CLAIMS

What is claimed is:

1. A method for ~~precisely~~ enlarging the size of a nanopore formed in a membrane, comprising:

   a) selecting a value for an electric potential that induces an electric field in a nanopore, where the electric field is above 0.1 volts per nanometer;

   b) removing material of the membrane to enlarge the nanopore by applying, for a predetermined period of time, an electric potential at the selected value across the ~~a~~ nanopore disposed in an ionic solution;

   c) after the predetermined time period, reducing the electric potential applied across the nanopore to a value less than the selected value;

   d) measuring current flowing though the nanopore, while the electric potential is applied at the reduced value; and

   e) determining size of the nanopore based ~~in part~~ on the measured current.

2. The method of claim 1 wherein determining size of the nanopore further comprises removing the electric potential applied across the nanopore when the measured current is equal to or exceeds a threshold.

3. The method of claim 1 further comprises

   f) increasing the electric potential applied across the nanopore to the selected value when the measured current is less than a ~~the~~ threshold and

   g) repeating steps (b) – (f) until the measured current is equal to or exceeds the threshold.

4. The method of claim 1 wherein selecting the value for the electric potential further comprises selecting the value of the electric potential such that the electric field is approximately 0.3 volts per nanometer.

5. The method of claim 1 wherein selecting the value for the electric potential further comprises selecting the value of the electric potential such that the electric field falls within a range of 0.10 volt per nanometer to 0.4 volts per nanometer.

6. The method of claim 1 further comprises applying the electric potential at the reduced value for period of time that enables an ohmic ionic current to stabilize.

7. The method of claim ~~1~~ 2 wherein determining size of the nanopore further comprises reapplying the electrical potential at the selected value across the nanopore when the measured current is less than the threshold, where polarity of the electric potential is reversed.

8. The method of claim 1 wherein applying the electric potential further comprises increasing ~~magnitude~~ the value of the electric potential to increase growth rate of the nanopore.

9. The method of claim 1 wherein applying the electric potential further comprises increasing ionic strength of the ionic solution to increase growth rate of the nanopore.

~~10. A method for precisely enlarging size of a nanopore formed in a membrane, comprising:~~

~~applying an electric potential across the nanopore disposed in an ionic solution, the electric potential having a pulsed waveform oscillating between a high value and a low value;~~

measuring current flowing though the nanopore while the electric potential is being applied across the nanopore at a low value;

determining size of the nanopore based in part on the measured current; and

removing the electric potential applied to the nanopore when the size of the nanopore corresponds to a desired size.

11. The method of claim 10 further comprises selecting the high value for the electric potential such that the electric field falls within a range of 0.1 volt per nanometer to 0.4 volts per nanometer.

12. The method of claim 10 further comprises selecting the low value for the electric potential such that the electric field is below 0.1 volts per nanometer.

13. The method of claim 10 wherein determining size of the nanopore includes comparing the measured current to a threshold and

removing the electric potential from across the nanopore when the measured current exceeds the threshold.

14. The method of claim 10 further comprises alternating polarity of the high value between a positive value and a negative value for every other pulse.

15. A method for precisely enlarging size of a nanopore formed in a membrane, comprising:

selecting a value for an electric potential that induces an electric field in a nanopore, where the electric field is above 0.1 volts per nanometer;

applying an electric potential at the selected value across a nanopore disposed in an ionic solution;

measuring current flowing through the nanopore while the electric potential is applied across the nanopore;

estimating size of the nanopore based in part on the measured current; and

removing the electric potential applied across the nanopore when the measured current exceeds a threshold.

~~16. The method of claim 15 further comprises~~

~~reducing the electric potential applied across the nanopore to a value less than the selected value;~~

~~measuring current flowing through the nanopore while the electric potential is applied at the reduce value; and~~

~~determining the size of the nanopore based in part on the current measure while the electric potential is applied at the reduced value.~~

~~17. The method of claim 15 further comprises selecting the value of the electric potential such that the electric field is approximately 0.3 volts per nanometer.~~

~~18. The method of claim 15 further comprises selecting the value of the electric potential such that the electric field falls within a range of 0.10 volt per nanometer to 0.4 volts per nanometer.~~