WHAT IS CLAIMED IS:

1. A method of generating a model for the analysis of events associated with brain seizures, the method comprising:

receiving simultaneously collected electrophysiology data and magnetic resonance imaging (MRI) data that was collected from a kindled animal brain, wherein the electrophysiology data, the MRI data, or both includes data of at least one neural event reflecting functional and neural circuit changes, wherein the at least one neural event was responsive to a stimulation of the brain;

analyzing the electrophysiology data and the MRI data to determine corresponding changes in the electrophysiology data and MRI data indicative of the neural events,

wherein analyzing the electrophysiology data comprises calculating a band power during a stimulation divided by a band power prior to the stimulation, and

wherein analyzing the MRI data comprises:

segmenting the MRI data of the animal brain into a plurality of individual regions;

quantifying activation volumes of the plurality of individual regions; and

selecting a subset of the plurality of individual regions having the largest activation volumes; and

generating a map of a network associated with the at least one neural event based on the MRI data, the electrophysiology data, or a combination thereof.

2. The method of claim 1, further comprises analyzing the MRI data to determine neural event propagation, the analyzing comprising:

low pass filtering the MRI data;

registering the MRI data to a brain atlas;

segmenting the MRI data into a plurality of individual regions based on the registering; and

calculating a mean time course for a plurality of voxels in an individual region of the plurality of individual regions.

3. The method of claim 2, wherein calculating the mean time course comprises determining a time at which a signal reached four standard deviations from a baseline.

4. The method of claim 1, wherein the stimulation was electrical and targeted to a region of interest.

5. The method of claim 4, wherein the region of interest is the hippocampus.

6. The method of claim 1, wherein the at least one neural event reflecting functional and neural circuit changes comprise one or more of focal to bilateral tonic-clonic (FBTC) seizures, changes in excitatory ventral hippocampal (VH) networks, changes triggered by sub-threshold stimulus, and induction of a migrating seizure core.

7. The method of claim 6, wherein the stimulation provided for neural events reflecting functional and neural circuit changes was electrical stimulation.

8. The method of claim 7, wherein the electrical stimulation was delivered by optogenetics.

9. The method of claim 2, wherein the low-pass filtering is performed at 0.1Hz.

10. The method of claim 1, further comprising generating connectivity data by calculating a conditional probability than an individual region of a plurality of regions of the animal brain is active during the neural event.

11. The method of claim 8, wherein the stimulation that provides for neural events is below the threshold to trigger seizures.

12. The method of claim 11, wherein the stimulation is from 5 Hz to 15 Hz.

13. The method of claim 11, wherein the stimulus was applied to evaluate underlying functional circuit changes.

14. The method of claim 8, wherein the stimulus is sufficient to trigger a seizure.

15. The method of claim 14, wherein the stimulation is from 35 Hz to 45 Hz.

16. The method of claim 14, wherein the stimulus was applied to evaluate seizure circuit dynamics.

17. The method of claim 1, further comprising identifying a migrating seizure core.

18. The method of claim 17, further comprising localizing a seizure onset zone (SOZ) based on the identified migrating seizure core.

19. The method of claim 18, wherein the SOZ is imaged by single-photon emission computed tomography (SPECT).

20. The method of claim 1, wherein generating the map of the network comprises:

calculating a percent a voxel was activated during a portion of an induction period, wherein a maximum percent BOLD change is determined for the voxel; and

binarizing an image including the voxel.

21. The method of claim 20, wherein the binarizing comprises applying a threshold that minimizes intraclass variance.

22. The method of claim 1, wherein the map comprises a radar plot of a plurality of individual regions of the animal brain, wherein the plurality of individual regions are sorted from fastest to slowest of onset of the neural event and color-coded for ipsilateral and contralateral hemispheres of the animal brain.

23. A method for developing a therapeutic intervention for epilepsy, the method comprising:

determining the effect on neural events reflecting functional and neural circuit changes obtained by applying a therapeutic intervention to the model generated by the method of claim 1, wherein the therapeutic intervention was surgical, electrical, comprises deep brain stimulation, or is pharmacologic.

24. The method of claim 23, wherein the neural event comprises a seizure.

25. The method of claim 23, wherein the neural event comprises a migrating seizure core.

26. The method of claim 23, wherein the neural event comprises an epileptic comorbidity.

27. The method of claim 23, wherein the neural event comprises a focal to bilateral tonic-clonic (FBTC) seizure.

28. The method of claim 23, wherein the neural event comprises alterations in an excitatory ventral hippocampal (VH) network.