Data Handling — Biophysical Methods

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$$M = \frac{2RT}{(1-v\rho)\omega^2}\frac{d(\ln(c))}{dr^2}$$

$$M = \frac{2 \times 8.314 \times 298.15}{(1-0.74) \times 27000^2}\frac{d(\ln(c))}{dr^2} = 2.6156 \times 10^{-5}\frac{d(\ln(c))}{dr^2}$$

```
r = c(6.918, 6.923, 6.924, 6.929, 6.932, 6.935, 6.942, 6.943, 6.945,
6.952, 6.955, 6.962, 6.964, 6.968, 6.973, 6.977, 6.978, 6.983,
6.985, 6.987, 6.992, 6.994, 6.998, 7.002, 7.004, 7.006, 7.009,
7.013, 7.016, 7.019, 7.022, 7.024, 7.026, 7.031, 7.033, 7.038,
7.042, 7.045, 7.047, 7.05, 7.053, 7.059, 7.061, 7.062, 7.065,
7.069, 7.07, 7.075, 7.077, 7.081, 7.084, 7.087, 7.09, 7.095,
7.098, 7.102, 7.106, 7.109, 7.11, 7.114, 7.116, 7.121, 7.123,
7.131, 7.137, 7.139, 7.141, 7.145, 7.146, 7.148, 7.15, 7.156,
```

```
7.158, 7.163, 7.166, 7.17)
od <- c(0.0645, 0.0658, 0.0731, 0.07, 0.0726, 0.0721, 0.0762, 0.0755,
0.0807, 0.082, 0.0809, 0.0914, 0.0909, 0.0969, 0.0979, 0.0983,
0.1054, 0.1038, 0.095, 0.1105, 0.1087, 0.1045, 0.1181, 0.1189,
0.1224, 0.1302, 0.1187, 0.133, 0.1306, 0.1413, 0.1378, 0.1371,
0.1333, 0.1521, 0.1481, 0.1578, 0.1498, 0.1495, 0.1605, 0.1699,
0.1664, 0.1757, 0.1802, 0.1834, 0.1882, 0.1856, 0.195, 0.2039,
0.1999, 0.1874, 0.2191, 0.2143, 0.215, 0.2186, 0.2283, 0.2347,
0.2677, 0.2532, 0.2596, 0.262, 0.2812, 0.271, 0.2816, 0.2841,
0.31, 0.3141, 0.3336, 0.3147, 0.334, 0.3528, 0.3548, 0.3572,
0.3752, 0.373, 0.3863, 0.3792)
```

Prepare data $\ln(c)$ and r^2:

```
# divide 2 by 100 to convert cm to m
r2 = (r/100)^2; lnc = log(od)
```

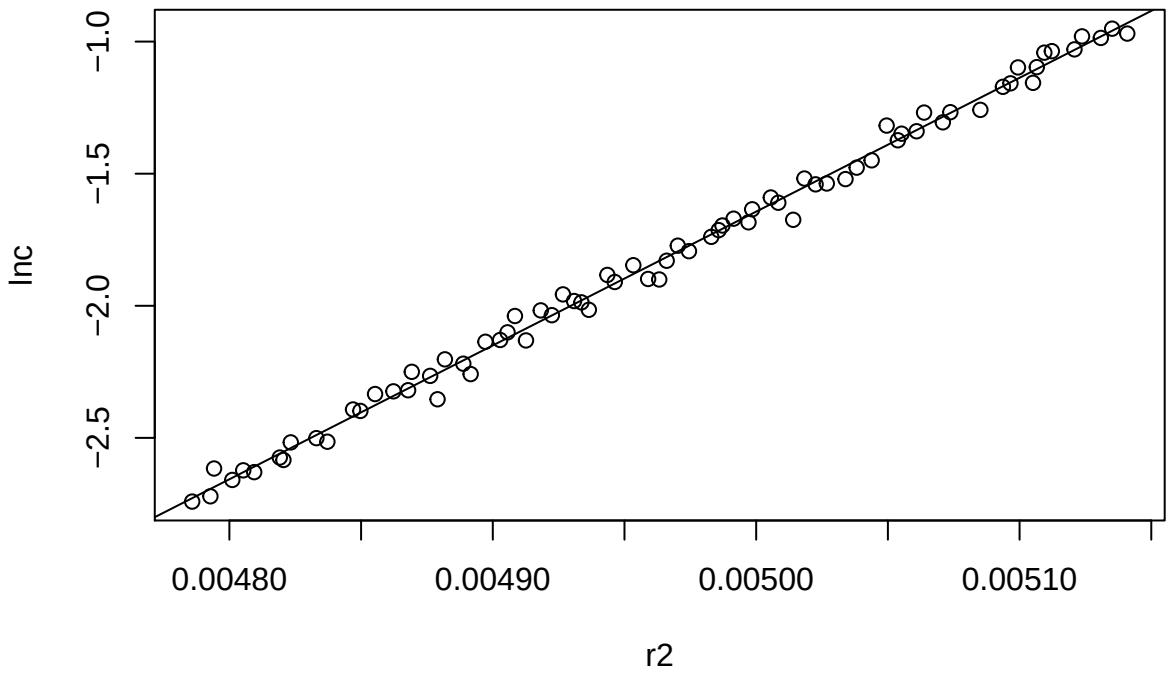
```
mod <- lm(lnc~r2)
summary(mod)
```

```
##
## Call:
## lm(formula = lnc ~ r2)
##
## Residuals:
##       Min        1Q    Median        3Q       Max
## -0.102145 -0.020829  0.001427  0.022606  0.074815
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)  -26.9712     0.2063  -130.7   <2e-16 ***
## r2          5065.5170    41.5559   121.9   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.03669 on 74 degrees of freedom
## Multiple R-squared:  0.995,  Adjusted R-squared:  0.995
## F-statistic: 1.486e+04 on 1 and 74 DF,  p-value: < 2.2e-16
```

```
# only gradient is important
```

Plot it:

```
plot(r2, lnc)
abline(-26.9711515, 5065.51703)
```




```
2.6156e-5 * 5065.51703
```

```
## [1] 0.1324937
```

```
#2.6156e-5 * 506551.703
```