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ERIN: A Portal to Resources for Higher Education in Neuroscience

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ARTICLE
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ERIN, Educational Resources in Neuroscience, is the Society for Neuroscience's web portal to selected, high-quality materials for higher education. A Board of Editors approves resources after describing them and classifying them by topic, subtopic, media type, author, and appropriate educational level. Some resources are also accompanied by reviews and ratings from faculty who have used the resource. These features make a search of ERIN far more useful than a typical Google search.

ERIN's development was funded by the National Science Foundation with a three-year grant to SfN. Along the way, various unexpected problems arose and solutions were found, many of which are described in this overview of ERIN's history and the various decisions that were made in its design and development.

Key words: website, teaching resources, media, faculty reviews, classification schemes, crowdsourcing

"There's so much out there – how do you know what's good?" That sentence has served as the motto for ERIN, Educational Resources in Neuroscience, the Society for Neuroscience's (SfN's) web portal for higher education. ERIN allows faculty to share advice about effective materials for teaching by listing, describing, and evaluating resources. Its development began in July 2011, supported by a three year grant from the National Science Foundation. It was launched as an independent SfN website in March 2012, and a year later it was incorporated into the Society's main website. ERIN is now a mature resource for faculty, subject only to regular updates as new materials for teaching become available.

ERIN's database currently lists about 600 resources, each of which is categorized by topic, subtopic, media type, author, date of publication, and educational level. In many cases, resource descriptions are accompanied by reviews and ratings from faculty who have used the resource in their own teaching. The ERIN database can be searched by entering free-form search strings, or it can be browsed using drop-down menus for topic, subtopic, and the other classification categories.

ERIN is open to the world to search, but submission of reviews or suggestions for new resources requires sign-in as a member of SfN. That policy was initially adopted to keep out inappropriate submissions, but since a group of editors examines, describes and classifies all nominated resources before they are added to the database, the sign-in requirement is under review. (In particular, SfN sign-in has prevented members of Faculty for Undergraduate Neuroscience [FUN] from submitting materials to ERIN unless they are also members of SfN, although they can search ERIN freely, like everyone else.)

DESIGN CHOICES

Any website is potentially always a work in progress, but many aspects of ERIN's design have been in place from the beginning.

ERIN's basic concept was initially proposed in 2007 by the first author at the Association for Neuroscience Departments and Programs spring meeting. The idea was further refined in 2008 at a workshop at Macalester College prior to the triennial meeting of Faculty for Undergraduate Neuroscience (Korey, 2009). That workshop led directly to a formal proposal to SfN Council that argued not only for the value of a website where faculty could share advice about resources for teaching, but also that SfN (and not ANDP or FUN) was the appropriate organization to develop and host such a website (Olivo, 2009). SfN Council was enthusiastic about the idea and formed a small committee to extend the concept. This led to a proposal in 2009 to the National Science Foundation's NSDL program (originally "National Science Digital Library") to create a neuroscience website. The proposal, written largely by SfN staff, was ambitious in the scope of its intended audience and its budget, but it was somewhat diffuse, and it was not funded. The following year, the first author in collaboration with Eun-Joo Chang, SfN's Senior Director of Professional Development, wrote a more focused proposal with a much smaller budget to submit to NSF's TUES ("Transforming Undergraduate Education in Science") program. The proposal, for which Olivo and Chang were co-PIs, centered on resources for undergraduate and graduate education. It was livelier and less bureaucratic than the previous year's NSDL proposal, and it was funded.

The preliminary design for ERIN's home page

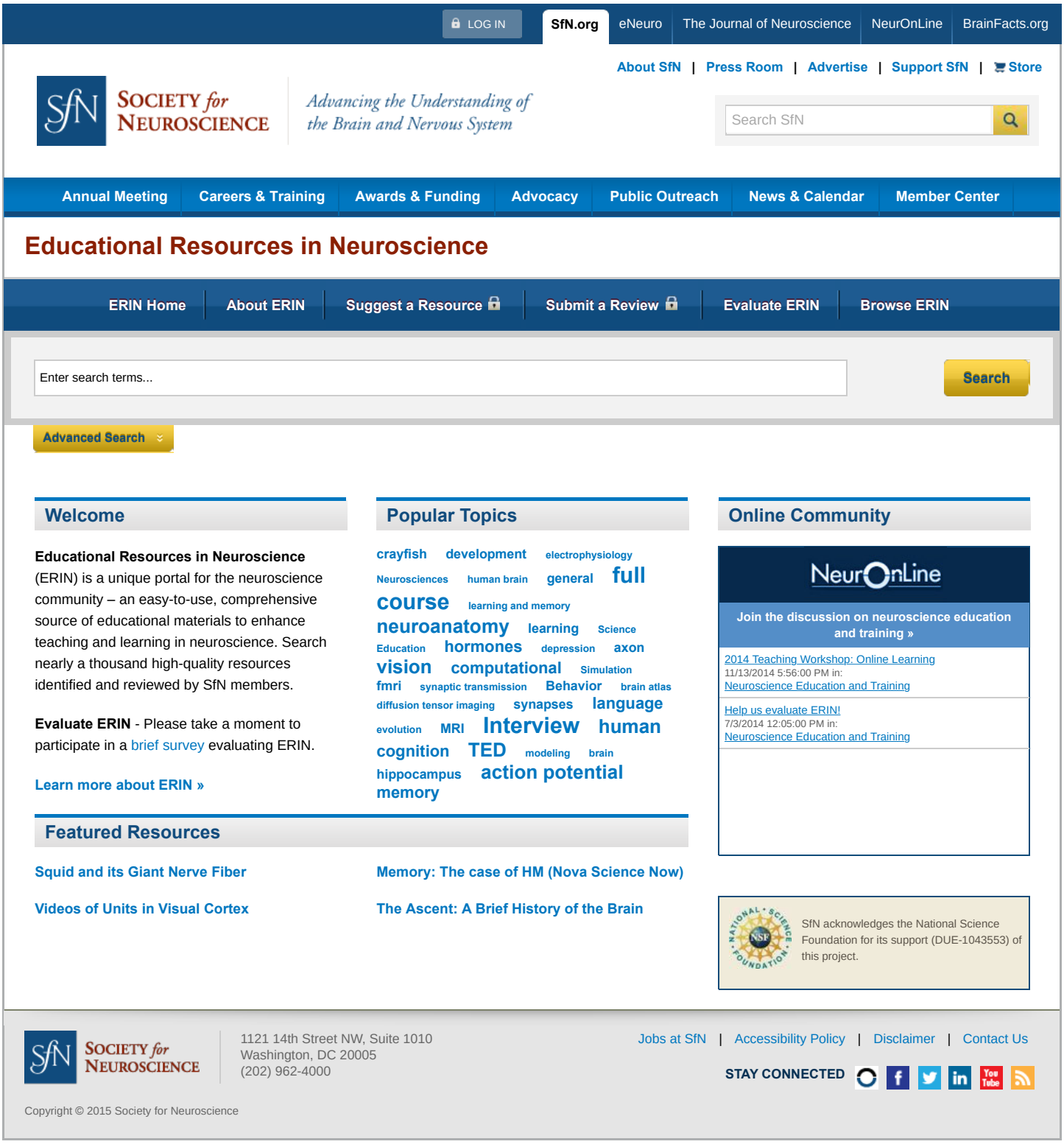

Figure 1. The ERIN home page. Among its features are access to free-form searching and browsing, a word cloud of popular topics with links to search results for those topics, the current page for the NeurOnLine community for neuroscience education and training, and several featured resources that are updated periodically.

A: Development
A.01. Brain Patterning
A.02. Neurogenesis and Gliogenesis
A.03. Postnatal Neurogenesis
A.04. Stem Cells
A.05. Axon and Dendrite Development
A.06. Synaptogenesis & Activity-Dependent Development
A.07. Developmental Cell Death
A.08. Development of Motor, Sensory and Limbic Systems
A.09. Transplantation and Regeneration
A.10. Evolution of Developmental Mechanisms

B: Neural Excitability, Synapses, and Glia: Cellular Mechanisms
B.00. Action Potentials
B.01. Neurotransmitters and Signaling Molecules
B.02. Ligand Gated Ion Channels
B.03. G-Protein Linked Receptors
B.04. Ion Channels
B.05. Transporters
B.06. Neurotransmitter Release
B.07. Synaptic Transmission
B.08. Synaptic Plasticity
B.09. Network Interactions
B.10. Intrinsic Membrane Properties
B.11. Glia-Neuron Interactions

C: Disorders of the Nervous System
C.01. Translational Mechanisms
C.02. Alzheimer's Disease and Other Dementias
C.03. Parkinson's Disease
C.04. Neurodegenerative and Movement Disorders
C.05. Aging
C.06. Developmental Disorders
C.07. Epilepsy
C.08. Ischemia
C.09. Demyelinating Disorders
C.10. Trauma
C.11. Neurotoxicity, Inflammation, and Neuroprotection
C.12. Neuro-Oncology
C.13. Sensory Disorders
C.14. Gene Therapy
C.15. Schizophrenia and Bipolar Disorder
C.16. Cognitive, Emotional, and Behavioral State Disorders
C.17. Drugs of Abuse & Addiction
C.18. Behavioral Pharmacology

D: Sensory and Motor Systems
D.01. Chemical Senses (Olfaction and Taste)
D.02. Auditory
D.03. Multisensory
D.04. Vision
D.05. Visual Sensory-Motor Processing
D.06. Eye Movements
D.07. Vestibular
D.08. Pain
D.09. Tactile/Somatosensory
D.10. Spinal Cord Injury and Plasticity
D.11. Vertebrate and Invertebrate Rhythmic Pattern Generation
D.12. Kinematics and EMG
D.13. Motor Neurons and Muscle
D.14. Cerebellum
D.15. Basal Ganglia
D.16. Posture and Gait
D.17. Voluntary movements
D.18. Brain-Machine Interface
D.19. Comparative Anatomy and Evolution

E: Homeostatic and Neuroendocrine Systems
E.01. Neuroendocrine Processes
E.02. Neuroimmunology
E.03. Behavioral Neuroendocrinology
E.04. Autonomic Regulation
E.05. Stress and the Brain
E.06. Thirst and Water Balance
E.07. Food Intake and Energy Balance
E.08. Biological Rhythms & Sleep
E.09. Brain Blood Flow, Metabolism, and Homeostasis
E.10. Reproduction

F: Cognition and Behavior
F.01. Learning and Memory
F.02. Language
F.03. Motivation and Emotion
F.04. Consciousness
F.05. Decision-making, Neuroeconomics
F.06. Neuroethology

G: Novel Methods and Technology Development
G.01. Molecular, Biochemical, and Genetic Techniques
G.02. Genomics, Proteomics, and Systems Biology
G.03. Staining, Tracing, and Microscopy Techniques
G.04. Brain Imaging
G.05. Physiological Methods
G.06. Bioinformatics
G.07. Computation, Modeling, and Simulation
G.08. Data Analysis and Statistics

H: History and Societal Impacts of Neuroscience
H.01. History of Neuroscience
H.02. Teaching Strategies
H.03. Public Awareness
H.04. Ethical and Policy Issues

I: Neuroanatomy
I.01. Human Neuroanatomy
I.02. Other Mammalian
I.03. Other Vertebrate
I.04. Invertebrate Neuroanatomy
I.05. Neuroanatomical Techniques

Figure 2. ERIN's scheme of topics and subtopics for classifying resources, based on the "Themes and Topics" for the SfN annual meetings.

presented in the NSF proposal was similar to the design that finally emerged (Figure 1). Searching is prominently placed as ERIN's central feature. Browsing and advanced searching by specifying resource categories are also prominently featured. A word cloud of popular topics and a few suggested resources (updated periodically) are displayed to suggest topics that visitors might not think to explore. The navigation bar includes links to two other principal functions: suggesting new resources and submitting reviews. The search box and navigation bar appear on all subsidiary pages to make ERIN's main functionality constantly available.

ERIN's classification system for topics and media types were both derived from pre-existing systems. The topic and subtopic lists (Figure 2) were taken directly from the "Themes and Topics" classification scheme for abstracts and presentations at the SfN annual meeting. Most neuroscientists will be at least somewhat familiar with that system, suggesting that there would be no advantage to devising a new one. However, one topic was added that is important for teaching but no longer appears as a primary research topic: neuroanatomy.

Another classification scheme, the list of media types (Figure 3), was based with minor modifications on the system used by BiosciEdNet (BEN). The list has served well for the most part, although a few categories required revision, and one may still need rethinking: "Lecture videos" and "Video clips" are easy to distinguish if the item is an online course lecture or a short video from a journal supplement, but is a 15-minute TED talk a lecture or a clip? That ambiguity remains unresolved.

Once these and other design decisions were made, technical specifications were circulated to two potential developers, and in the fall of 2011, the software contract was awarded to Velir Studios (Somerville, MA), who

Animation	Laboratory Manual
Article - News	Lecture Audio
Article - Research	Lecture Notes
Article - Review	Lecture Slides
Assessment - Exam or Quiz	Lecture Video
Assessment - Tools	Open Course Site
Assignment	PowerPoint Presentation
Audio or Podcast	Resource Compilation
Blog	Simulation
Book - Academic or Textbook	Software Package
Book - Popular	Syllabus
Case study	Teaching Strategies & Guidelines
Dataset	Tools - Computational
Discussion group	Tools - Graphing
Humor	Tools - Mathematical
Image - Diagram	Tools - Writing
Image - Photograph	Video Clip
Laboratory Equipment	Webcast
Laboratory Exercise	

Figure 3. ERIN's classification system for resource (media) formats, modified from the system used by BiosciEdNet (BEN).

Figure 4. ERIN's founding Board of Editors, photographed during their working session at Pomona College in July 2011. (L-R) Richard Olivo (Smith College), Bob Calin-Jageman (Dominican University), Monica Linden (Brown University), Laura Symonds (Michigan State University), Bob Rosenberg (Earlham College), Jan Thornton (Oberlin College), Bill Grisham (UCLA), and Joe Burdo (Boston College). During their week of working together, the editors searched for and described resources in their areas of expertise, posting them to a temporary database created by Bob Calin-Jageman. The editors also modified ERIN's lists of topic and subtopic categories and media types, and frequently discussed whether particular resources would be appropriate for inclusion in ERIN as part of developing the standards for the database.

proposed creating the database in Sitecore. Their task was to write the software for the pages that would connect users to the database. They finished their work in early 2012, for the most part capturing the intentions of the ERIN design very well. Some important problems emerged after the website was launched, however, which are discussed in the next section.

THE ROLE OF THE BOARD OF EDITORS

After funding from NSF was assured, the co-PIs set about appointing a Board of Editors, seven faculty members with expertise in different areas of neuroscience who initially would be responsible for pre-populating the ERIN database. Subsequently, their work would center on evaluating, editing and approving new resources that SfN members were expected to submit. From more than sixty nominations, seven editors were selected (Figure 4). They met for a week in July 2011 at Pomona College, prior to the triennial meeting of Faculty for Undergraduate Neuroscience. During that week, the editors identified more than 500 resources that they loaded into a temporary database created for them by Bob Calin-Jageman. This was the start of a collaboration that would continue for the next three years through emails, video conferences, conversations at the annual meeting, a poster presentation to publicize ERIN (Olivo et al., 2013), and even a two-day work session at Boston College in July 2013 that the editors attended at their own expense.

Although the editors' work initially was finding and describing resources, as expected, it soon became clear that their familiarity with ERIN put them in a unique position to detect problems in software implementation, and to suggest solutions. This emerged most clearly after ERIN was launched, when it became apparent that its search engine had significant problems. For example, searching for "Alzheimer," "Alzheimer's" or "Alzheimers" produced different results. Another, simpler problem was that the drop-down list for authors' names was alphabetized by first name rather than last name, an obviously inappropriate choice that had not been caught earlier. The alphabetization problem was fixed, but the deficiencies of the search engine remained.

A solution to the search problem was finally worked out by the editors at their July 2013 meeting at Boston College. By that time, ERIN had been incorporated into the main SfN website, which also was based on a Sitecore database developed by Velir Studios. The main SfN website used a much better search engine than the one originally chosen for ERIN. By experimenting, the editors discovered that the main SfN search engine could be used to search the ERIN database. SfN technical staff approved of this solution and implemented the change. As a result, searching ERIN now has two flavors that most users will not notice. Free-form searching uses the main SfN search mechanism and returns ERIN-specific results in a page that looks different from the other ERIN pages. For most users, this is all they will need to access the resources they are seeking. Refining a search and browsing are still available using the multiple classification categories that are one of ERIN's major assets.

Thus, the original Board of Editors took on a role that they had not been expected to play, diagnosing and solving implementation problems in addition to describing, classifying, and approving resources to be listed. The outcome of their work in both realms was a powerful database of high-quality resources that has attracted thousands of visitors. By the spring of 2014, two years after ERIN was launched, almost 27,000 unique visitors had viewed 79,000 pages. More than 600 resources were included, each approved for accuracy and pedagogical utility, classified by appropriate educational level, and in some cases accompanied by reviews from faculty who have used the resource. These are features that are not available from a generic Google search.

CROWDSOURCING AND OTHER SURPRISES

The work of the editors also took on yet another unexpected role. In the original proposal to SfN Council,

the editors were described as “curators,” and the expectation was that their task would be to winnow the most appropriate items from hundreds of resources submitted by neuroscience faculty. Crowdsourcing was expected to power the website, both by identifying new resources to list, and by reviewing existing ones. Unfortunately, the expectation for crowdsourcing has not been fulfilled.

In spite of the thousands of visitors who seem to find ERIN a useful source of information, very few visitors have contributed resources or reviews. Even offering a prize if fifty new reviews were received by a target date did not generate enough responses. Crowdsourcing may work on large sites like Amazon, major news sites, and other national venues, but it has not worked for the neuroscience community -- and not just for ERIN. Neuroscientists seem remarkably reticent about sharing their pedagogical thoughts online. NeurOnLine is SfN’s series of special interest communities, but the one for education has been largely moribund since its inception. The FUN listserve has occasional traffic, but nothing resembling an ongoing conversation. Faculty who seem very glad to exchange ideas about teaching in direct conversation do not show an equivalent enthusiasm for posting their thoughts online. As a result, the editors’ ongoing role was transformed from approving resources submitted by others to finding appropriate materials themselves. (This, of course, was their initial role, to pre-populate the database before it was launched.) Their ongoing work can be considered a very rarefied version of crowdsourcing, where a small but dedicated group of editors keeps ERIN fresh and updated. It served well in getting ERIN underway, and it seems a viable way to continue.

As the development period neared its end, SfN prepared to transfer ERIN’s management from the original Board of Editors to the SfN Committee on Neuroscience Departments and Programs (CNDP), which has oversight of SfN's various educational endeavors. A subcommittee of CNDP will take over the editors’ role. They inherit a formidable resource, and the former editors remain available to them for consultation as needed. We wish them dedication, energy, and luck!

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