

# Eyeballing Parameters

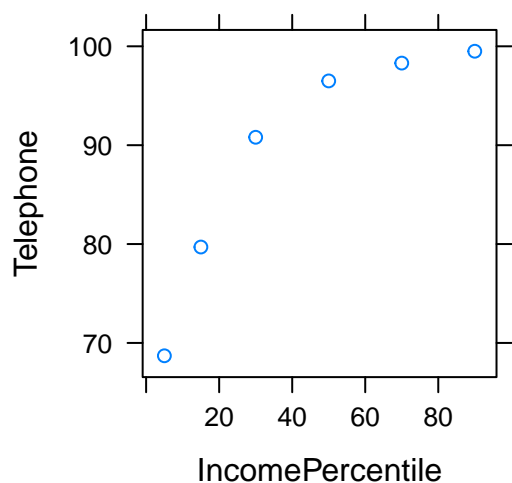
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For each graph, choose an appropriate function form to represent the pattern shown by the data and estimate, by eye, the parameters that will fit the data.

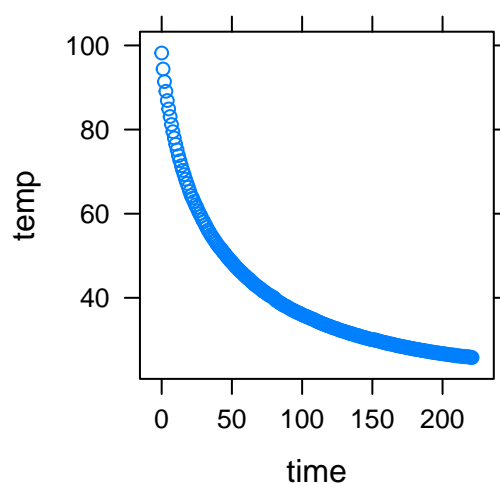
**Telephone** The fraction of US households with a telephone, as a function of family income. (Source: Susan E. Mayer (1997) *What money can't buy: Family income and children's life chances* Harvard Univ. Press p. 102.)

```
inc = fetchData("Income-Housing.csv")
plotPoints(Telephone~IncomePercentile,data=inc)
```



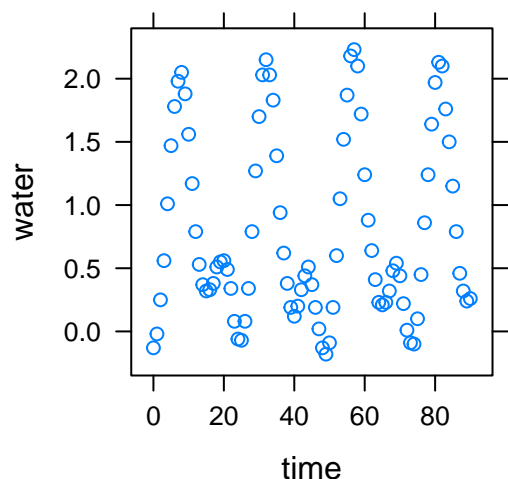
**Cooling Water** Stan Wagon's measurements of the temperature of cooling water. The water was boiled and poured into an aluminum pot. Time in seconds, temperature in degrees C. (For similar data: Stan Wagon and Robert Portmann, "How quickly does hot water cool?", *Mathematica in Education and Research* **10:3** (July 2005) 1-9.)

```
Cooling = fetchData("stan-data.csv")
plotPoints(temp ~ time, data=Cooling)
```



**Tides** Tidal measurements in Pearl Harbor, Hawaii. (Source: Andrew Beveridge)

```
Hawaii = fetchData("hawaii.csv")
plotPoints(water ~ time, data=Hawaii)
```



**Internal Combustion Engines** Data about the size, power, and other characteristics of internal combustion engines. (Source: Thomas McMahon and John Tyler Bonner (1983) *On Size and Life*)

```
Engines = fetchData("engines.csv")
Engines = transform(rpm=RPM, bhp=BHP)

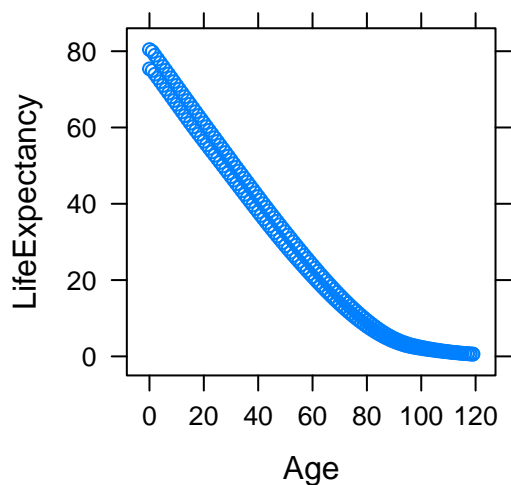
Error: object 'RPM' not found

plotPoints(log(rpm)~log(bhp), data=Engines)

Error: object 'rpm' not found
```

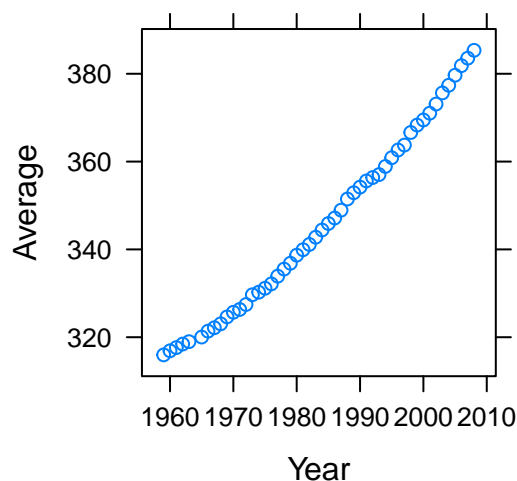
**Life Expectancy** Residual life expectancy versus age in the US. US Census Bureau.

```
LE = fetchData("LifeExpectancy.csv")
plotPoints(LifeExpectancy ~ Age, data=LE)
```



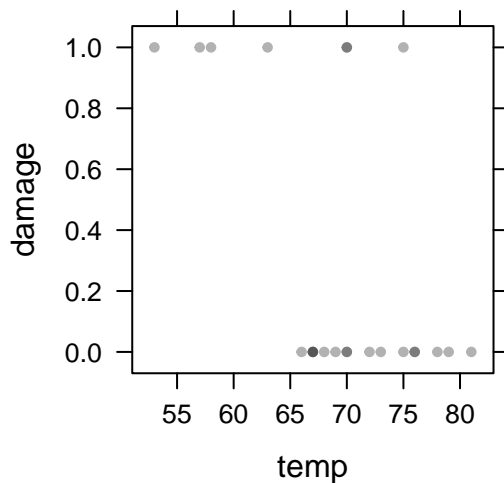
**Carbon Dioxide** Keeling's record of atmospheric carbon dioxide from Mauna Loa, 1958-2008. <http://cdiac.ornl.gov/trends/co2/sio-mlo.html>

```
C02 = fetchData("maunaloa-CO2.csv")
C02 = subset(C02, Average > 200)
plotPoints(Average ~ Year, data=C02)
```



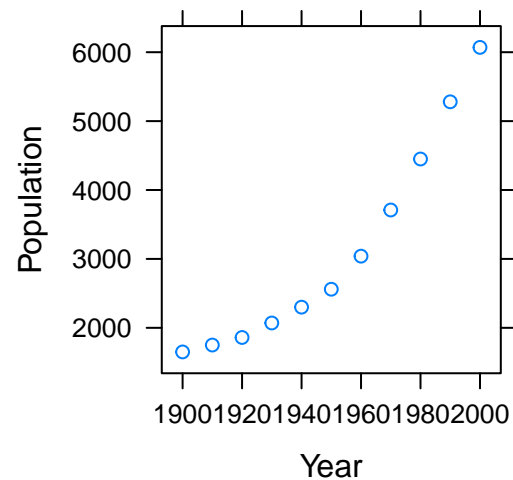
**Space Shuttle O-ring Failures** The number of O-ring failures versus temperature at the launch site for each Space Shuttle launch up to the 1986 Challenger accident.

```
oring = fetchData("oring-damage.csv")
plotPoints(damage ~ temp, data=oring,
           pch=20, col=rgb(0,0,0,.3))
```



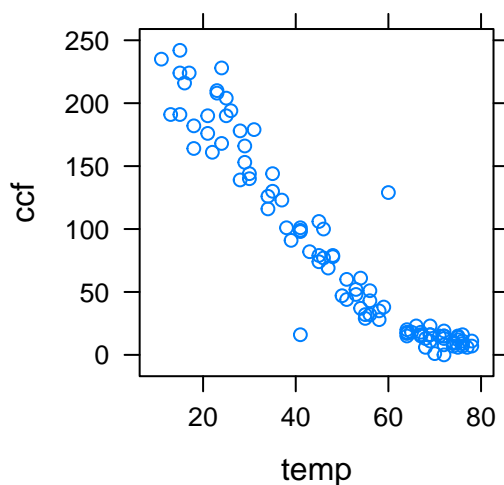
**Interpolating World Population** Data from a problem in Stewart, giving world population versus year. (Source: Stewart, *Calculus: Concepts and Contexts* 2/e p. 38).

```
worldPop = fetchData("PREP-Stewart-World-Population.csv")
plotPoints(Population ~ Year, data=worldPop)
```



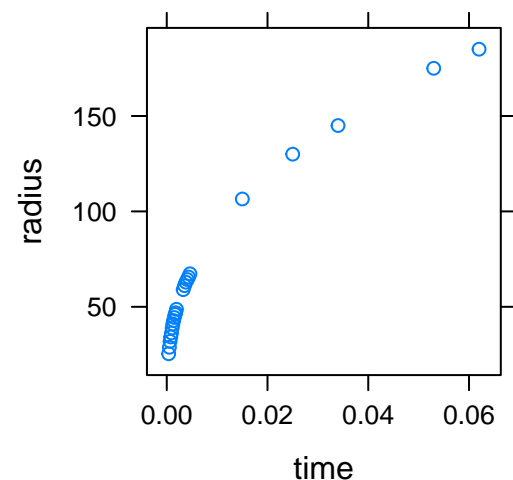
**Utility Use Data** Month-by-month utility bill data from a single-family house in Saint Paul, Minnesota.

```
utils = fetchData("utilities.csv")
plotPoints(ccf ~ temp, data=utils)
```



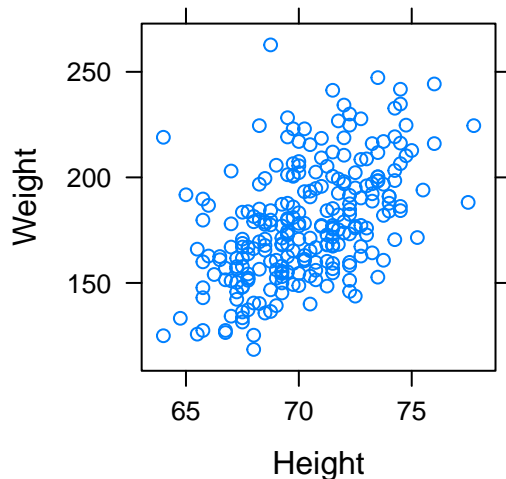
**Trinity Test Fireball** The radius of the fireball versus time measured at the first atomic bomb test, Trinity, in Alamogordo, New Mexico, on July 16, 1945.

```
blast = fetchData("blastdata.csv")
plotPoints(radius ~ time, data=blast)
```



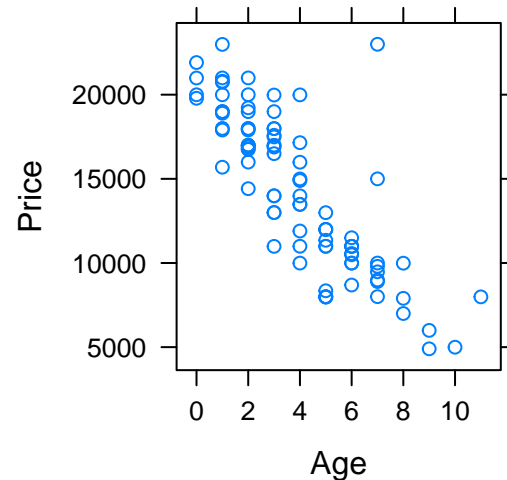
**Body Fat Measurements** Body circumference measurements for 252 men, along with estimates of the percentage of body fat determined by underwater weighing. (Source: StatLib <http://lib.stat.cmu.edu/datasets/bodyfat>. See also a discussion by Victor Addona [http://www.mosaic-web.org/go/MCAST/materials/Sept-10-2010/Addona\\_MCAST\\_Sept\\_10.pdf](http://www.mosaic-web.org/go/MCAST/materials/Sept-10-2010/Addona_MCAST_Sept_10.pdf).)

```
body = fetchData("BodyFat.csv")
body = subset(body, Height>60 & Weight<300 )
plotPoints(Weight ~ Height, data=body)
```



**Used Car Prices** Data on used Honda Accords collected by a student group in Macalester's Math 155 class. (Contact: Daniel Kaplan, Macalester College)

```
cars = fetchData("used-hondas.csv")
plotPoints(Price ~ Age, data=cars)
```



**Kepler's Observations of Mars** Kepler's measurements of the position of Mars relative to the sun. (Data source: McLaughlin, Michael P. (1999) "A Tutorial on Mathematical Modelling" [http://www.causascientia.org/math\\_stat/Tutorial.pdf](http://www.causascientia.org/math_stat/Tutorial.pdf) p. 21-23.) The 'Time' variable is measured as a Julian date; 0 is Greenwich noon, on 1 January 4713 BC. Radii are in astronomical units (AU) — the mean distance from the Earth to the Sun.

```
kdata = fetchData("kepler-mars.csv")
plotPoints( kepler.radius ~ kepler.angle, data=kdata, xlab="Angle",ylab="Radius" )
kdata = transform(kdata, x=kepler.radius*cos(kepler.angle))
kdata = transform(kdata, y=kepler.radius*sin(kepler.angle))
plotPoints(y~x, data=kdata,col="red")
```

