Appendix 5

Drake Equation:
\[ N = R_\ast f_p n_e f_\ell f_i f_c L \]

- **N** = number of communicable civilizations in our galaxy.
- **R_\ast** = rate at which stars form.
- **f_p** = fraction of stars that have planetary systems.
- **n_e** = number of planets, per planetary system, that are suitable for life.
- **f_\ell** = fraction of planets suitable for life on which life actually arises.
- **f_i** = fraction of life-bearing planets where intelligence develops.
- **f_c** = fraction of planets with intelligent life that develop a technological phase during which there is capability for and interest in interstellar communication.
- **L** = average lifetime of communicable civilizations.
- **r** = average distance to nearest civilization.

<table>
<thead>
<tr>
<th>R_\ast</th>
<th>f_p</th>
<th>n_e</th>
<th>f_\ell</th>
<th>f_i</th>
<th>f_c</th>
<th>L</th>
<th>N</th>
<th>r</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Estimate</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Birthrate</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

if \( N > 8000 \) \[ r = \frac{10^4 \text{ l.y.}}{N^{1/3}} \]

if \( N < 8000 \) \[ r = \frac{5 \times 10^4 \text{ l.y.}}{N^{1/2}} \]