

# NEUROSCIENCE CURRICULUM

(VOL. 1)

This curriculum is designed to be an as-available approach to becoming a neuroscientist. This curriculum is prepared under the assumption of genuine interest for the field. The meaning of life (for humans) is fun productivity. If your ideal life consists of a fun and productive career in one (or more) of the many fields of neuroscience: this curriculum is the single best resource on the planet for attaining that aim through self-education. If you are not excited about anything concerning the subject of neuroscience, there is a chance your true interests lay elsewhere. Your ideal career will be a job you can't wait to get to in the morning (or night). Your dream career is one that you'd do for fun if you had unlimited wealth. If that's the case with any career in neuroscience, please see below:

The material below is presented in no particular order. Pick whichever is the most interesting to you and start there. As you learn the fundamentals of "the cool stuff", the less interesting material becomes more interesting as you begin to see its relevance. Don't worry about the things that seem daunting. As you learn more, hesitation will become interest. Then curiosity.

The Neuroscience Curriculum consists of material from free or commercially available online sources.

## AUDIO COURSES & AUDIOBOOKS

All material currently available at [www.audible.com](http://www.audible.com) [x1.25 speed encouraged]

The underlining is for ease of navigating the list, and has no relevance concerning content.

1. **Behave (Robert Sapolsky)**
2. **The Body Keeps the Score (Bessel A. van der Kolk)**
3. Your Best Brain: The Science of Brain Improvement (John Medina)
4. **Biology: The Science of Life (Stephen Nowicki)**
5. The Addictive Brain (Thad A. Polk)
6. The Great Ideas of Psychology (Daniel N. Robinson)
7. Memory and Human Lifespan (Steve Joordens)
8. Thinking Fast & Slow (Daniel Kahneman)
9. Stress and Your Body (Robert Sapolsky)
10. Understanding the Secrets of Human Perception (Peter Vishton)
11. Secrets of Sleep Science: Dreams To Disorders (Craig Heller)
12. Mind-Body Medicine: The New Science of Optimal Health (Jason M. Satterfield)
13. Medical School for Everyone: Grand Round Cases (Roy Benaroch)
14. Philosophy of Mind: Brains, Consciousness, and Thinking Machines (Patrick Grim)
15. Understanding Genetics: DNA, Genes, and Their Real-World Application (David Sadava)
16. How We Learn (Monisha Pasupathi)
17. Brain Maker (David Perlmutter, Kristin Loberg)
18. Do No Harm: Stories of Life, Death, and Brain Surgery (Henry Marsh)
19. Sensation, Perception, and the Aging Process (Francis B. Colavita)
20. An Introduction to Infectious Diseases (Barry C. Fox)
21. The Story of Human Language (John McWhorter)
22. The Science of Mindfulness: A Research-Based Path to Well-Being (Ronald Siegel)
23. **The Blank Slate (Steven Pinker)**
24. The Joy of Science (Robert M. Hazen)
25. Life's Ratchet: How Molecular Machines Extract Order from Chaos (Peter M. Hoffman)
26. Louder Than Words: The New Science of How the Mind Makes Meaning (Benjamin K. Bergen)
27. Consciousness and the Brain: Deciphering How the Brain Codes Our Thoughts (Stanislas Dehaene)
28. The Myth of Mirror Neurons: The Real Neuroscience of Communication and Cognition (Gregory Hickok)
29. Drugged: The Science and Culture Behind Psychotropic Drugs (Richard J. Miller)
30. The Tale of the Dueling Neurosurgeons: The History of the Human Brain as Revealed by True Stories of Trauma, Madness, and Recovery (Sam Kean)
31. Origins of the Human Mind (Stephen P. Hinshaw)
32. Stuff Matters (Mark Miodownik)
33. Understanding the Mysteries of Human Behavior (Mark Leary)
34. Incomplete Nature: How Mind Emerged from Matter (Terrence W. Deacon)
35. Reaching Down the Rabbit Hole: A Renowned Neurologist Explains the Mystery and Drama of Brain Disease (Brian David Burrell, Dr. Allan H. Ropper)
36. Don Quixote (Miguel de Cervantes)(Edith Grossman - translator)
37. **Life Unfolding: How the Human Body Creates Itself (Jamie A. Davies)**
38. Bonk: The Curious Coupling of Science and Sex (Mary Roach)
39. The Rational Optimist: How Prosperity Evolves (Matt Ridley)
40. Life on the Edge: The Coming of Age of Quantum Biology (Johnjoe McFadden, Jim Al-Khalili)
41. Genome: The Autobiography of a Species in 23 Chapters (Matt Ridley)
42. How to Build an Android (David F. Dufty)
43. Radical Abundance: How a Revolution in Nanotechnology will Change Civilization (K. Eric Drexler)
44. How to Create a Mind: The Secret of Human Thought Revealed (Ray Kurzweil)
45. On Intelligence (Jeff Hawkins, Sandra Blakeslee)
46. Rise of the Robots: Technology and the Threat of a Jobless Future (Martin Ford)
47. Virtually Human: The Promise – and the Peril – of Digital Immortality (Martine Rothblatt)
48. Evolving Ourselves (Juan Enriquez, Steve Gullans)
49. The 4<sup>th</sup> Revolution: How the Infosphere is Reshaping Human Reality (Luciano Floridi)
50. Intertwined: Information Changes Everything (Peter Morville)
51. Search: How the Data Explosion Makes Us Smarter (Stefan Weitz)
52. The Private Lives of Birds: A Scientist Reveals the Intricacies of Avian Social Life (Bridget Stutchbury)
53. Winter World: The Ingenuity of Animal Survival (Bernd Heinrich)
54. Gifts of the Crow: How Perception, Emotion, and Thought Allow Smart Birds to Behave Like Humans (John Marzluff, Tony Angell)
55. How Pleasure Works: The New Science of Why We Like What We Like (Paul Bloom)
56. Just Babies: The Origins of Good and Evil (Paul Bloom)
57. The Nature of the Matter: Understanding the Physical World (David W. Ball)
58. **Redefining Reality: The Intellectual Implications of Modern Science (Steven Gimbel)**
59. Brain in Balance: Understanding the Genetics and Neurochemistry behind Addiction and Sobriety (Fredrick Von Steff)
60. The Science of Integrative Medicine (Brent A. Bauer)

## AUDIO COURSES & AUDIOBOOKS (CONT'D)

61. NeuroTribes: The Legacy of Autism and the Future of Neurodiversity (Steve Silberman)
  62. Medical School for Everyone: Pediatrics Grand Rounds (Roy Benaroch)
  63. Biology and Human Behavior: The Neurological Origins of Individuality (Robert Sapolsky)
  64. Life's Engines: How Microbes Made Earth Habitable (Paul G. Falkowski)
  65. Are we Smart Enough to Know How Smart Animals Are? (Frans de Waal)
  66. How the World Learns: Comparative Educational Systems (Alexander W. Wiseman)
- 

## YOUTUBE

(Material available at [www.youtube.com/crashcourse](http://www.youtube.com/crashcourse))

### CRASH COURSE – YouTube Channel

1. **BIOLOGY** (There are **40 courses** on this Playlist – all of which are essential. Below are the ones you should give special concentration.)
  - a. 5 – In The Club – Membranes & Transport
  - b. 10 – DNA Structure and Replication
  - c. 12 – Mitosis: Splitting Up is Complicated
  - d. 25 – Animal Behavior
  - e. 26 – The Nervous System
  - f. 30 – Skeletal System: It's ALIVE!
  - g. 32 – Your Immune System: Natural Born Killer
  - h. 33 – Great Glands: Your Endocrine System
2. **CHEMISTRY** (There are **46 courses** on this Playlist – all of which are essential. Below are the ones you should pay special concentration to)
  - a. 5 – The Electron
  - b. 6 – Stoichiometry: Chemistry for Massive Creatures
  - c. 7 – Water and Solutions – for Dirty Laundry
  - d. 8 – Acid-Base Reactions in Solution
  - e. 10 – Redox Reactions
  - f. 17 – Energy & Chemistry
  - g. 21 – Lab Techniques & Safety
  - h. 22 – Atomic Hook-Ups – Types of Chemical Bonds
  - i. 23 – Polar & Non-Polar Molecules
  - j. 30 – pH and pOH
  - k. 34 – Network Solids and Carbon
  - l. 45 – Polymers
3. **ANATOMY & PHYSIOLOGY** (There are currently **40 courses** on this Playlist – all are essential. Below are the ones to specially consider)
  - a. 8 – The Nervous System, Part 1
  - b. 9 – The Nervous System, Part 2 – Action! Potential!
  - c. 10 – The Nervous System, Part 3 – Synapses!
  - d. 11 – Central Nervous System
  - e. 12 – Peripheral Nervous System
  - f. 13 – Autonomic Nervous System
  - g. 14 – Sympathetic Nervous System
  - h. 15 – Parasympathetic Nervous System
  - i. 17 – Hearing & Balance
  - j. 18 – Vision
  - k. 23 – Endocrine System, Part 1 – Glands & Hormones
  - l. 24 – Endocrine System, Part 2 – Hormone Cascades
4. **PSYCHOLOGY** (There are **40 courses** on this Playlist – all of which are essential.)
  - a. All 40 episodes of Crash Course Psychology are special considerations to this field.

### Ninja Nerd – YouTube Channel – All HUMAN PHYSIOLOGY and CHEMISTRY Playlists

#### YouTube Channels that aid in the study of Neuroscience

YouTube search:

- |                                                     |                                           |                                         |
|-----------------------------------------------------|-------------------------------------------|-----------------------------------------|
| • <b>Ninja Nerd</b>                                 | • <b>Neuroscientifically Challenged</b>   | • <b>LawNeuro.org</b>                   |
| • <b>Neural Academy</b>                             | • <b>Neuro Transmissions</b>              | • <b>Neuroscience Channel</b>           |
| • <b>Society for Neuroscience</b>                   | • <b>E4N Electronics 4 Neuroscience</b>   | • <b>Neuroscienceinc</b>                |
| • <b>Neuroscience News</b>                          | • <b>Auditory Neuroscience Laboratory</b> | • <b>Neipsychopharm</b>                 |
| • <b>Penn Center for Neuroscience &amp; Society</b> | • <b>EdNeuroscience</b>                   | • <b>Pacific Neuroscience Institute</b> |
| • <b>Braincraft</b>                                 |                                           | • <b>Kenhub</b>                         |

## WEBSITE LINKS

**Phet Interactive Simulations** – “Neuron” – interactive neuron simulation. [Phet.colorado.edu/en/simulation/neuron](http://phet.colorado.edu/en/simulation/neuron)

- “Membrane Channels” [phet.colorado.edu/en/simulation/legacy/membrane-channels](http://phet.colorado.edu/en/simulation/legacy/membrane-channels)
- “Molecular Motors” – [phet.colorado.edu/en/simulation/legacy/molecular-motors](http://phet.colorado.edu/en/simulation/legacy/molecular-motors)
- “Acid-Base Solutions” [phet.colorado.edu/en/simulation/acid-base-solutions](http://phet.colorado.edu/en/simulation/acid-base-solutions)
- “Balancing Chemical Equations” [phet.colorado.edu/en/simulation/balancing-chemical-equations](http://phet.colorado.edu/en/simulation/balancing-chemical-equations)
- “Concentration” [phet.colorado.edu/en/simulation/concentration](http://phet.colorado.edu/en/simulation/concentration)
- “pH Scale” [phet.colorado.edu/en/simulation/ph-scale](http://phet.colorado.edu/en/simulation/ph-scale)
- “Simplified MRI” [phet.colorado.edu/en/simulation/legacy/mri](http://phet.colorado.edu/en/simulation/legacy/mri)

**Molecular Workbench** – Visual interactive simulations for teaching and learning science. [mw.concord.org/modeler](http://mw.concord.org/modeler)

**Wiley Online Library** – An online library. [onlinelibrary.wiley.com/subject/code/LSA0/titles?&start=1&ordering=](http://onlinelibrary.wiley.com/subject/code/LSA0/titles?&start=1&ordering=)

**NeuroscienceForum.com** - ...Neuroscience forums..... [www.neuroscienceforums.com](http://www.neuroscienceforums.com)

**National Center for Biotechnology** - An enormous database of biomedical articles and information [www.ncbi.nlm.nih.gov](http://www.ncbi.nlm.nih.gov)

## APPS

The following apps will aid in the study of neuroscience.

- **Brain Tutor 3D** (Rainer Goebel, Brain Innovation) <https://itunes.apple.com/us/app/brain-tutor-3d/id301362928>
- **Essential Anatomy** (3d4 Medical) [applications.3d4medical.com/essential\\_anatomy\\_3/](http://applications.3d4medical.com/essential_anatomy_3/)
- **The Journal of Neuroscience** (HighWire Press, Inc) <https://play.google.com/store/apps/details?id=org.highwire.fta.android.app.jneuro1>

## APPS (CONT'D)

- **3D Brain** (Cold Spring Harbor Laboratory) <https://itunes.apple.com/us/app/3d-brain/id331399332?mt=8>
- **FINR Brain Atlas** (Florida Institute for Neurologic Rehabilitation, Inc.) <https://itunes.apple.com/us/app/finr-brain-atlas/id424850167?mt=8>
- **Brain Science App** (Wizzard Media) <https://itunes.apple.com/us/app/brain-science-podcast-app/id336200391>
- **ICD9 Consult 2015** (Evan Schoenberg) <https://itunes.apple.com/us/app/icd9-consult/id293293832>
- **NeuroSlice** (Dr. Sanjay Manohar) <https://play.google.com/store/apps/details?id=org.homophisiology.neuroslices&hl=en>
- **Interactive Neuro Anatomy 3D** (Doctor Jana) <https://play.google.com/store/apps/details?id=com.CoolDude.InteractiveNeuroAnatomy>
- **Neurology** (Wolters Kluwer Health) <https://play.google.com/store/apps/details?id=com.wolterskluwerhealth.neurology>
- **Neurology Pocket Reference** (Harrier) <https://play.google.com/store/apps/details?id=com.appinhand.neurology-pocket-reference>
- **Atlas of MRI Brain Anatomy** (Clinical Apps) <https://play.google.com/store/apps/details?id=com.appsclinical.atlasofmribrainanatomy>
- **MRI Artefacts 01** (MRI Education Company) <https://play.google.com/store/apps/details?id=air.com/mrieducation.art01>
- **Radiology Signs** (Androidmedics) <https://play.google.com/store/apps/details?id=com.androidmedics.radiologysigns>
- **Radiology CT Anatomy** (Viet Nguyen) <https://play.google.com/store/apps/details?id=air.CT>
- **Neurology® Clinical Practice** (Wolters Kluwer Health) <https://play.google.com/store/apps/details?id=com.wolterskluwerhealth.neurologycp>
- **3-D brain Atlas** (Soham Sengupta) <https://play.google.com/store/apps/details?id=com.soham.android.mi.brainimage>

## OPEN CULTURE

Free online courses

[www.openculture.com/freeonlinecourses](http://www.openculture.com/freeonlinecourses)

### BIOLOGY Courses

1. Adolescent Health and Development (Robert Plum)
2. Biochemistry (S. Dasgupta)
3. Biochemistry for Pre-Med (Kevin Ahern)
4. Biophotonics (UC Davis)
5. Bioscience in the 21<sup>st</sup> Century (Lehigh University)
6. Brain Structure and its Origin (Gerald Schneider)
7. Diet and Nutrition (LaTrobe University – Australia)
8. Exercise Science and Wellness (Arizona State)
9. Frontiers in Biomedical Engineering (W. Mark Saltzman)
10. General Biochemistry and Molecular Biology (UC Berkeley)
11. Genetic Engineering in Medicine, Agriculture... (Robert B. Goldberg)
12. Genomic Medicine (Isaac Cohane)
13. Hacking Consciousness: Consciousness, Cognition, and the Brain (Michael Heinrich)
14. Health Behavior Change at Individual, Household, and Communal Levels (John Hopkins)
15. Human Behavioral Biology (Robert Sapolsky)
16. Introduction to Biochemistry (Kevin Ahern)
17. Introduction to Immunology (U-Mass Boston)
18. Introduction to Toxicology (UC Berkeley)
19. Issues in Mental Health Research in Developing Countries (Judith Bass)
20. Molecular Biology: Macromolecular Synthesis and Cellular Function (UC Berkeley)
21. Principles of Human Development (Jim Meyer)
22. Replaceable You: Stem Cell and Tissue Engineering (Jill Helms)
23. Straight Talk About Stem Cells (Christopher Scott)
24. The Brain: A User's Guide (Barry Jacobs)
25. Virology (Vincent Racaniello)

### COMPUTER SCIENCE Courses

1. Human-Computer Interaction Seminar (Multiple staff)
2. Machine Learning (Yaser S. Abu-Mostafa)

### CHEMISTRY Courses

1. Freshman Organic Chemistry (Stephen L. Craig)
2. Freshman Organic Chemistry II (J. Michael McBride)
3. Organic Chemistry (James Nowick)
4. Organic Chemistry 1 (Sean Hickey)
5. Organic Chemistry 2 (Sean Hickey)
6. Organic Reactions and Pharmaceuticals (Steven Hardinger)
7. Organic Spectroscopy (James Nowick)

### PSYCHOLOGY & NEUROSCIENCE Courses

1. Animal Behavior (Gerald Schneider)
2. Coding and Vision 1 (Christof Koch & R. Clay Reid)
3. Behavioral Neuroscience Laboratory (William Grisham)
4. Brain and Behavior (Wendy Suzuki)
5. Buddhist Psychology (Eleanor Rosch)
6. Clinical Psychology (Ann Kring)
7. Cognitive Neuroscience (Richard Ivry)
8. Developmental Psychology (Alison Gopnik)
9. Developmental Psychopathology (Stephen Hinshaw)
10. Human Emotion (Dacher Keltner)
11. Introduction to Cognitive Psychology (Paul Bloom)
12. Maps of Meaning (2014) (Jordan Peterson)
13. Neural Networks and Biological Modeling (Wolfram Gerstner)
14. Neuroscience and Behavior (Gerald Schneider)
15. Positive Psychology (Tal Ben-Shahar)
16. Research and Data Analysis in Psychology (Frederic Theunissen)
17. Scientific Approaches to Consciousness (John F. Kihlstrom)
18. Sensory Systems (Peter Schiller)
19. Social Cognition (John F. Kihlstrom)
20. The World of Abnormal Psychology (Philip Zimbardo)

### ENGINEERING Courses

1. Basic Electronics (T.S. Natarajan)
2. Chemical Engineering: Process Dynamics and Controls (Peter Woolf)
3. Direct Solar/Thermal to Electrical Energy Conversion Technologies (Gang Chen)
4. Electrical-Digital Signal Processing (S.C. Dutta Roy)
5. Electro Magnetic Fields (Harishankar Ramachandran)
6. Elementary Fluid Mechanics (Mark Stacey)
7. Fluid Mechanics (T.I. Eldho)
8. Fundamentals of Photovoltaics (Tonio Buonassisi)
9. Introduction to Chemical Engineering (Channing Robertson)
10. Introduction to Microelectric Circuits (Chang-Hasnain)
11. Microelectric Devices and Circuits (Sayeef Salahuddin)
12. Nano-to-Macro Transport Processes (Gang Chen)
13. Nanomanufacturing (John Hart)

OPEN CULTURE (CONT'D)  
[www.openculture.com/freeonlinecourses](http://www.openculture.com/freeonlinecourses)

## MATH Courses

1. A First Course in Linear Algebra (N. J. Wildberger)
2. Against All Odds: Inside Statistics (Pardis Sabeti)
3. Algebraic Topology: A Beginner's Course (N. J. Wildberger)
4. Analytic Geometry and Calculus (Benjamin Johnson)
  - a. \*Analytic Geometry and Calculus II (Thomas Scanlon)
5. Brief Calculus (Omayra Ortega)
6. Calculus (F. Michael Christ)
7. Calculus 1 (Matthew Leingang)
8. College Algebra (Patti Blanton)
9. Core Science Mathematics (SK Ray)
10. Differential Equations (Arthur Mattuck)
11. Differential and Integral Calculus (Steve Butler)
12. \*Empirical Research Methods (Carnegie Mellon)
13. Introduction to Probability and Statistics (Fletcher Ibser)
14. Mathematics for Computer Science (Tom Leighton)\*
15. Rational Trigonometry (N. J. Wildberger)
16. Trigonometry (Jason Roesnberry)

## PUBLIC HEALTH Courses

1. Epidemiology and Control of Infectious Diseases (Tomas Aragon)
2. Public Health Statistics (Alan Hubbard)
3. Theories and Biological Basis of Substance Abuse & Addiction (Audrey Begun)

## PHYSICS Courses

1. A Brief Guide to Everything (John Ellis)
2. A Descriptive Introduction to Physics (Steven W. Stahler)
3. Atomic and Optical Physics I (Wolfgang Ketterle)
4. Atomic and Optical Physics II (Wolfgang Ketterle)
5. Classical Field Theory (Suresh Govindarajan)
6. Classical Physics (V. Balakrishnan)
7. Effective Field Theory (Iain Stewart)
8. Electromagnetism and Optics (Michael Thorpe)
9. Fundamentals of Physics I (Ramamurti Shankar)
10. Fundamentals of Physics II (Ramamurti Shankar)
11. Quantum Electrodynamics (Richard Feynman)
12. Physics I: Classical Mechanics (Walter Lewin)
13. Physics II: Electricity and Magnetism (Walter Lewin)
14. Physics II: Vibration and Waves (Walter Lewin)
15. Physics for Scientists and Engineers (Achilles Speilotopoulos)
16. Science and Cooking: From Haute Cuisine to the Science of Soft Matter (Team)
17. Soft X-Rays and Extreme Ultraviolet Radiation (David Attwood)
18. Solid State Basics (Steven Simon)
19. Wave Physics (F. Romanelli)

## TEXTBOOKS

(All currently [available at www.amazon.com](http://www.amazon.com))

Text Material – According to your budget, preview everything you can about each book, and pick which ones you're most interested in, first.

1. **The Human Brain Book (Rita Carter)**
2. **Principles of Neural Science, 5<sup>th</sup> Edition (Eric R. Kandel)**
3. Geometry: Concepts & Skills, Student Edition (Ron Larson, Laurie Boswell, Lee Stiff)
4. Mastering Essential Math Skills: Geometry (Richard W. Fisher)
5. The Complete Human Body (Alice Roberts/DK Publishing)
6. Netter Atlas of Human Anatomy
7. Clinical Neuroanatomy Made Ridiculously Simple
8. Neuroscience for Dummies
9. Basic Clinical Neuroscience
10. Neuroanatomy Through Clinical Cases 2<sup>nd</sup> Edition
11. Neuroanatomy in Clinical Context: An Atlas of Structures, Sections, Systems, and Syndromes
12. Neuroscience: Exploring the Brain
13. Chemistry: A Molecular Approach (Nivaldo J. Tro)
14. Trachtenberg Speed System of Basic Mathematics (Jakow Trachtenberg)
15. Guyton and Hall Textbook of Medical Physiology, 13e (Guyton Physiology) – (John E. Hall)
16. Wheater's Functional Histology (Barbara Young)
17. Cunningham's Textbook of Veterinary Physiology, 5e (Bradley G. Klein)
18. Morgan and Mikhail's Clinical Anesthesiology 5<sup>th</sup> Edition (John Butterworth)
19. An Illustrated Guide to Veterinary Medical Terminology 4e (Janet Amundson Romich)
20. Saunders Comprehensive Veterinary Dictionary 4e (Virginia P. Studdert)
21. Pushing Electrons (Daniel P. Weeks)
22. The Extended Phenotype (Richard Dawkins)
23. Laboratory Techniques in Organic Chemistry (Jerry R. Mohrig)
24. Case Files Neuroscience [LANGE Case Files] (Eugene Toy, Rahul Jandial, Evan Snyder)

## PODCASTS

Neuroscience Podcasts compensate for classroom and campus discussion. They'll allow you to be immersed in social conversation of the material contrary to the lecture form of many of the above media.

1. Neuropod
2. All In The Mind
3. Brain Science
4. Radio Lab
5. The Infinite Monkey
6. Neuromyths
7. Neurophilosophy
8. Brain Blogger
9. Mental Elf
10. The Psychology Podcast
11. The Best Brain Possible

## T.L.U.V.I. POSTERS

All posters available at [www.theupwardeducation.com/tluviposters](http://www.theupwardeducation.com/tluviposters).

1. T.L.U.V.I. Poster #2: Potential Excitement #1
2. T.L.U.V.I. Poster #5: Genetics #1: You-Carry-All-This

NEUROSCIENCE CURRICULUM

# EXPERIENTIAL LEARNING

## Potential Careers, Condensed Wisdom, and Creative Compensations

Pink = **Medically-based**

Blue = **Technology-based**

Green = **Research-based**

### POTENTIAL CAREERS IN THE FIELD OF NEUROSCIENCE

Many of these span two or three of the colored categories above. The color correlation used is the more defining form of the vocation.

Artificial Intelligence  
Assisted Living  
Neuroregeneration  
Video Games  
Audiology  
Chiropractor  
Cognitive Neuroscience  
Dentistry  
EEG Technologist

Veterinary Medicine  
Neuroethology  
Pharmacist  
Drug Rehabilitation  
Research Scientist  
Speech Pathology  
Medical Technician  
Neurological Surgeon  
Neurologist

Neuroimaging Technician  
Neuropharmacologist  
Neuropsychologist  
Neuroradiologist  
Neuroscience Nurse  
Biological Psychologist  
Occupational Therapy  
Electroneurodiagnostic Technician

---

### BRIEF CAREER DESCRIPTIONS

**Artificial Intelligence** – the creation of computers and software capable of intelligent behavior.

**Assisted Living** – assisting the disabled in the administration of medical and/or personal care.

**Audiology** – the study, diagnosis, and treatment of hearing and balance related disorders.

**Biological Psychologist** – studies the neural basis of behavior.

**Chiropractor** – the diagnosis, treatment, and prevention of neuromusculoskeletal system disorders.

**Cognitive Neuroscience** – the study of biological substrates underlining cognition, with a focus on neural substrates and mental processes.

**Dentistry** – the study, diagnosis, prevention, and treatment of diseases, disorders and conditions of the oral cavity and adjacent related structures.

**Drug Rehabilitation** – medical or psychotherapeutic treatment for dependency on psychoactive substances.

**EEG Technologist** – involvement in the engineering, creation, and modification of EEG devices.

**Electroneurodiagnostic Technician** – Records electrical activity from the brain (EEGs; evoked potentials) and spinal cord.

**Medical Technician** – an allied health professional that analyzes and tests body fluids and tissues.

**Neuroethology** – the evolutionary and comparative approach to the study of animal behavior and it's underlying mechanistic control of the nervous system.

**Neuroimaging Technician** – Records and analyzes neural-imagery from any number of neuroimaging techniques (MRI, CT, fMRI, MEG, PET, SPECT)

**Neurological Surgeon** – operates on the central and peripheral nervous systems and extra-cranial cerebrovascular system to prevent and treat disorders.

**Neurologist** – An M.D. who diagnoses and treats disorders of the nervous system.

**Neuropharmacologist** – studies the action of drugs on the cellular function of the nervous system and/or behavior.

**Neuropsychologist** – Studies brain-behavior relationships, especially cognitive function.

**Neuroradiologist** – Uses imaging methods such as X-ray, MRI, CT and angiography to diagnose diseases of the nervous system.

**Neuroregeneration** – research and effort into prompting beneficial neurogenesis and neuroplasticity into damaged nervous systems.

**Neuroscience Nurse** – Nurse who cares for patients with neurological disorders and assists other neuroscience-related health care professionals.

**Occupational Therapy** – the use of assessment and treatment to develop, recover, or maintain the daily living and work skills of people with a disorder.

**Pharmacist** – healthcare professionals who practice in pharmacy: the field of health sciences focusing on safe and effective medication use.

**Research Scientist** – Conducts behavioral, technical, or statistical research within one (or more) of the many realms of neuroscience branches.

**Speech Pathology** – the evaluation and treatment of communication disorders and swallowing disorders.

**Veterinary Medicine** – deals with the prevention, diagnosis, and treatment of disease, disorder and injury to animals.

**Video Games** – Research and development in the integration of video game software and hardware into the brain/body's neural network.

---

## EXPERIENTIAL SELF-EDUCATION IN NEUROSCIENCE

**A University Degree is a certificate verifying your aptitude in a particular field. Completing 100% of the Neuroscience Curriculum (with a Superficial, Conceptual, and Technical comprehension of the material) will merit you a Masters Degree's equivalence worth of knowledge in the field of Neuroscience. Because your education is unconventional, it is up to you to discover a creative way of exhibiting your mastery of the field to future employers. This curriculum provides a means of acquiring all of the appropriate knowledge. Such knowledge will allow you to test into requisite university programs (for medical fields) with ease, and perhaps even ease the financial burden of tuition.**

But education is both knowledge *and* experience (and experience is the most important part). This section of the Curriculum gets as close as possible to providing an identical experience of the mechanical, routine, and reflexive behavior traditionally only provided by institutional settings (universities, clinics, etc.). Mastering the different branches of experiential training below will result in you possessing the technical skill necessary to (somewhat) seamlessly transition into most of the careers listed above without much difficulty and adjusting to mechanical and technical techniques.

Content subject to future updates. If a technique is not relevant to your field of study, don't do it. As above: organize your own itinerary.

---

### ANIMAL HANDLING EXPERIENCE & TECHNIQUES

- Whether you plan on going into veterinary practices or not doesn't affect the importance of Animal Handling expertise.
  - Aside from an extra tally on your resume, the ability to understand animal behavior will only contribute to your understanding of human behavior.
- **Look for places that give you experience in the handling of animals.**
  - Seek employment at – or establish credit with – agencies/companies/stores/etc. whose employees and/or customers have the opportunity to handle animals regularly. **\*Please take any and all medical precautions before doing so.**
- There is as much versatility in the behavior of various species of animals as there is variety in humans. Animals operate under the dictation of Genetic Influence and Cultural Influence (culture = environment, and those in it). Understanding the various driving motives for animal behavior (within dozens of species) – and being able to handle them when aggressive, at that – will make clinically or therapeutically treating most humans significantly less stressful by comparison.

## ANIMAL HANDLING EXPERIENCE & TECHNIQUES (CONT'D)

- Have several details to observe listed and ready (in advance) before you associate with any animal – this will give every single one of your encounters purpose. Plan your projects to be inclusive enough to allow for every interaction to have purpose to your studies.
  - Relevance assists significantly in retention.
  - **Develop a list of things you want to learn (in the realm of neuroscience/behavior/brain activity) about each animal that you commonly and occasionally come in contact with.**
- **Keep detailed records (as detailed as possible) of everything you do.** Since you will not have time to detail your records immediately in most cases, develop a short list of the essential properties, first, and fill in the rest when you have time.
- **Every living thing with a nervous system is a potential study for confirming, eliminating, or tallying data for ideas in the realm of neuroscience.**

## NEUROIMAGING READING AND TECHNIQUES

Neuroimaging involves visualizing the structure and function of the nervous system. A neuroscientist learns to read neuroimages by viewing them and correlating the curiosity or problem that prompted the imaging in the first place. **There are more than enough sample images (and corresponding information) online for you to get more than a handful's worth of daily neuroimaging experience. Nothing is stopping you from going through each neuroimaging technique, and learning to identify problems until personal expertise develops.** Don't know where to start? Go to google.com, type in any one of the techniques in the list below, hit enter, click Images, start lookin'.

\*It would benefit to develop a system where you observe and diagnose the images before viewing their data. The more opportunities you have for being wrong, the more detailed your study of the data will be. The embarrassment you have at being wrong will prompt a mental acuity whose purpose is to avoid feeling anything of the sort in the future. Negative stimuli (like embarrassment) can aid memory and retention. Humans are smart enough to use that to our advantage.

Below are the most common neuroimaging techniques used in neuroscience. The above curriculum will certify your familiarity with them. **Use online resources to practice diagnosis, identification, and classification of readings for every variation of each technique.**

- **CT – Computed axial Tomography**
- **EEG – Electroencephalography**
- **fMRI – Functional Magnetic Resonance Imaging**
- **MEG – Magnetoencephalography**
- **MRI – Magnetic Resonance Imaging**
- **PET – Positron Emission Tomography**
- **SPECT – Single Photon Emission Computed Tomography**

## LABORATORY TECHNIQUES

- Videos of neuroscience techniques online (though limited) will give you the experience of viewing the equipment and seeing how others interact with it.
- Emailing a university (or several professors in it) with a location that practices what you're interested in – and explaining your purpose of autodidactic (or enthusiast) pursuits – may *possibly* get you a sympathetic response, and a chance to at least look at the equipment you've been studying. Though legitimate experts usually welcome outside interest into their field, don't expect much. Even if they do have the interest in obliging, they may not have the time.
- Depending on your area of study, there is more than enough commercially available equipment online for you to build your own laboratory (even if piece-by-piece). Start with your primary interests; then gauge the price of the equipment mandatory for practice (if available, buy it; if not, build it). Save money with the purchase in mind. Compile a list of projects to complete with the purchased equipment (add as much as possible). Gauge and start saving for the next piece of equipment once you can afford the first.
  - Upon purchase of the first piece of equipment, get to work with what you have and save for what you don't.
- Use common sense with safety concerns. If that needs clarification, you have no business attempting to build your own lab.

## PSYCHOLOGICAL TECHNIQUES

The **Five Causes of Unhappiness** section in the "Human Curriculum" states them to be: Inferiority Complex, Social Dissatisfaction, Physical Difficulties, Mental Difficulties, and Career/Purpose Dissatisfaction. All of these fall into the realm of therapeutic psychology and neuroscience. As a psychologist, the most help you can do for humanity is to aid humans in the extinction of these five stressors.

1. **Inferiority Complex** is thwarted by the detachment of the patient from societal standards and possession envy.
2. **Social Dissatisfaction** is eliminated by re-prioritizing the patient's purpose toward solo productivity and/or familial reparation.
3. **Physical Difficulties** include all medical-related issues. The innumerable solutions here don't fit in a summary.
4. **Mental Difficulties** (when not caused by Physical Difficulties) are caused by a lack of information, understanding, or both.
5. **Career/Purpose Dissatisfaction** is reversed by re-routing the patient toward a career/purpose that they enjoy working.

These Five Causes mix and match in innumerable ways. The degrees to which they are intertwined (in addition to the number present) usually correlate to the difficulty in handling the psychological disturbance. An accurate assessment cannot be made without several information-gathering interviews.

There is nothing wrong with a psychologist befriending a patient – in fact, it is more likely to be of benefit to the both of you than the contrary. However, *objectivity* must remain the only mode of operation when clinically appraising the patient, and *discretion* must be taken before deciding which patients to befriend. The moment you're subjective in official evaluation is the moment you harm your patient. When genuine, friendship is an additional therapeutic tool.

\*Intentionally, or even accidentally, a patient may take advantage of friendship in order to elicit a certain behavior from you, or leverage property from you.

Patients that are sexually inclined toward your sex may potentially develop infatuation or romantic attachment to you. If either of these situations seems even remotely possible (after thorough evaluation of the patient), it dictates an automatic ineligibility for befriending. Your friendship should be a rare option used if necessary, not emotional indulgence or vocational heuristics.

## SURGICAL TECHNIQUES

If you are capable of breaking down each of the individual components that go into successfully operating a surgical procedure, all of the below practices will be self-explanatory. Explanations are listed, regardless.

Dexterity of the fingers is a continuous theme in surgical training. Most people that are unused to micro-scale manipulation of the fingers are prone to minor trembling when operating on such a sensitive scale. Relying on your natural tendency to overcome this through repeated practice is not as thorough an approach as consciously eliminating the *trait* from further potentiality. The brevity of the descriptions are under the assumption that the practical contributions of the exercises are obvious. The idea is "no tremors *at all*" rather than "no tremors when operating".

### • VETERINARY AUTOPSIES

- This is the closest thing you can get to veritable surgical operation.
- Once you have a proficient amount of knowledge in the field of neuroscience to be a walking testament to your own credibility, inquire at relevant facilities until you find one (if any) willing to let you perform exploratory educational autopsies on deceased animals.
  - Have purpose to each operation.
    - If you don't know the cause of death: discover it.
    - If you do know the cause of death: describe and log it.
    - Develop your own personal database of information concerning the properties of the autopsy. **All statistics are important in science. No amount of information is too much with contemporary digital storage capacity. Patterns are discovered from abstract sources all the time. Never discount the relevance of data collecting...**and never underestimate the necessity of organization.
  - Starting an organization that connects prospective neurosurgeons with animal rescues and veterinary practices is an option. Most pet owners wouldn't want to donate their pet's body to science, but the several dozen cases a year that occur would serve as a valuable learning experience for those on the unconventional route upward.
- Reading books and watching videos can only get you so far. The experience of dealing with a real body is necessary to consolidate the theoretical conceptualization of bodily operations that you developed through the Knowledge section.

### • MASSEUSE TRAINING

- In addition to advancements in finger dexterity, massage training will give you a first-hand interaction into the patterns of bodily activity to variations of stimulation. The more detailed each layer of your comprehension is in the field, the more you bring to the table wherever you are.
  - Not to mention that it's necessary to understand anatomy and physiology to be an expert masseuse. Don't you need to know that, anyway?
- This could also serve as a second (or primary) career when continuing your neuroscience studies.

### • CLAY MOLDING

- Finger Dexterity again. Concentrate on creating as detailed and intricate patterns as possible. The high sensitivity required for fine-scale design mimics the sensitivity needed in surgical operation.
  - Habitual practice will make "steady-hands" automatic in many other small-scale occurrences.

### • DETAILED EDUCATIONAL ART

- You know what you could also do? Design clay (or any other material) structures that are biological models of some thing or another. Biomolecule, polymer, protein complex, single cell, single giant (sized) cell, tissue, etc. The Upward Education guarantees you that the value (and therefore, price) of educational art (in general) is going to rise inevitably (if not immediately).
- Sculptures, stuffed 'animals', artistic toys, mechanical contraptions, detailed paintings, anything that requires high-sensitivity finger control.

### • "OPERATION" (THE BOARD GAME)

- This is not a joke. Below is a breakdown of how to make this novelty game a legitimate training tool.
  - Perfection is the only standard. Since you have infinite tries, there is no reason whatsoever for you to not be able to complete the entirety of the game, perfectly, within one minute's time, in each of the variables set below.
    - You have five fingers on each hand. For every two-pair combination there is: run through the game with each. This includes such abominations as "index and pinky finger" and "middle finger and pinky finger". Until you can complete any finger combination 100% of the time (all the time), you're just some person playing Operation.
    - Then, get a second pair of applicable tweezers, and learn to complete the game to perfection with any combination of fingers for each hand. Surgery is not a "one-handed" sort of thing. Until you can complete this 100% of the time...
    - Last one: Eyes Closed. Use one hand to navigate the board by touch, and use the other hand (and each paired-finger combination), to complete the game 100% of the time, by touch. Until then...
  - This needs to be a daily thing. Regression will occur if dexterity isn't applied as a daily operation.

### • OFF-HAND WRITING

- One would imagine it would be obvious how ambidexterity contributes toward a career in surgery. When you master both hands, learn to write with a pen/pencil in each hand. When you learn that, learn to write two separate things with each hand (this is not "impossible", it takes less than a year to learn with daily practice).

### • FINGERTIP PUSHUPS

- It will become very apparent that dexterous strength does not transfer universally. Fingertip pushups round out the comprehensive/total potential for optimal hand strength and maneuverability. \*Be responsible when attempting this. If you hurt yourself it's your own fault.

### • SKETCHING

- Not just sketching, but never using rulers (or any other tracing devices) to do so. You will have to learn to form perfect, stabilized, lines by honing the movements of your fingers, hands, forearms, elbows, and shoulders in sync with each other. Not many of the above techniques offer the opportunity to practice Stabilized Tracing techniques over a horizontal surface (tantamount to operating format)...Oh yeah, only sketch standing up. The rest (on sketching) would be mostly pointless, otherwise. Practicing standing up and sitting down are two completely different things.

**The Neuroscience Curriculum is designed to be an as-available approach to the pursuit of knowledge and/or employable aptitude in ALL of the various fields of neuroscience: a "Universal Neuroscientist". This curriculum is accessible to those under 10years of age and those over 100years of age – and everyone in between. The sole gauge of your success with the curriculum is your interest in the field, and, the required tenacity necessary to complete a total education (in any field).**

**Your completion of this curriculum will not guarantee you employment, but it will make you capable of employment in each neuroscience field(s) of your interest. If nobody will hire you, or nobody is working on what you're interested in: pioneer your own program.**

**For potential assistance in pioneering your own programs, or vocation, see: "Entrepreneur's Curriculum"**

Website: [www.theupwardeducation.com](http://www.theupwardeducation.com) / Email: [theupwardeducation@gmail.com](mailto:theupwardeducation@gmail.com)

This image shows a blank sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.