

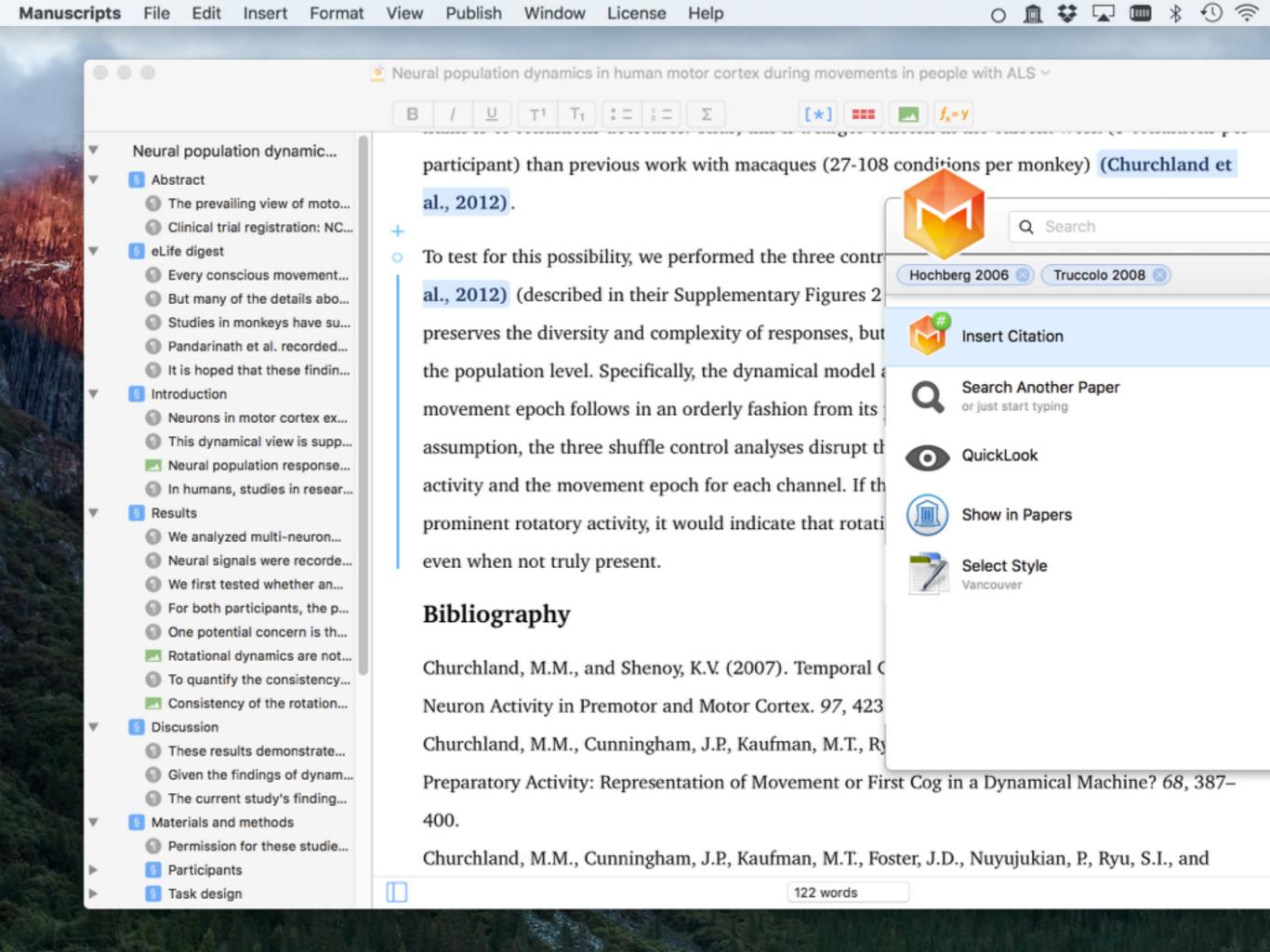


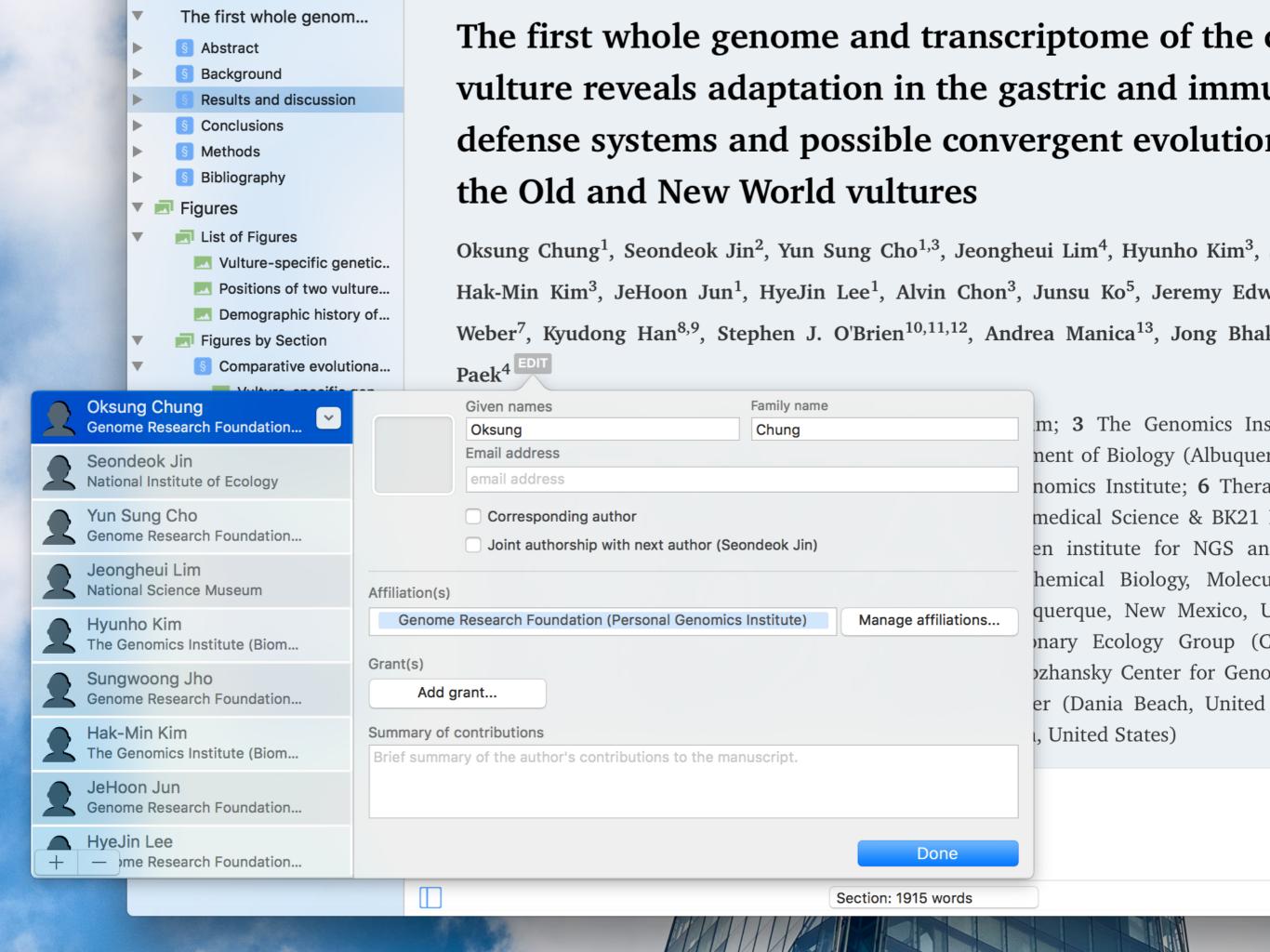


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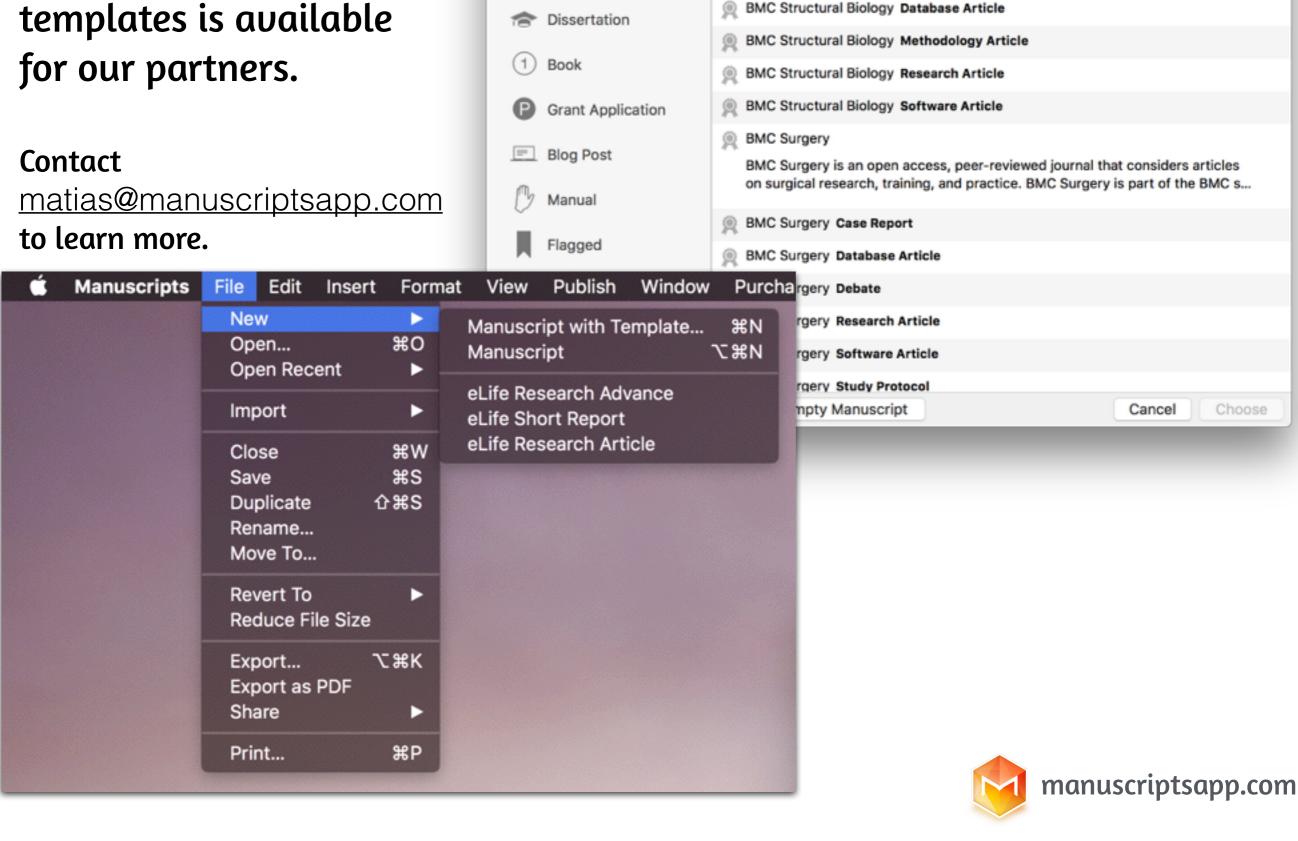
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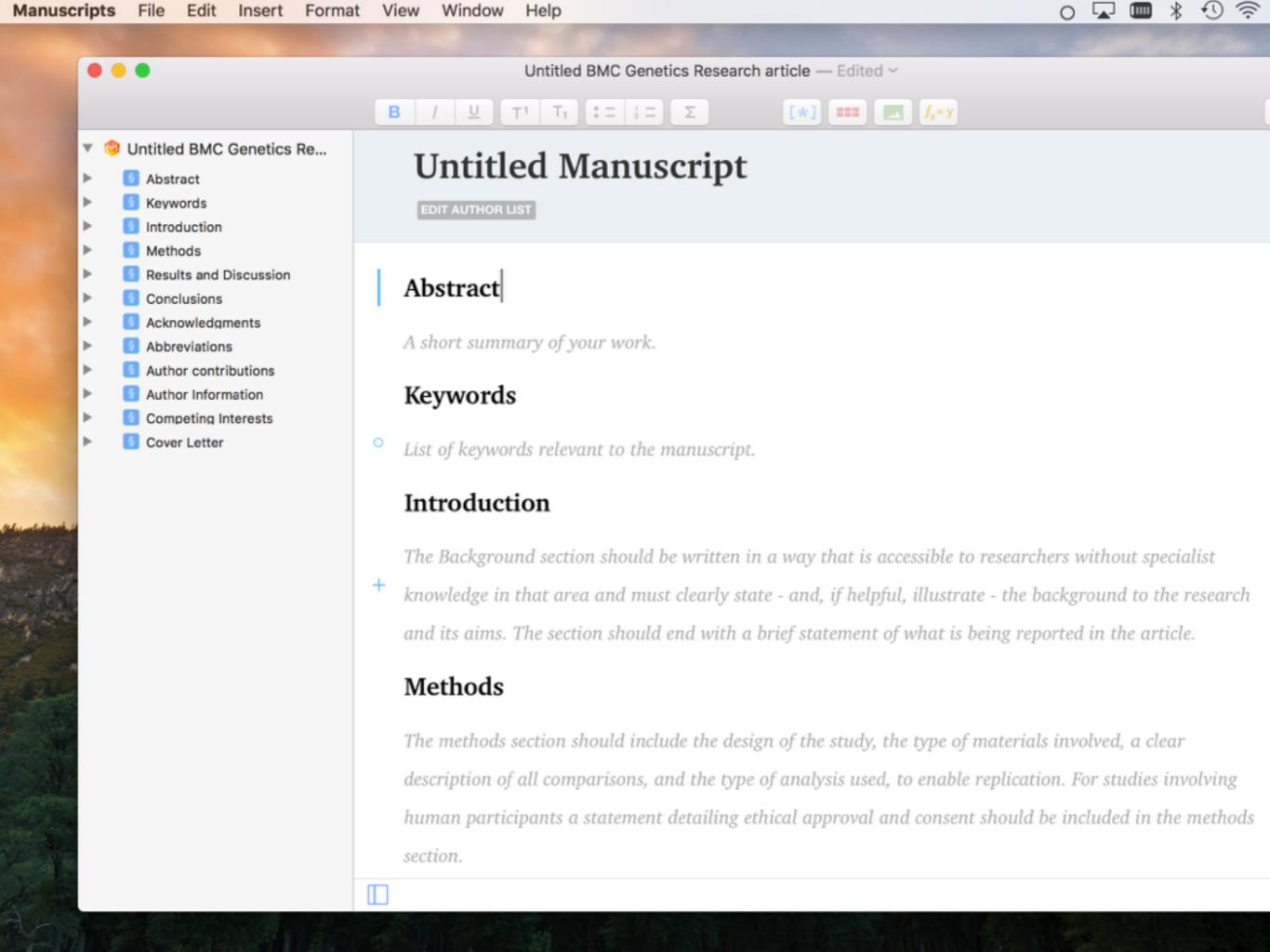
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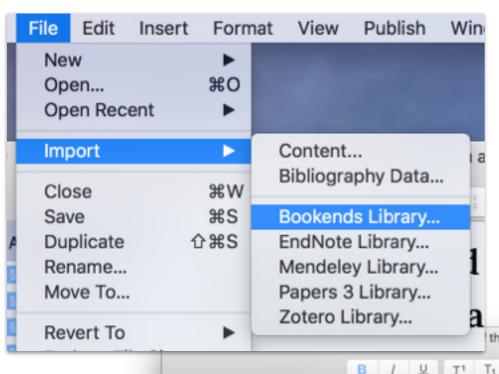
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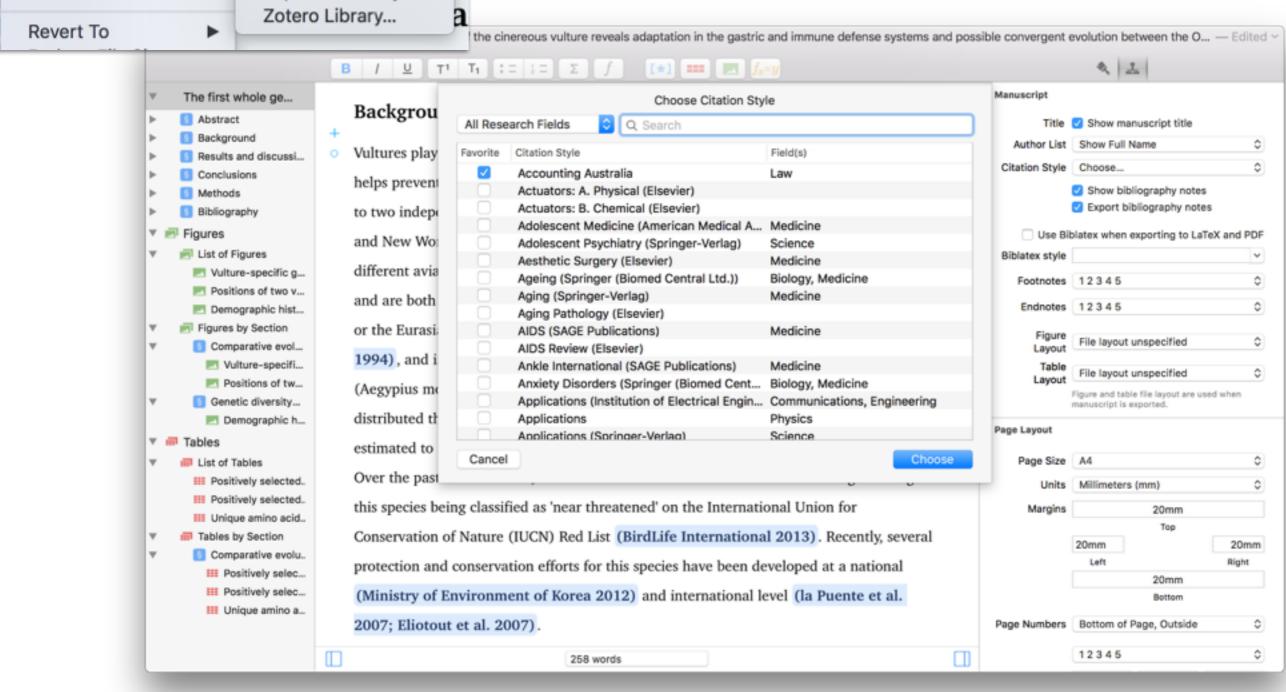
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accuracy). Methods like metamattican however become increasingly relevant once more high-throughput TF DNA specificity data becomes available.

Metamotifs - a generative model for building families of nucleotide position weight matrices — Edited ~

	Cys4	C2H2	ьнгн	bZIP	Forkhead	Homeodomain	Class error
Cys4	39	0	0	0	0	1	0.025
C2H2	0	38	3	0	10	3	0.156
ЬНІН	0	2	22	5	0	0	0.24
bZIP	0	3	0	78	0	4	0.08
Forkhead	0	0	0	o	31	2	0.09
Homeodomain	2	1	1	3	0	37	0.16
Totals	41	43	26	86	32	47	

Table 2: Confusion matrix of the homeodomain motif specificity group classifier

Conclusions

We present a novel motif family model, the metamotif. We show its use as an informative prior in a motif discovery algorithm, and describe a motif classification method based on metamotif density features. We find that the method compares favourably to previously published related methods. Its performance with two novel experimental TFBS motif datasets is also found consistent with expected error estimates. The

The metamotif

A metamotif a is a matrix of L columns, each defining a Dirichlet distribution over \mathbb{R}^K where K is the alphabet size (Equation 1).

$$lpha = \left(egin{array}{ccc} lpha_{11} & \dots & lpha_{1L} \ dots & & dots \ lpha_{K1} & \dots & lpha_{KL} \end{array}
ight)$$

Equation 1: A metamotif is a column Dirichlet distribution.

A motif $X = (x_1, x_2,...,x_n)$ is a set of column vectors over the same alphabet. The probability of observing the column x_i from the metamotif a is given by the density of Dirichlet distribution with parameters a_i at weights \mathbf{x}_i (Equation 2). The normalising constant B(a) is the multinomial beta function, expressed in Equation 3 via the Gamma function.

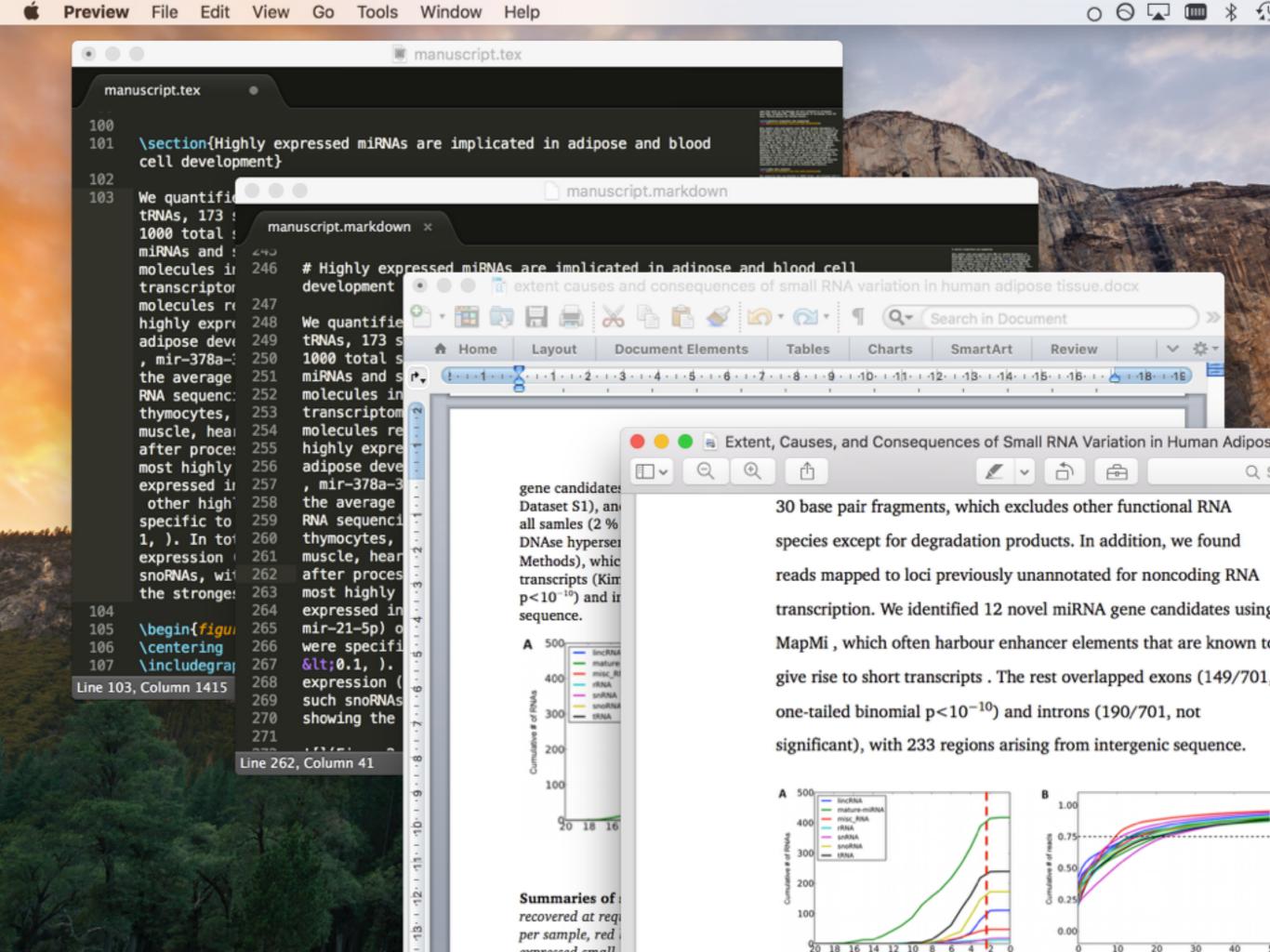
$$\mathbb{P}(\mathbf{x}_i | lpha_i) = \mathrm{Dir}(\mathbf{x}_i; lpha_i) = rac{1}{B(lpha)} \prod_{j=1}^K x_{ij}^{lpha_{ij}-1}$$

Equation 2: A Dirichlet distribution with parameters alpha.

$$B(lpha) = rac{\prod_{j=1}^K \Gamma(lpha_j)}{\Gamma(\sum_{j=1}^K lpha_j)}$$

Equation 3: Beta distribution.

The log probability of observing a motif of length L is then given by Equation 4.



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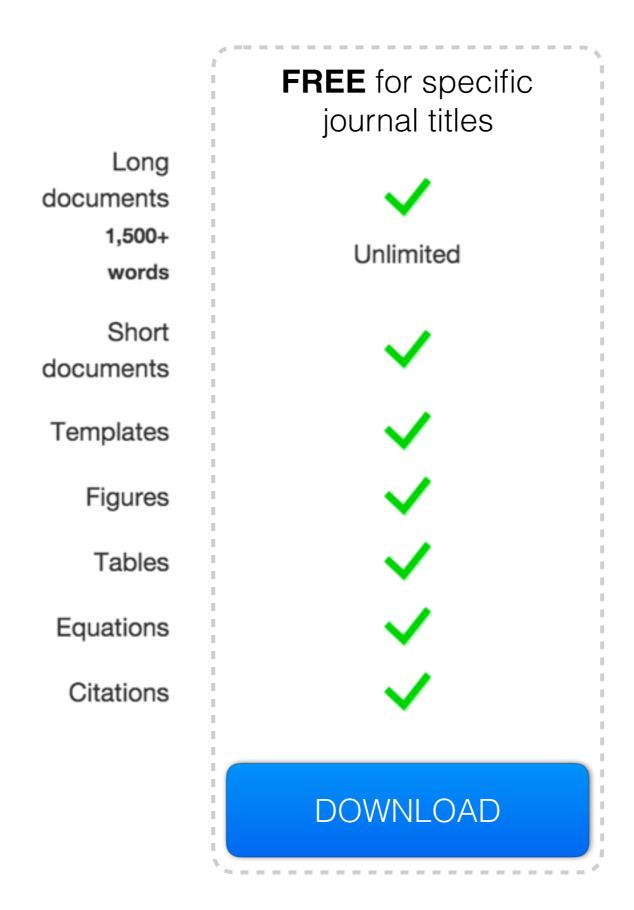
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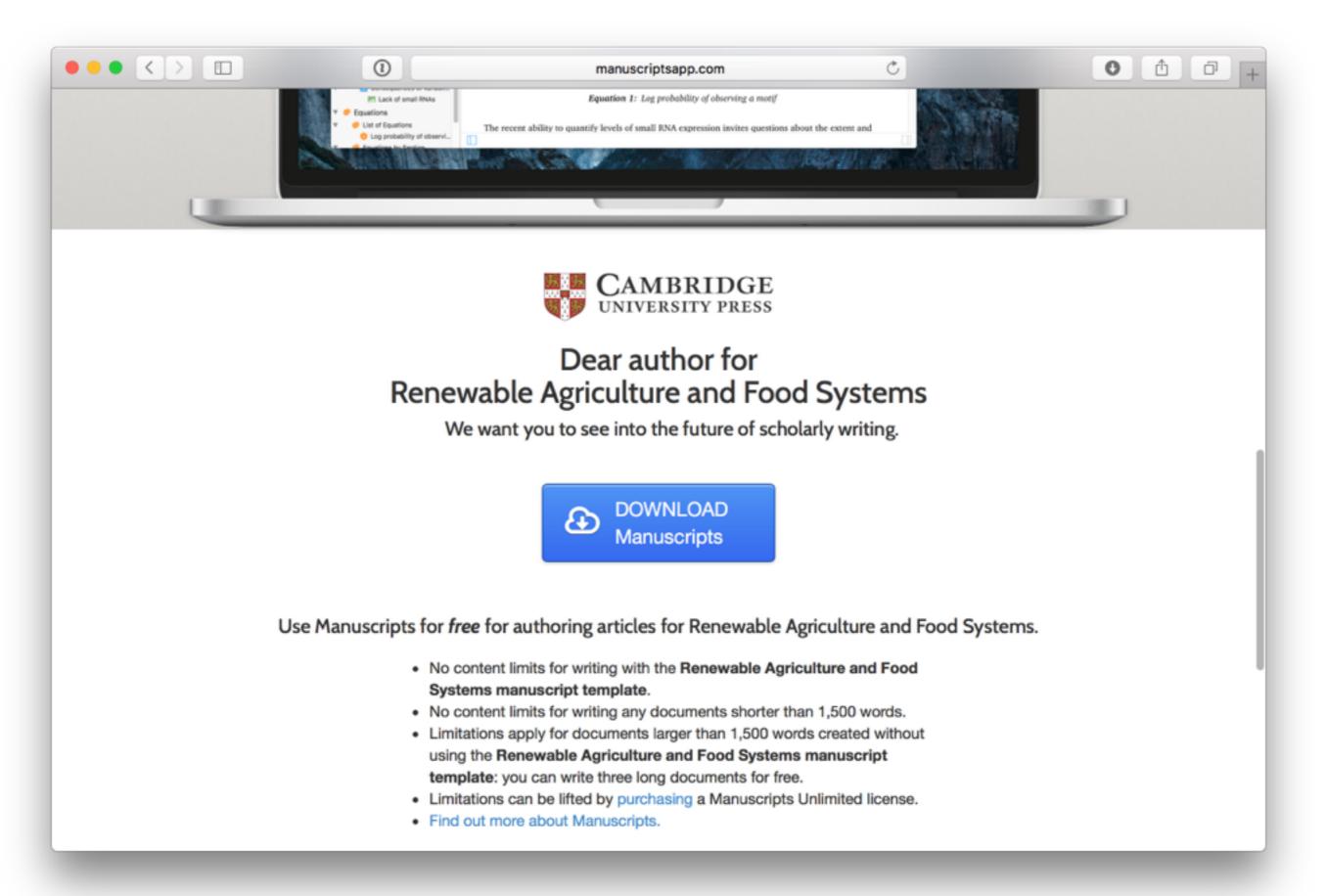


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