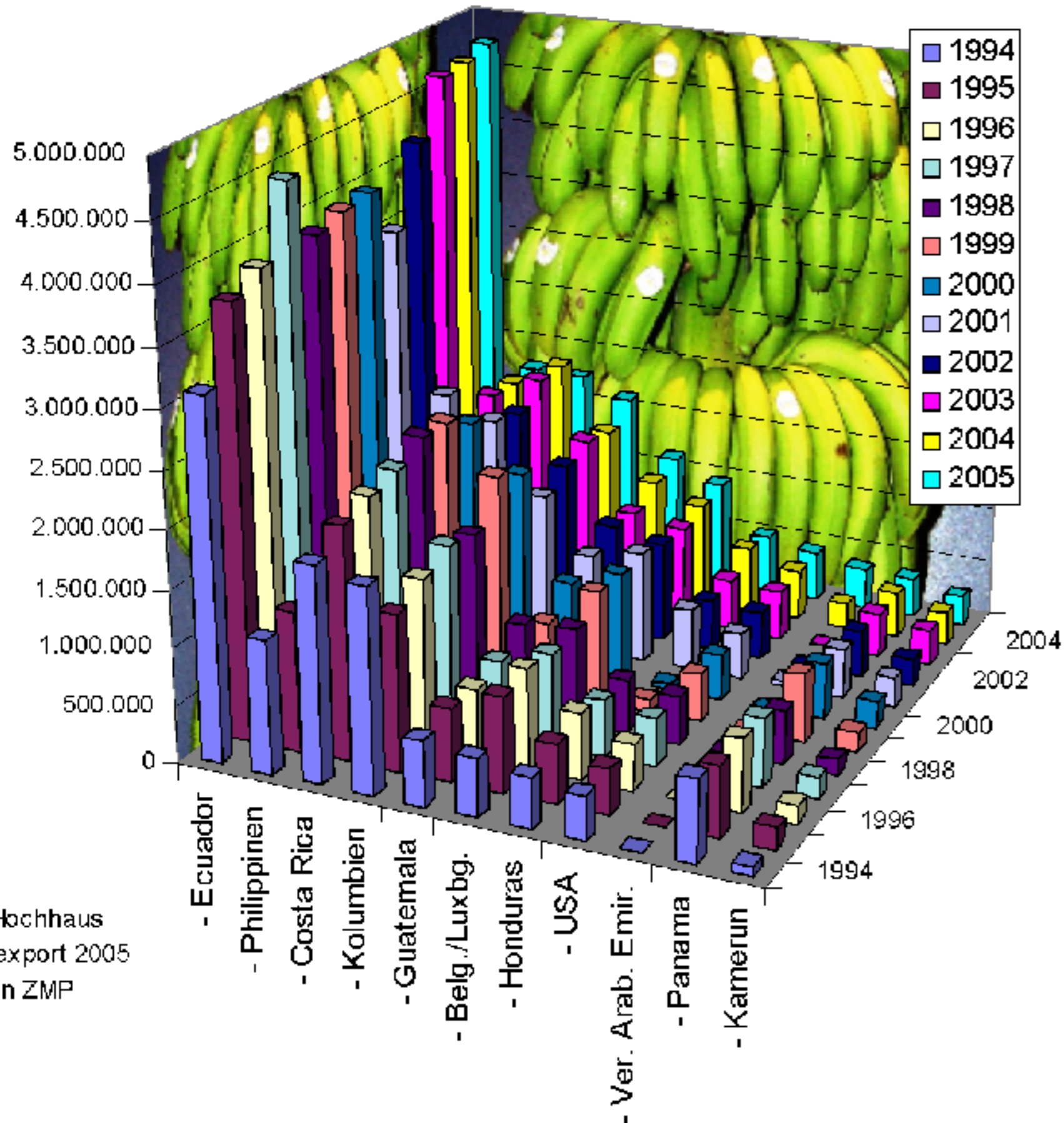**Used in painting as a powerful way to infer depth**

Motion parallex - changing occlusion as we change viewing position

Interactive 3d tools allow us to simulate motion parallex
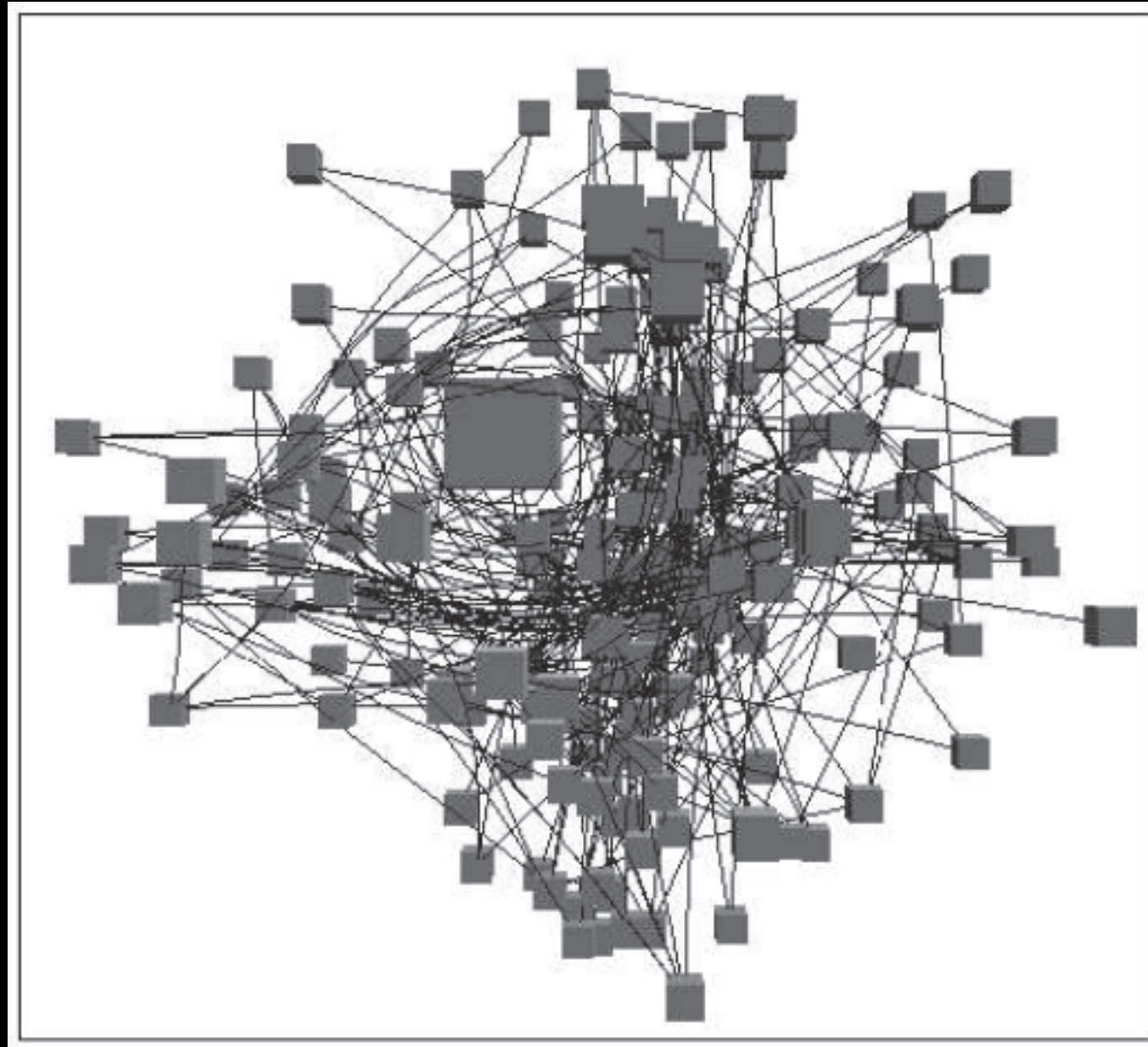
Example Protein Structure

If you have static image - occlusion hides information!

Export von Bananen in Tonnen von 1994-2005

Even if you have an interactive tool…

Many 3d structures are unfamiliar
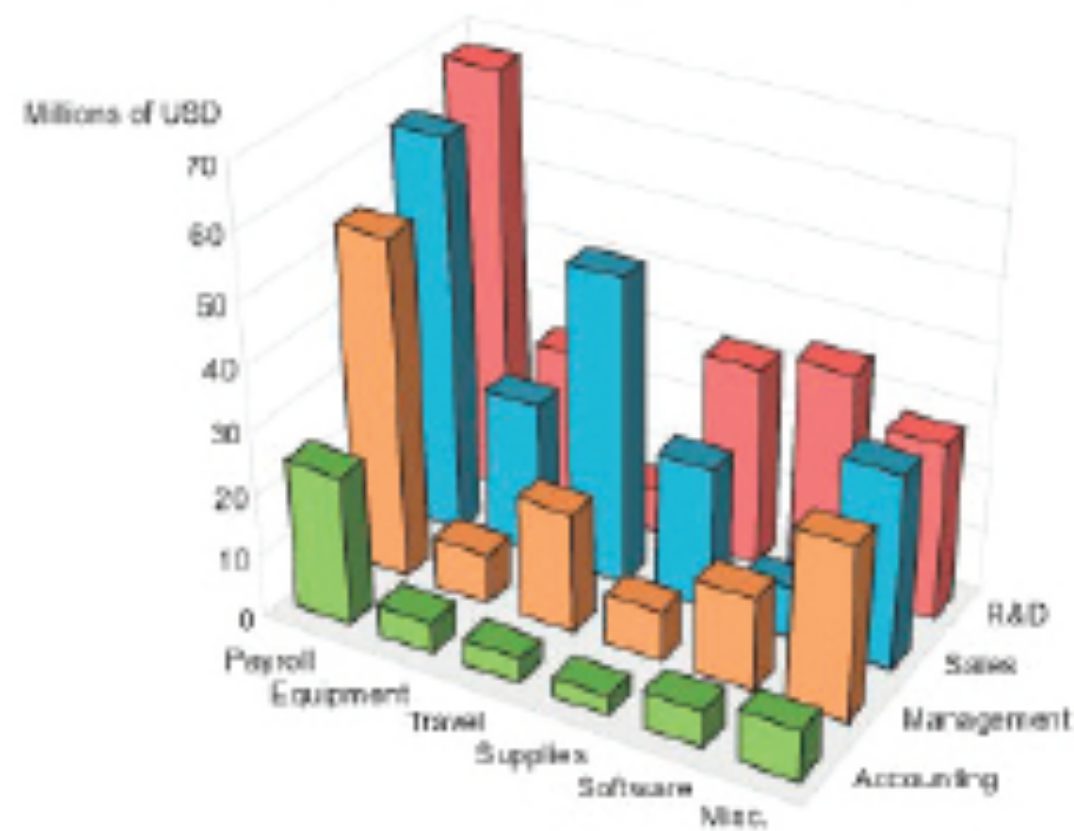
Perspective distorts distances

**Ancient Greeks adjusted widths of temples
so that they "look correct" from a distance**

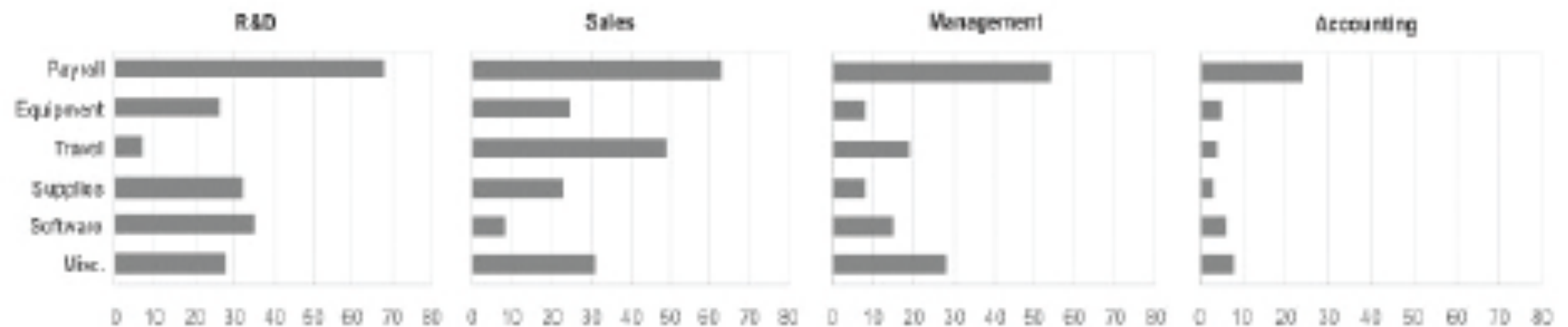Question 7: Which graph makes it easier to determine R&D's travel expense?

2006 Expenses by Department

3-D Bar Graph (left)

2-D Bar Graphs (below)

2006 Expenses by Department in Millions of USD

Other depth cues
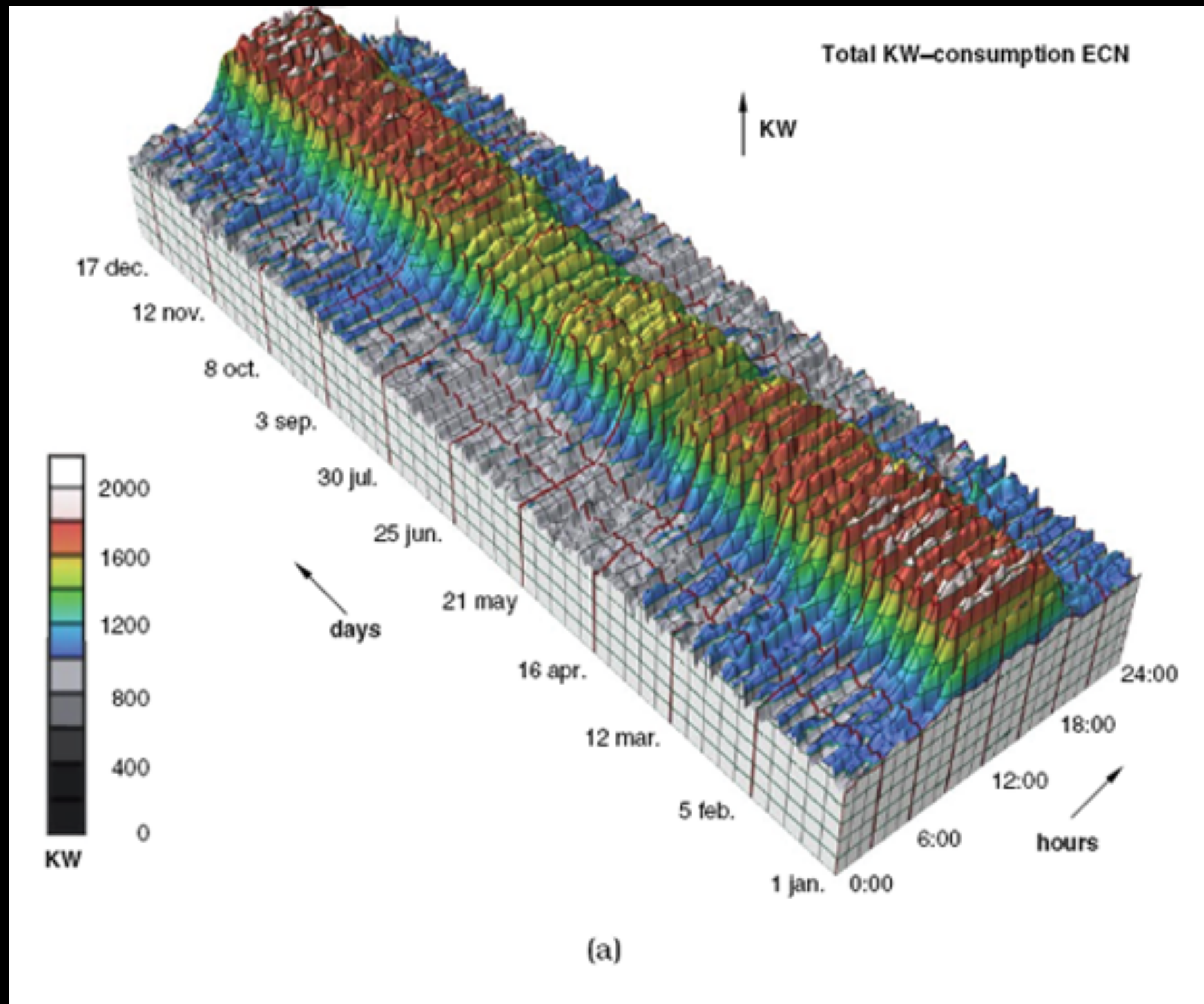
Shadows

Comparison with object of known size (e.g. car)

Well maybe not for everybody

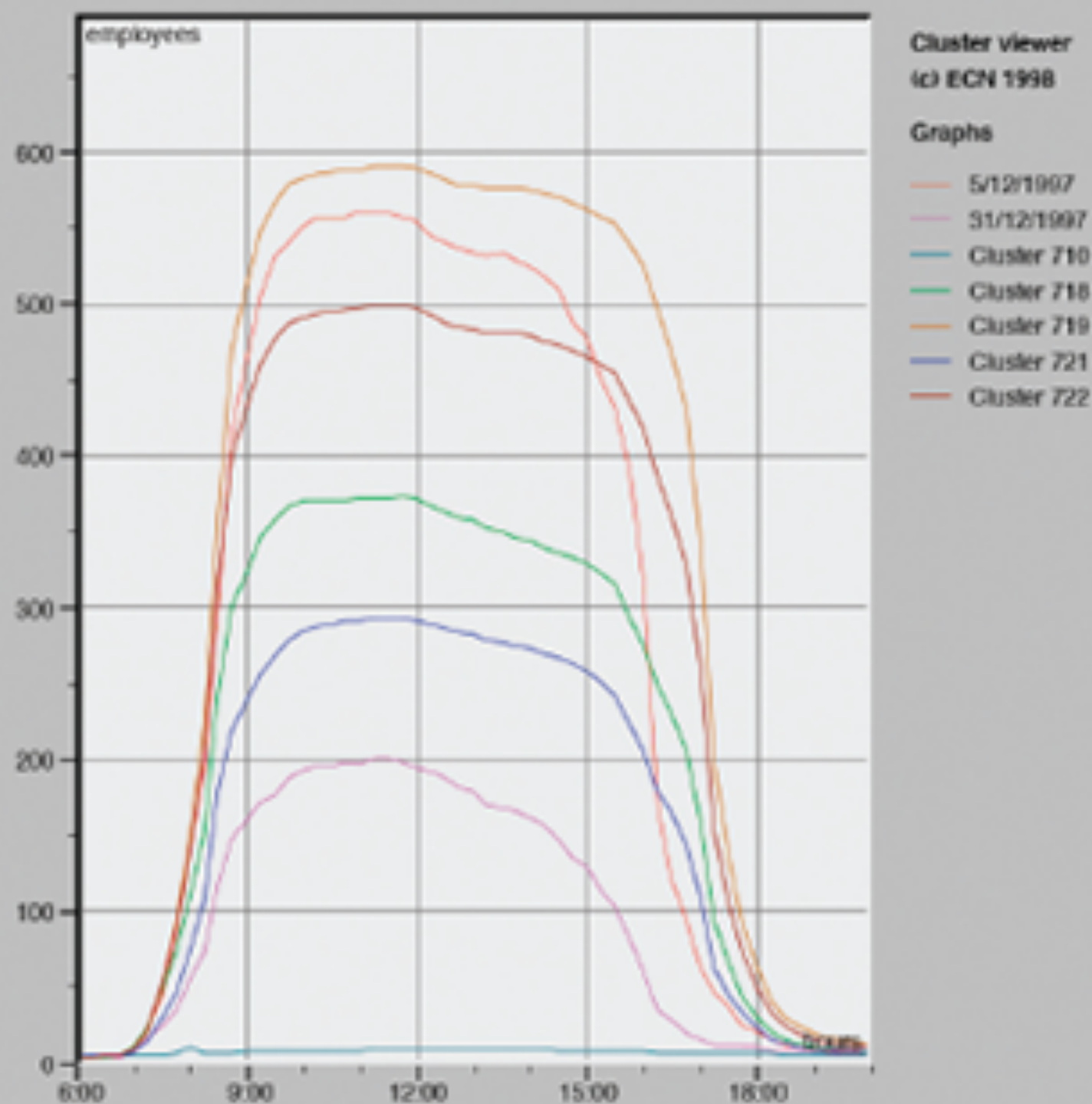Stronger than stereo-vision depth

Adds clutter to image !

Shadows etc. affect colour

What do you do with 3D looking data ?

(a)

(b)

Eyes beat memory

**Switching between different views that are visible simultaneously
has a much lower cognitive load
than using our memories.**

In other words, this ….
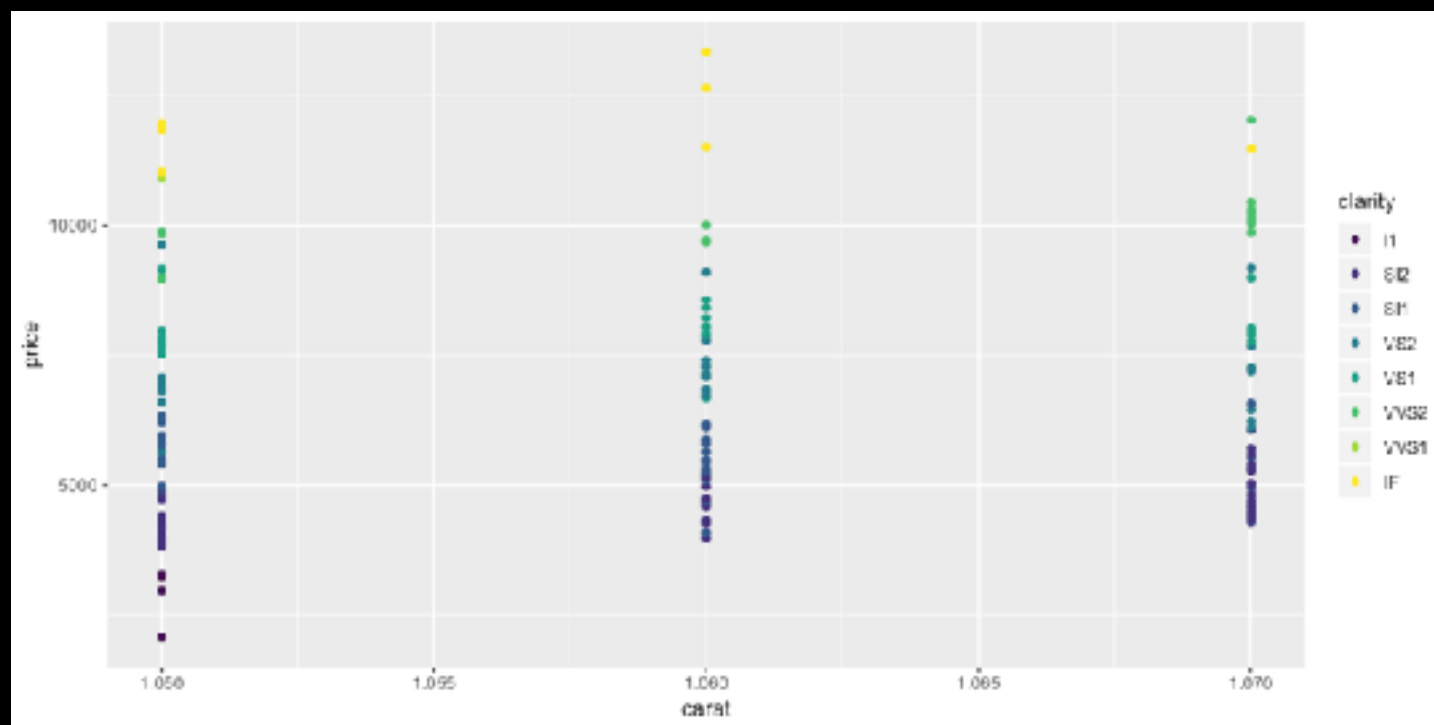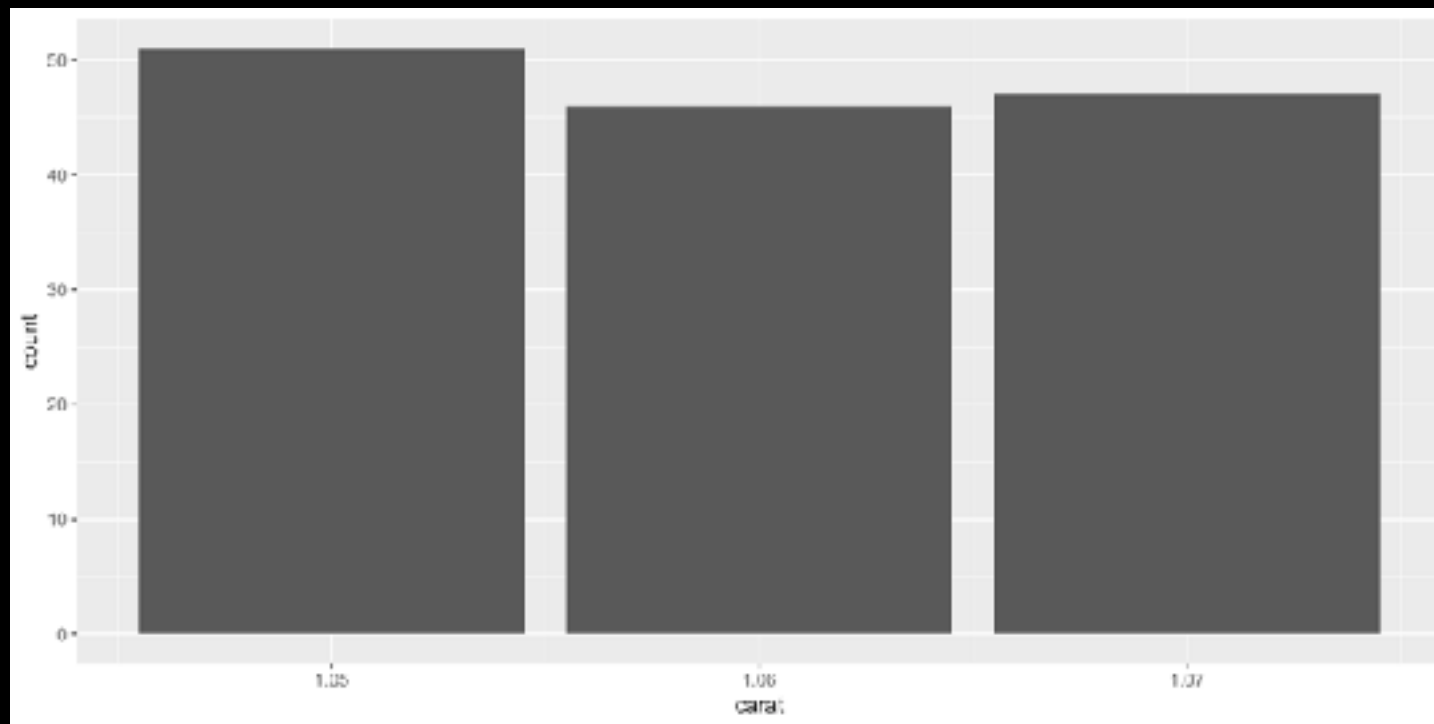
Is better than this…
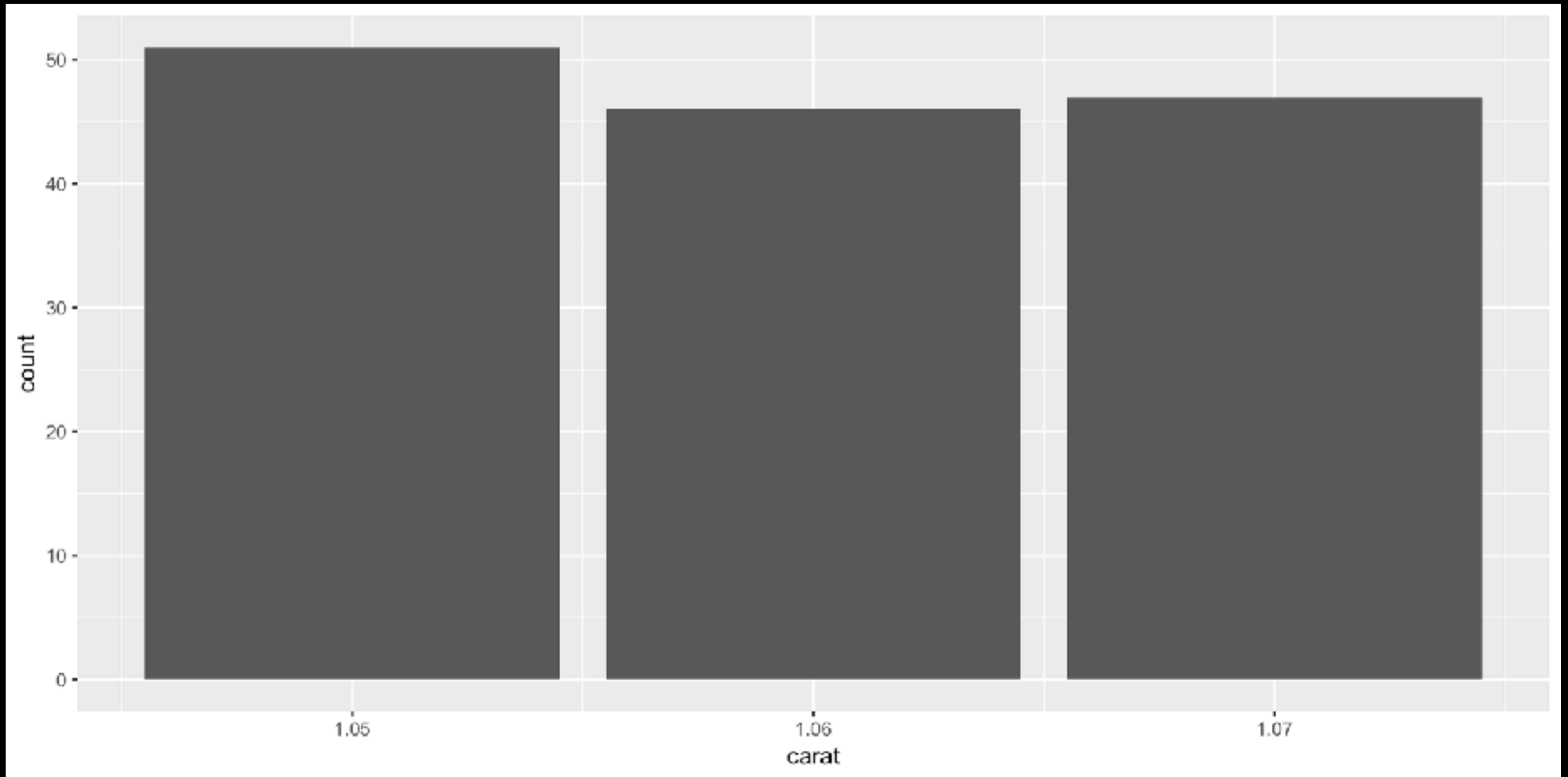
Is better than this…

Is better than this…
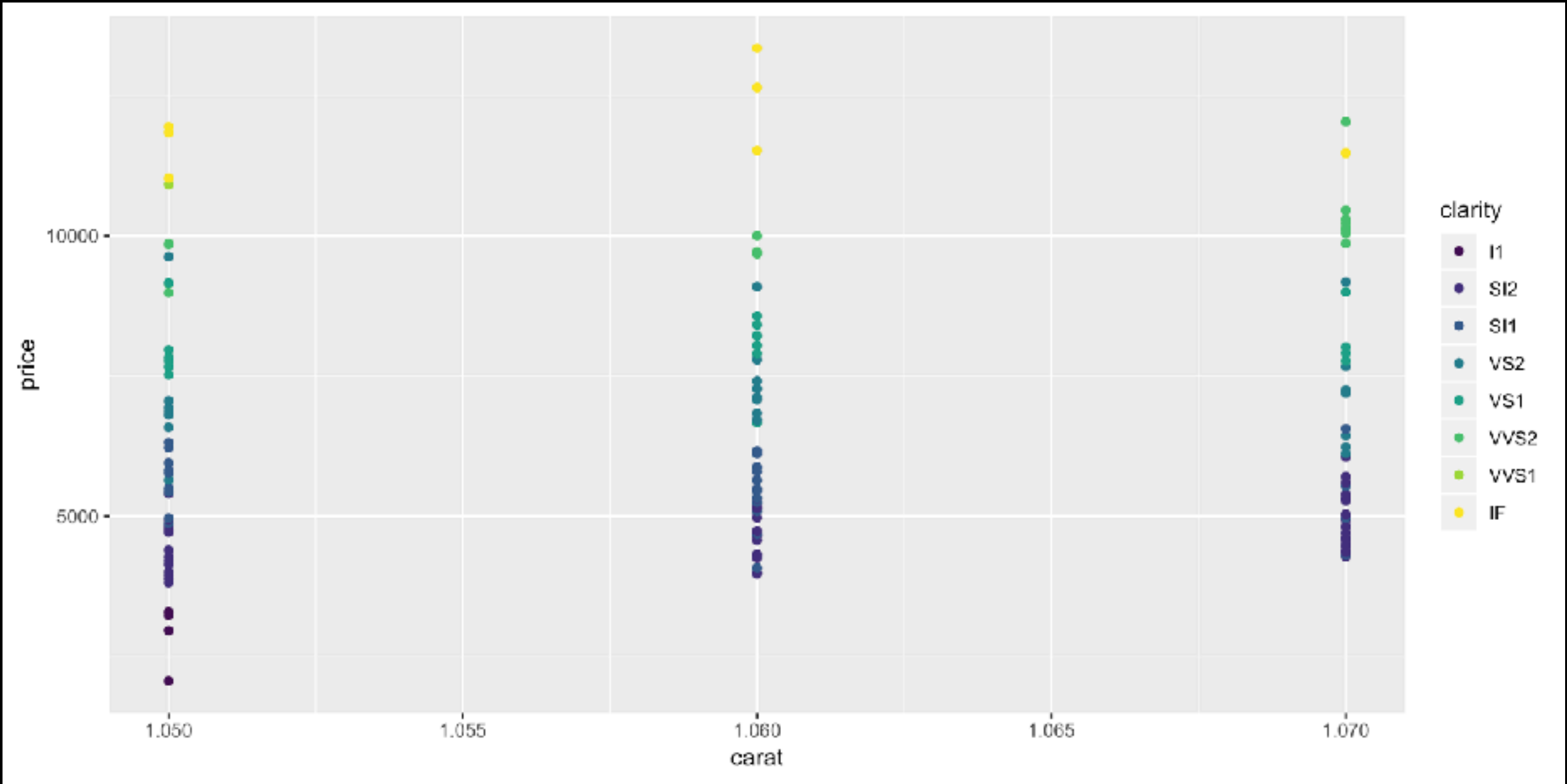
Two categories of memory

Short term - lasts several seconds - working memory

Long term - can last a lifetime

Short term memory - limited

Cognitive load when reach limits

Fail to absorb information

Facet plots are useful

Animation

Important tool but caution…

Good for showing transitions

Multiple animated frames can lose detail in comparison with frames
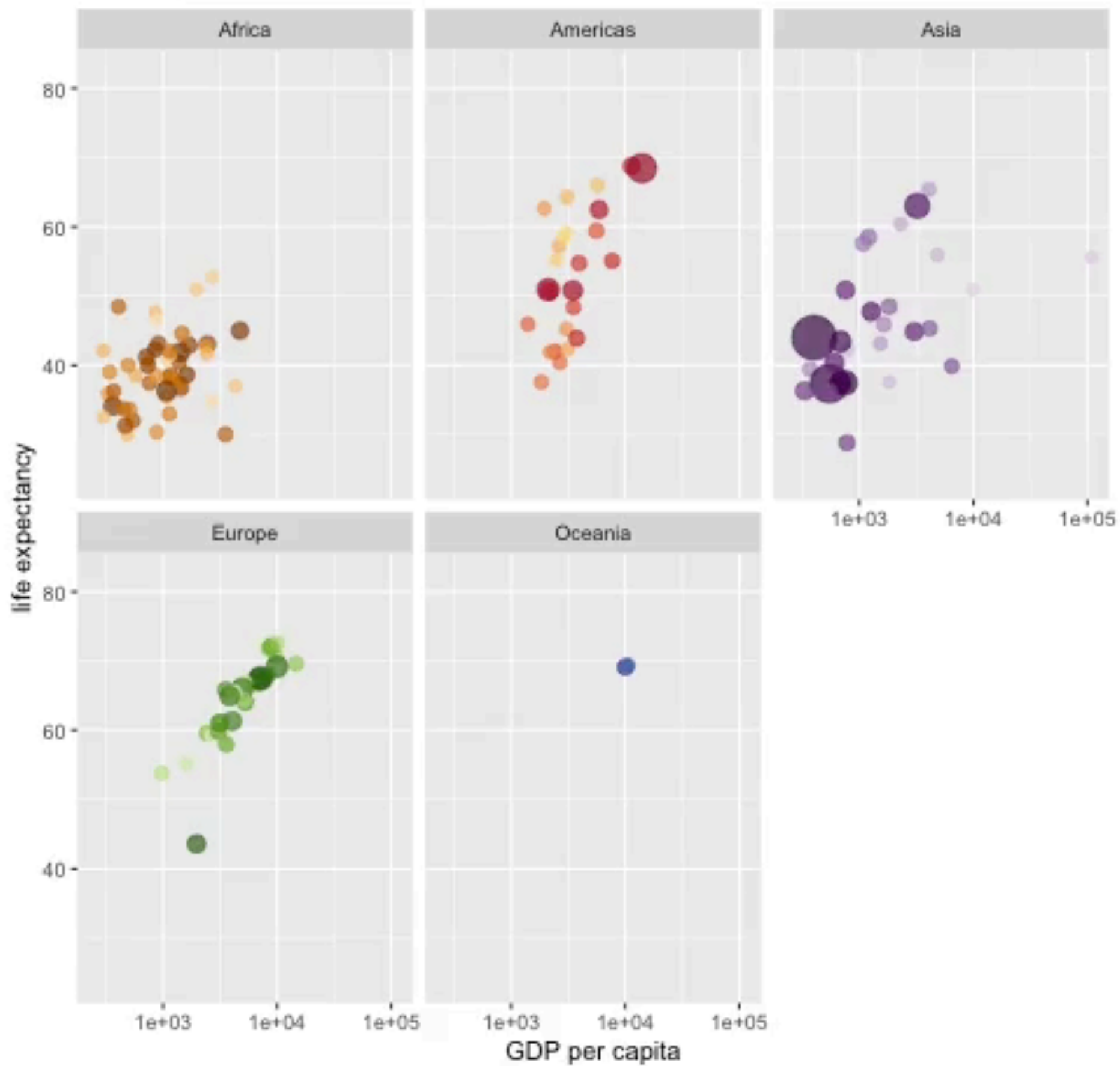
Year: 1952
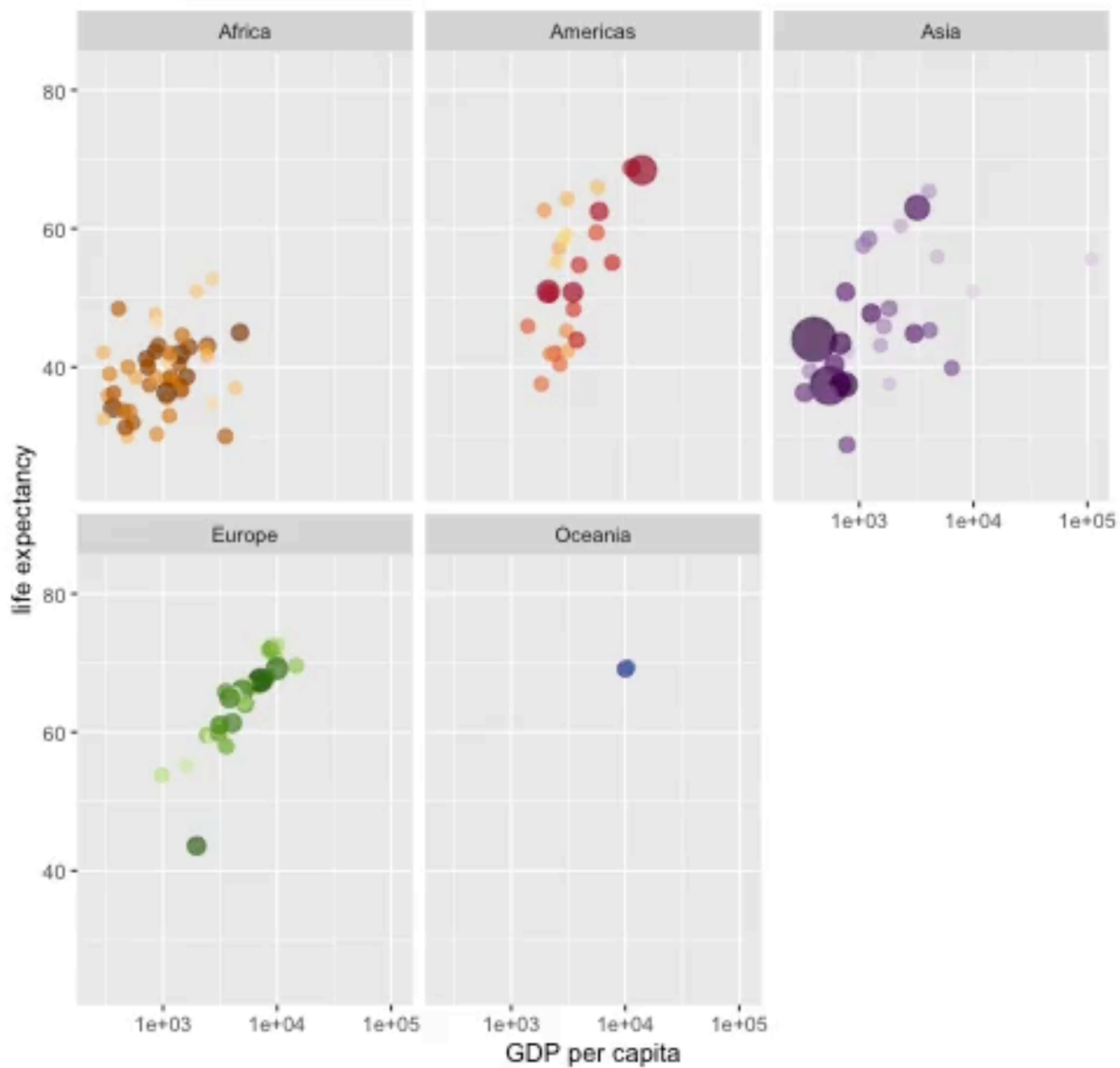
Change blindness

Get it right in Black and White

Noted effectiveness of colour

Check most crucial aspects of visualisation there in Black & White

Don't print in colour as a check

Function First, Form Next

Concentrate first on telling the story, then on making it look good.

Bad Graphics!

What's wrong with these images?

How would you plot it instead?

(f) Distribution of Genus

Legend:

- Acaryochloris
- Achromobacter
- Acidiphilium
- Acidobacterium
- Acidovorax
- Acinetobacter
- Albidiferax
- Algoriphagus
- Alkalilimnicola
- Allochromatium
- Ammonifex
- Anabaena
- Anaerolinea
- Anaeromyxobacter
- Aromatoleum
- Arthrospira
- Azoarcus
- Bacillus
- Bacteroides
- Bordetella
- Bradyrhizobium
- Burkholderia
- Caldanaerobacter
- Caldicellulosiruptor
- Candidatus Accumulibacter
- Candidatus Desulforudis
- Candidatus Koribacter
- Candidatus Solibacter
- Carboxydothermus
- Caulobacter
- Chitinophaga
- Chlorobaculum
- Chlorobium
- Chloroflexus
- Chthoniobacter
- Clostridium
- Cupriavidus
- Cyanothece
- Cytophaga
- Dechloromonas
- Dehalococcoides
- Deinococcus
- Desulfarculus
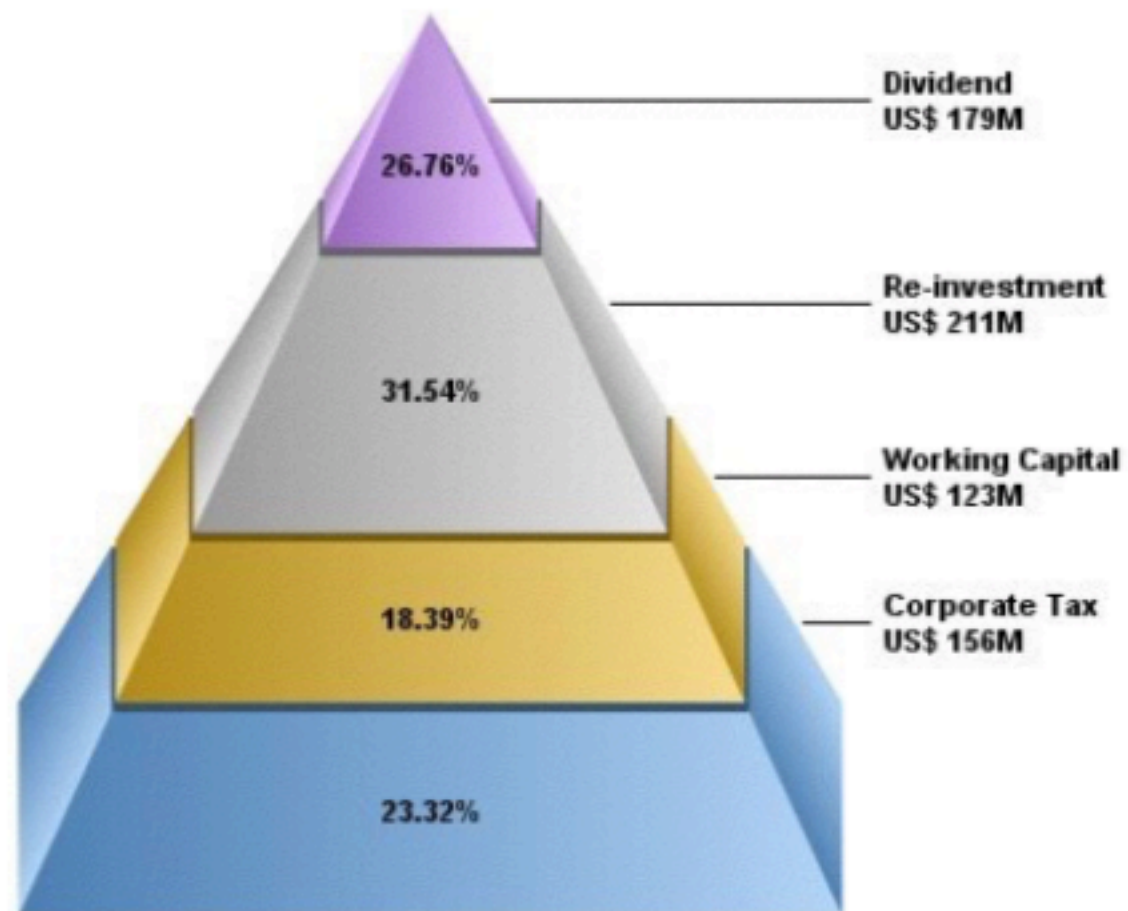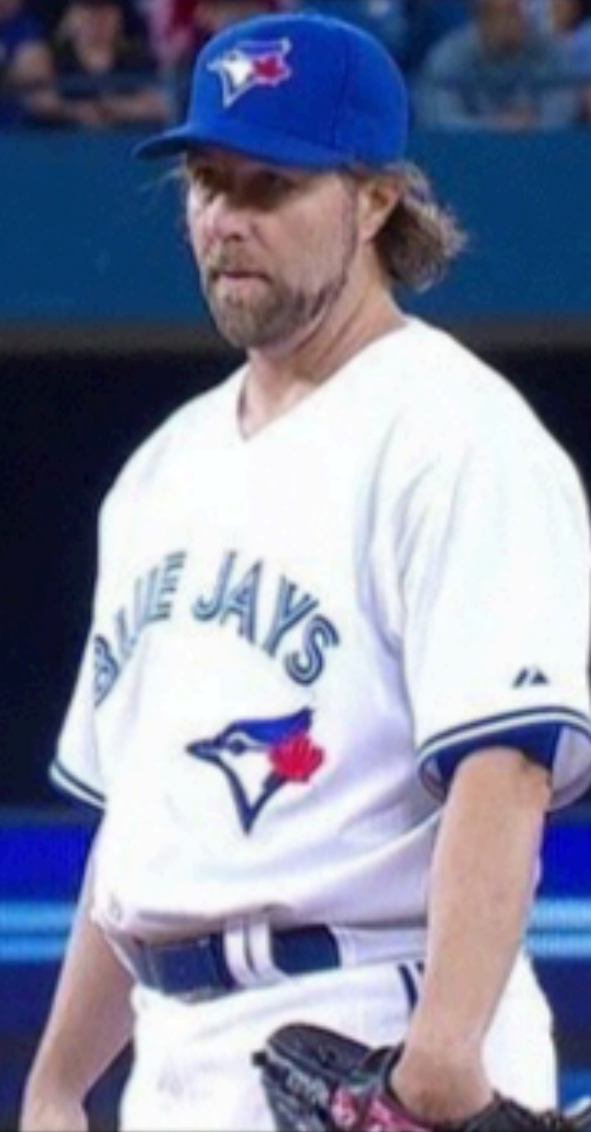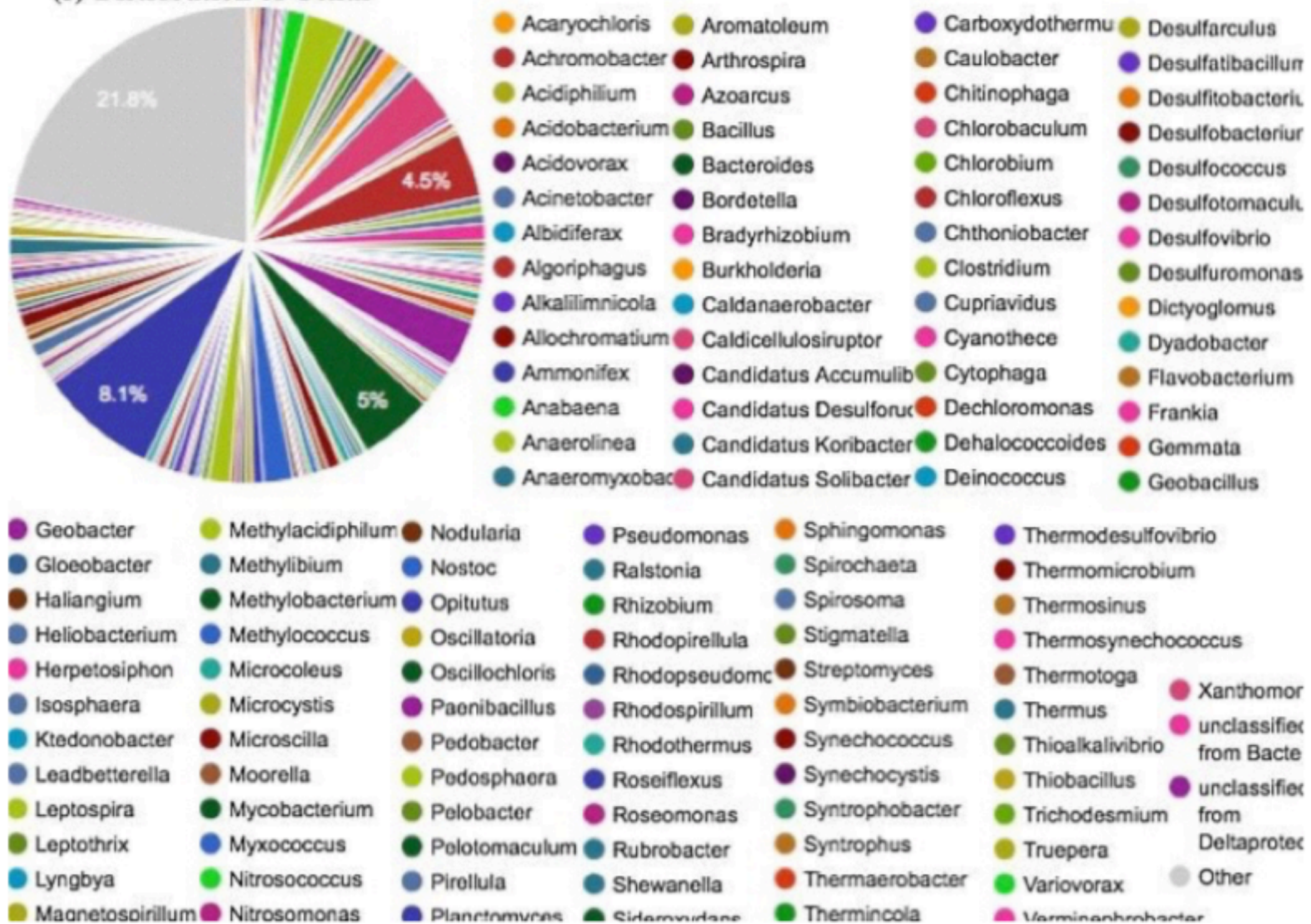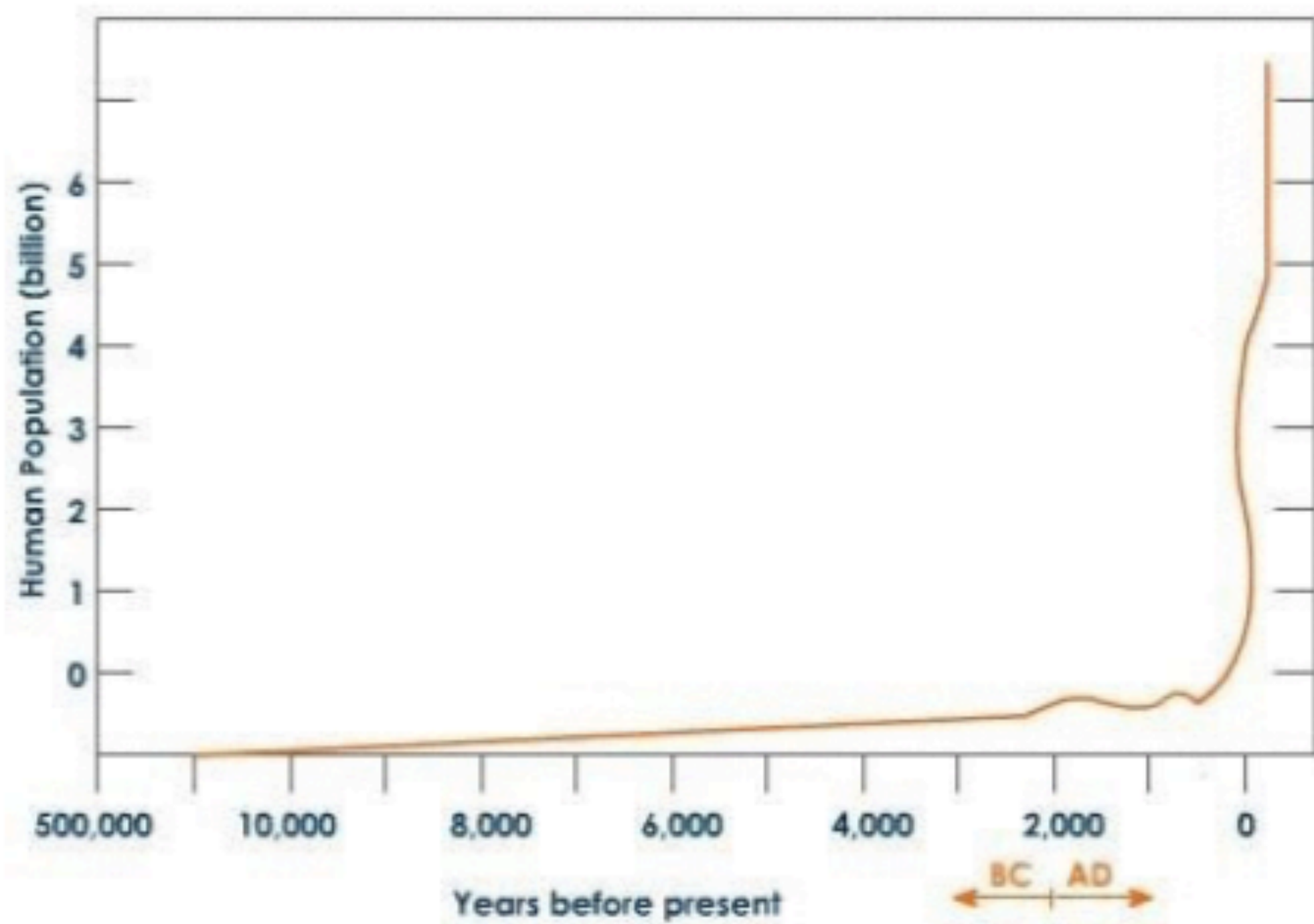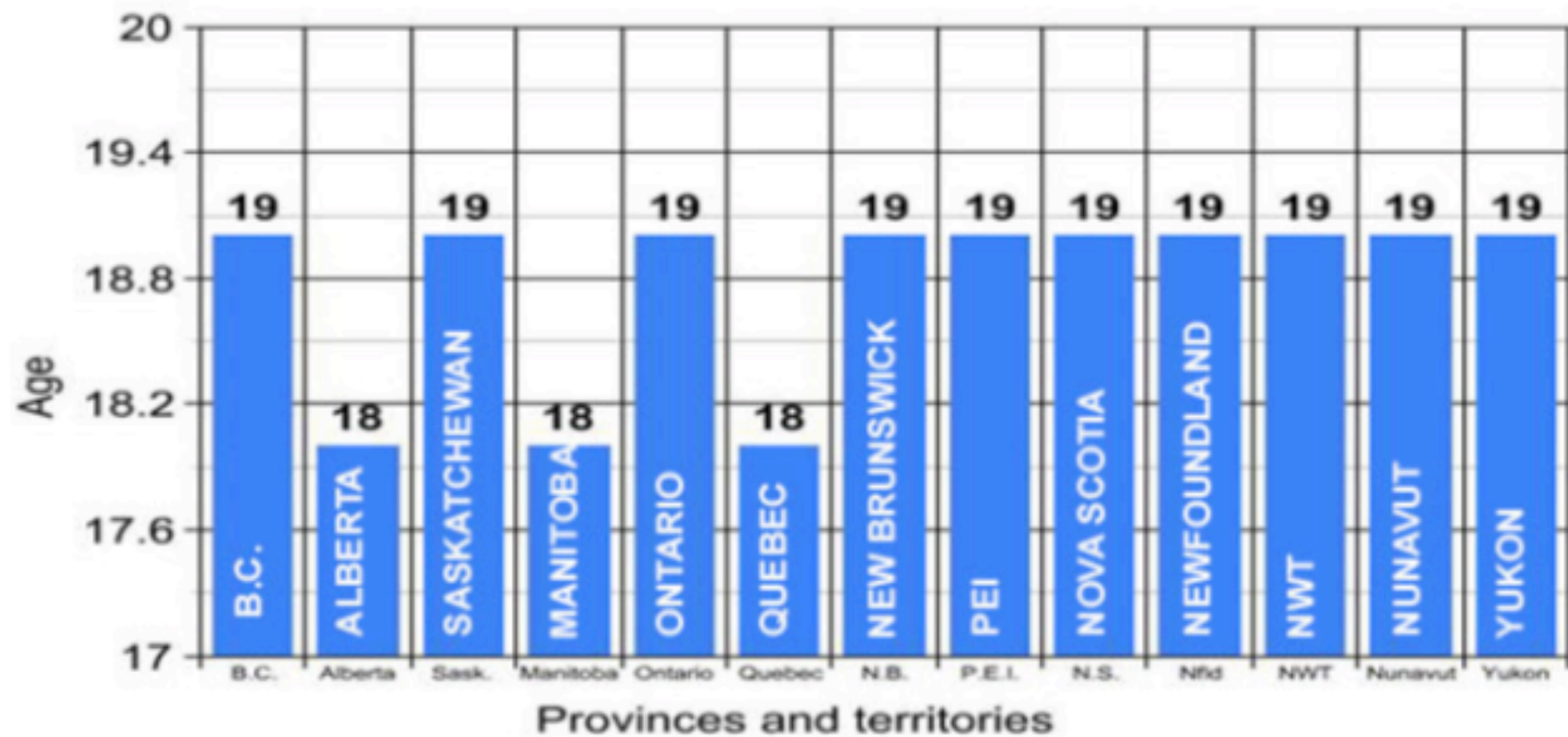- Desulfatibacillum
- Desulfitobacterium
- Desulfobacterium
- Desulfococcus
- Desulfotomaculum
- Desulfovibrio
- Desulfuromonas
- Dictyoglomus
- Dyadobacter
- Flavobacterium
- Frankia
- Gemmata
- Geobacillus

- Geobacter
- Gloeobacter
- Haliangium
- Heliobacterium
- Herpetosiphon
- Isosphaera
- Ktedonobacter
- Leadbetterella
- Leptospira
- Leptothrix
- Lyngbya
- Magnetospirillum
- Methylacidiphilum
- Methylibium
- Methylobacterium
- Methylococcus
- Microcoleus
- Microcystis
- Microscilla
- Moorella
- Mycobacterium
- Myxococcus
- Nitrosococcus
- Nitrosomonas
- Nodularia
- Nostoc
- Opitutus
- Oscillatoria
- Oscillochloris
- Paenibacillus
- Pedobacter
- Pedosphaera
- Pelobacter
- Pelotomaculum
- Pirellula
- Planctomyces
- Pseudomonas
- Ralstonia
- Rhizobium
- Rhodopirellula
- Rhodopseudomonas
- Rhodospirillum
- Rhodothermus
- Roseiflexus
- Roseomonas
- Rubrobacter
- Shewanella
- Sideroxydans
- Sphingomonas
- Spirochaeta
- Spirosoma
- Stigmatella
- Streptomyces
- Symbiobacterium
- Synechococcus
- Synechocystis
- Syntrophobacter
- Syntrophus
- Thermaerobacter
- Thermincola
- Thermodesulfovibrio
- Thermomicrobium
- Thermosinus
- Thermosynechococcus
- Thermotoga
- Thermus
- Thioalkalivibrio
- Thiobacillus
- Trichodesmium
- Truepera
- Variovorax
- Verminephrobacter
- Xanthomonas
- unclassified from Bacteria
- unclassified from Deltaproteobacteria
- Other

Drinking ages across Canada

Canadian Centre on Substance Abuse