DESIGN OF A WEBSITE AND SIGNALING MAP TEMPLATE ACTING AS A DATABASE INTERFACE AND PROVIDING A VISUAL EXPLANATION OF CELLULAR SIGNALING NETWORKS AND THEIR OPERATIVE COMPONENTS

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DEDICATION

This work is dedicated to my family members who have

always been supportive, regardless of where I am

on this life's journey.

ACKNOWLEDGEMENTS

I would like to thank the following people and organizations:

Gilberto Sambrano, Alfred Gilman and the Alliance for Cellular Signaling

Lewis Calver, Kim Hoggatt Krumwiede, and the Biomedical Communications Department

Michael Berridge

The Vesalius Trust

Leslie (Wable) Harper

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by

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THESIS

Presented to the Faculty of the Graduate School of Biomedical Sciences

The University of Texas Southwestern Medical Center at Dallas

In Partial Fulfillment of the Requirements

For the Degree of

MASTER OF ARTS
BIOMEDICAL COMMUNICATIONS
The University of Texas Southwestern Medical Center at Dallas

Dallas, Texas

October 20, 2004

ABSTRACT FOR THE DESIGN OF A WEBSITE AND SIGNALING MAP TEMPLATE ACTING AS A DATABASE INTERFACE AND PROVIDING A VISUAL EXPLANATION OF CELLULAR SIGNALING NETWORKS AND THEIR OPERATIVE COMPONENTS

Publication No.

Lisa Jo Wable, B.S., D.C.

The University of Texas Southwestern Medical Center at Dallas, 2004

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The intention of this thesis is to document and describe the design of a website and signaling map template wherein the maps are standardized, expandable in detail, and act as a database interface while providing a visual explanation of cellular signaling networks and their operative components. This template was designed to provide scientific researchers in the cell signaling community with a unique method of presenting cell signaling networks (maps)

within the web-based environment that can be used by persons with little web design experience. It was further designed to offer the scientific community a new way to access cell signaling network (map) information which provides the viewer/researcher multiple levels of map detail, consistent map formats, and a map interface that taps into a large database with information on specific molecules and isoforms, narratives related to biochemical and dynamic processes, references, illustrations, animations, or other information which the webpage author may feel relevant to the specific network. For this thesis, development of the website and a set of sample pages with maps on chemotaxis were constructed for the Alliance for Cellular Signaling (AfCS). A manual was written and assembled for use by key AfCS members to use the template and thus expand the Signaling Maps pages of the AfCS website, and the sample pages from this thesis project were posted online for members to view and evaluate.

This thesis explores the needs of the cell signaling community and the AfCS, discusses the unique environment of the internet as a medium for displaying and sharing cell signaling pathway information, and documents the research, creative process, and discovery that went into the creation of the template and sample web pages.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF APPENDICES

CHAPTER ONE
Introduction

PROJECT, THESIS QUESTION, GOAL AND OBJECTIVE

Thesis Question

This project was designed to answer the question: Can a straightforward website template be developed utilizing static and animated images and a visually-based database interface which will provide a viable environment for the procurement of information related to cell signaling networks and their operative components?

The Project

The project, undertaken with the cooperation of Systems Committee Coordinator for the Alliance for Cellular Signaling (AfCS), Gilberto Sambrano, Ph.D., involved the design of a website template for the AfCS that includes sample maps with interface and detail expansion, a standardized signaling map design based on Dr. Sambrano's work, a sample animation, and an instruction manual for template use.

Goal and Objectives

The goal of this thesis was to design a website template for the AfCS utilizing static and animated images and a visually-based database interface which could be utilized by key AfCS members to expand the online Signaling Maps database and serve as an example for other members of the cell signaling community interested in presenting and accessing information related to cell signaling pathways and their operative components in an online environment. Objectives included meeting the needs of the AfCS, developing an htm-based interface and graphics for the template, providing an example of template use, providing a manual for template use, and integration of the new pages and design within the AfCS website.

THE ALLIANCE FOR CELLULAR SIGNALING

The Alliance for Cellular Signaling (AfCS) is a multidisciplinary consortium of more than 50 scientists and 8 dedicated laboratories engaged in a ten-year collaboration to understand the complex networks of signal transduction within a cell . Intensive studies have been conducted on the following cell types: B-lymphocytes, macrophages, and cardiac myocytes, with emphasis placed on macrophages at the time of this writing.

The overall goal of the Alliance for Cellular Signaling (AfCS) is to "understand as completely as possible the relationships between sets of inputs and outputs in signaling cells

that vary both temporally and spatially"[1]. The AfCS is bringing together numerous members of the cell signaling community to construct a "virtual cell" through the sharing of information by these members in their areas of expertise. In an interview, Dr. Alfred Gilman, AfCS director, states: "…the community will have a great resource….an appropriate, academic, scholarly, non-ego-driven, generous type of behavior"; he also relates that "a proper virtual cell will be an incredible drug discovery engine"[2]. The potential for advances in the treatment of disease is apparent, and what is extraordinary about the AfCS endeavor is that the members of the Alliance will put their data in the public domain immediately and disclaim all intellectual property rights to the data.

The AfCS works with the science publisher, Nature Publishing Group, to provide the web environment that brings data to the public domain. The users of the AfCS Signaling Gateway website include persons interested in cell signaling. These persons are most likely to be researchers and professors in fields such as cellular biology, pharmacology, biochemistry, and molecular biology.

THE MOLECULE PAGES AND SIGNALING MAPS

The AfCS Signaling Gateway website is divided into three general areas: "Signaling Update", "Molecule Pages", and "Data Center". The "Molecule Pages" contain thousands of

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[1] http://www.signaling-gateway.org/aboutus/afcs.html. [cited June-October 2003].
[2]http://molinterv.aspetjournals.org/cgi/content/full/1/1/14?hits=10&FIRSTINDEX=0&SEARCHID=1097025772143_11&gca=1%2F1%2F14&TITLE=please+check+ego+at+door&sendit=Get+All+Checked+Abstract%28s%29& [online] 2003. [cited June-July 2003].

database records which focus on individual proteins. Within this same division is a section called the "Signaling Maps". Dr. Gilberto Sambrano describes these maps as follows: "These maps, or signaling modules, are designed to provide simple guides to very small parts of the much more complex signaling networks of B lymphocytes and cardiac myocytes. We recognize that each map is necessarily incomplete and at best an inaccurate representation of the signaling machinery that regulates a particular cell function. Eventually, the AfCS will represent and model signaling networks in much more complex formats, designed for generating testable hypotheses. As we tackle the complex task of mapping the complex terrain of signaling networks, we hope the crude modules presented here will guide us - and our readers - to making more comprehensive and powerful tools for navigating regulatory networks."[3] The Signaling Maps section is the focus of this thesis.

[3] http://www.signaling-gateway.org/molecule/maps [online] 2003. [cited June-October 2003].

CHAPTER TWO
Review of the Literature

AFCS WEBSITE DESIGN

As mentioned previously, the AfCS website is split into three main sections. These sections include the "Signaling Update", the "Data Center", and the "Molecule Pages". The "Signaling Update" section is a news and information service which is updated on a weekly basis; the "Data Center" section is a collection of primary experimental data from the AfCS laboratories. The "Molecule Pages" section consists of approximately 3,500 automated and author-sponsored database records of signaling proteins, which are actively growing at the time of this writing. The "Molecule Pages" section also contains the "Signaling Maps" , a collection of images with associated text describing intracellular signaling networks.

The website has a simple design with a green bar navigation menu along the top utilizing rollover images and executed with JavaScript. Submenus have the same design and are placed below the main menu. An early review of the site revealed some use of frames in areas and some individuality in the appearance of pages from various contributors to the site.

GRAPHIC AND WEBSITE DESIGN PRINCIPLES

Graphic Design

Three components in art and design, "what, how, why", have been described. The subject is "what", the form is "how", and the content is "why". The subject may be a person, animal, place, thing, or idea. The form is the totality of the visual devices manipulated by the artist. The content is the emotional or intellectual message of the artwork. The successful combination of these three parts produces what Otto Ocvirk et al refer to as "organic unity" – an interrelationship of the three parts that contains only what is necessary, nothing that is distracting, and relationships that "seem inevitable"[4].

Having addressed the basic components of art, one is still left with the actual execution of a work. Actually producing a project with the three basic components requires construction utilizing the structural elements of design. These elements are shape, line, value, color, and texture. Final assembly will be guided by dimensionality (2-D or 3-D), size, medium, and space.

[4] Ocvirk, O.G., R.E. Stinson, P.R. Wigg, R.O. Bone, and D.L. Cayton. 1998. Art Fundamentals Theory and Practice. McGraw-Hill, Boston, MA.

Web Design

The basic design principles can be applied to the construction of websites and web pages. Many new media have been introduced to the art community over the centuries and although the digital medium requires specific training and a different approach during execution, the design outcome can reflect traditional design principles.

Marla R. Wilkins describes three features of a web page design: 1) accomplishing the goal, 2) attraction, and 3) ease of use. In the case of scientific sites, the goal may include such topics as instruction, education, or publication. Attraction is audience-specific and includes visual esthetics incorporating graphics and text. Ease of use or "usability" is a feature which incorporates overall organization and navigation. She further relates a lack of research time for extracurricular projects by researchers, such as the development of web pages and web design, and a lack of experience with visual design techniques among scientific researchers. This thesis project is aimed at bypassing any need for outside web design training and research by providing a template for research scientists in which all aspects of web design have already been addressed[5].

[5] Wilkins, M. The Development of an Instructional Module on the Basics of Web Design for Scientists Interested in Creating a Web Page. [online] 2003.

SOFTWARE AND MARK-UP LANGUAGE

Mark-Up Language

The internet is a large collection of computers which are connected to each other. The World Wide Web (www) is a variable collection of documents written in hypertext which are located within the internet. Mark-Up language is interpreted by browsers, software which converts the language into web pages. The original and still popular hypertext language, Hypertext Markup Language or HTML, continues to be widely used. The appearance of web pages is variable dependant upon the internet connection speed, computer platform – such as IBM Personal Computer (PC) or Macintosh Apple (Mac), and type of browser. Currently the most popular browsers are Internet Explorer and Netscape Navigator. Unfortunately, in 1994 Netscape decided to create a set of extensions to HTML so that only users of Navigator could properly view certain web pages. This act initiated the "browser wars". Microsoft reacted and began to add its own extensions only viewable with Explorer.

In response to the browser wars the World Wide Web Consortium (W3C) was formed in an attempt to undo the damage. Members of the consortium include Microsoft, America Online (Netscape), Adobe, and Macromedia, among others. The consortium attempts to unify Mark-Up languages, however compliance is still optional. Elizabeth Castro, in her book, HTML for the World Wide Web, cites a coalition of web designers who founded the "Web Standards Project" and describe increasing fragmentation of the Web and designers wasting

25% of their time attempting to program around proprietary tags, designing multiple versions of pages to accommodate various browsers, and educating their clients about the impossibilities of creating certain effects with some browsers[6].

The W3C after eventually standardizing HTML and introducing XHTML (Extensible Hypertext Markup Language), following several years bogged down in debate, recognized shortcomings in the language such as handling content like chemical formulae and supporting some media such as handheld computers. In reaction, the W3C developed Extensible Markup Language (XML). According to Chuck Musciano et al, "XML-compliant languages deliver information that can be parsed, processed, displayed, sliced, and diced by the many different communication technologies that have emerged since the Web sparked the digital communication revolution a decade ago"[7]. HTML (and XHTML) has been revised to run as an application of XML and due to the popularity of HTML and extensions such as JavaScript, cascading style sheets, and layers, is expected to continue to be used.

Client-Side JavaScript

Client-side JavaScript is an extension of mark-up language with object-oriented capabilities and is supported by the popular browsers. It was originally introduced by Netscape 2 and has since been revised, developed and debugged. JavaScript language is used to control such features as pop-up/pull-down menus, size/appearance/location of new browser windows, and mouse-over characteristics, among others.

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[6] Castro, E. 2000. HTML for the World Wide Web, 4th edition. Peachpit Press, Berkeley, CA.
[7] Musciano, C. and B. Kennedy. 2000. HTML & XHTML: The Definitive Guide, 4th edition, Cambridge, UK.

HTML EDITORS AND GRAPHIC DESIGN SOFTWARE

HTML Editors

A number of HTML text editors have been developed to assist designers in coding and designing web pages and websites. These programs, such as ®Macromedia Dreamweaver, allow persons with no experience in web design to create web pages by generating HTML code and JavaScript for the user. Such programs can also be used by professionals to assist in locating code quickly on a page, enter code quickly, and assist in maintaining a website.

Graphic Design Software

Additional software has been developed to assist in producing efficient graphics for the web environment. Programs such as ®Adobe Photoshop and Illustrator, have web optimization features that allow visual comparison of a graphic in common web formats such as JPEG, GIF, and PNG, while comparing file size and download speed. These optimization features also allow the elimination of colors from GIF and PNG files to further reduce file size. These programs also provide a web-safe RGB color palette for the production of graphics. Additionally, Illustrator provides vector-based graphics which offer smaller file sizes when

exported as PDF files or in SWF format for Flash graphics or the emerging SVG format developed by the W3C.

Bridging the gap between the software editors and the graphics programs are the web graphics and design production applications such as ®Macromedia Fireworks and ®Adobe ImageReady. Macromedia Fireworks provides further editing of graphics, organization into a web page, the generation of page layers and slices, and basic XHTML and JavaScript exporting. The exported images and hypertext can then be edited in programs such as Dreamweaver or even in a text editor for further modification. When Fireworks is used in this manner in conjunction with its partner program, Dreamweaver, a user may return to Fireworks to edit images and is a useful feature, however re-exporting the hypertext from Fireworks results in a loss of post-Fireworks modification to the script.

AFCS WEBSITE CONTENT

The AfCS Website

The AfCS website provides an online resource of new and freely available scientific data to the scientific community. The “Signaling Update” provides weekly AfCS news. The site’s “Data Center” contains half a terabyte of raw data collected from AfCS laboratory experiments on immune B-lymphocytes , macrophages, and cardiac myocytes, and is available to the entire scientific community for interpretation. The “Molecule Pages” contain

3,500 database records on proteins relevant to the cell signaling community, many of them sponsored by field experts. The “Molecule Pages” also contain the “Signaling Maps”, a collection of graphics describing signaling networks relevant to the cell signaling community.

The Signaling Maps

Conclusions were made following a review of the “Signaling Maps”, a review of other websites utilizing signaling maps, and a review of publications by and discussions with Dr. Gilberto Sambrano, Systems Committee Coordinator of the AfCS at University of California San Francisco.

It was noted that the current pages were limited to static images with enlargement features and related text. These images were similar to those seen in textbooks and printed publications. It was observed that a significant amount of information was placed on an individual map requiring scrolling on a computer monitor, even with a resolution setting of 1152 x 864 ppi. Additionally, the print option reproduced the entire web page, rather than just the map, and the image did not adjust for a standard 8.5 x 11” sheet of paper resulting in cropping of the map.

It was also noted that users could not access molecule or protein pages associated with the individual maps without leaving both the “Signaling Maps” section and the map under study, and that overall the advantages of the web environment were not realized.

An examination of other sites, as well as Dr. Sambrano's observations reveals a lack of uniformity in the construction of signaling maps. Molecules and connections vary widely from one illustration to another. A particular protein might be represented as a yellow circle on one map and a red polygon on another. Dr. Sambrano also has noted a need for scalability in navigational maps[8]. As one might switch from the low power objective of a microscope to the high power objective to view greater detail, so too one might apply expanded detail to pathway maps.

An investigation of other websites with signaling maps revealed pages similar to the current AfCS "Signaling Maps", however the illustrations were found to be less favorable esthetically and difficult to interpret secondary to design flaws such as asymmetry, lack of repetition, variable object forms, and multiple crossing and multidirectional lines. Only one site was found which interfaced with data, and only in a limited fashion. No site was found to utilize detail features as described by Dr. Sambrano or to interface with large databases, narratives, articles, animations or illustrations[9].

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[8] Sambrano, G.S. Developing a Navigation and Visualization System for Signaling Pathways. AfCS Research Reports. [online] 2003. Vol. 1 [cited July 2003]. Available from http://www.signaling-gatewary.org/reports/v1/DA0009.

[9] http://123genomics.homestead.com/files/pathway.html [online] 2003. [cited June-October 2003]. http://www.biocarta.com/ [online] 2003. [cited June-October 2003]. http://www.bioinformatics.org/forums/forum_id=227 [online] 2003. [cited June-October 2003]. http://www. Signaling-gateway.org [online] 2003. [cited June-October 2003].

SIGNALING MAPS AND THE CELL SIGNALING COMMUNITY

The cell signaling community has specific needs which can be met in part through the use of signaling maps. Dr. Sambrano states that, "The AfCS seeks a comprehensive understanding of cellular signaling networks, in all their spatial and temporal complexity. Embarking on this journey will be facilitated by assembling maps that can guide our research and trace our progress. Mapping networks that include thousands of molecules will require many years of exploration." He further states with regard to the current AfCS signaling maps that, "Eventually, the AfCS will represent and model signaling networks in much more complex formats, designed for generating testable hypotheses."[10]

While designing software for such complex maps continues to be developed, there remains a need for the more basic two-dimensional maps to "provide simple guides to very small parts of the much more complex signaling networks". These two-dimensional maps continue to be used in the cell signaling community in media such as the Web and printed publications. Dr. Sambrano states in a paper on navigation systems, "…for practical reasons, experimentalists will continue to draw simple pathway maps on paper napkins and chalkboards before taking them to more sophisticated computer drafting tools. Scientists will

[10] http://www.signaling-gateway.org/molecule/maps [online] 2003. [cited June-October 2003].

also have a continued need to communicate their findings with simple and lucid illustrations."[11]

PATHWAY VISUALIZATION SYSTEMS AND CHEMOTAXIS

Pathway Visualization Systems

Signaling maps are a subset of the broader molecular connection maps and represent visual descriptions of intracellular signals. In general terms, Dr. Sambrano describes these maps as a tool for allowing the viewer to follow the flow of biochemical information from an input to a specific output during a temporally- and spatially-dynamic event.

In his paper, "Developing a Navigation and Visualization System for Signaling Pathways", Dr. Sambrano describes the growing knowledge in intracellular signaling mechanisms and the evolution of thinking from linear paths to complex signaling networks requiring better visualization tools. He proposes standardized diagrammatic and layout guidelines for creating and visualizing signaling pathways, including detail scalability, molecule designations or symbols based on molecule type, connection edges, interaction symbols, and arrows to trace the flow of signaling information and type of interaction, and

[11] Sambrano, G. S. Developing a Navigation and Visualization System for Signaling Pathways. AfCS Research Reports. [online] 2003. Vol. 1 [cited July 2003]. Available from http://www.signaling-gateway.org/reports/v1/DA0009.

the utilization of modules to simplify visualization. He concludes that while analysis of complex intracellular signaling networks requires dedicated software, there is still a need for the simple signaling maps for such things as basic communication and lucid illustrations[12]. The signaling map template presented by this thesis brings these ideas into a web-based format.

Chemotaxis

The process of chemotaxis is defined as movement of cells in response to chemicals. Cells with chemotactic abilities are able to amplify a shallow extracellular chemical gradient into a steep intracellular gradient resulting in cell polarity. This causes the assembly of F-actin at the leading edge of the cell with the formation of pseudopodia and an actomyosin lattice at the rear of the cell prompting cell retraction. Together these processes provide forward propulsion of the cell. This movement is facilitated by coordinated cell adhesion to the substrate[13]. Signaling pathways regulate chemotaxis and have been translated into signaling maps by Dr. Sambrano. These maps have been modified and used in the website presented by this thesis to serve as examples of template usage.

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[12] Sambrano. G.S. Developing a Navigation and Visualization System for Signaling Pathways. AfCS Research Reports. [online] 2003. Vol. 1 [cited July 2003]. Available from http://www.signaling-gatewary.org/reports/v1/DA0009.

[13] Chung, C.Y, et al. 2001 Signaling Pathways Controlling Cell Polarity and Chemotaxis. TRENDS in Biochemical Sciences 26: 9:557-566.

Firtel, R.A. et al. 2000. The Molecular Genetics of Chemotaxis: Sensing and Responding to Chemoattractant Gradients. BioEssays 22.7:603-615. John Wiley & Sons, Inc., Cambridge, UK.

Iijima, J. et al. 2002. Temporal and Spatial Regulation of Chemotaxis. Developmental Cell 3: 469-478.

Parent, C.A. et al. 1999. A Cell's Sense of Direction. Science 284: 765-770.

CHAPTER THREE
Methodology

INSTRUCTIONAL DESIGN ANALYSIS

Before developing the website and map template, I identified my audience, their goals, and requirements.

Target Audience

The audience of the "Signaling Maps" website is the AfCS membership. There were approximately 50,000 AfCS members at the onset of this project. Members are persons with an interest in cell signaling, primarily those in the research community. Some members take active roles in the AfCS either as members of administration, researchers in participating laboratories, authors of articles found in the "Brief Communications" section of the site, or sponsors of the thousands of molecule and mini-molecule pages. The templates and manual were designed for AfCS members interested in assisting the expansion of the "Signaling Maps" section of the website who have little or no experience in web design.

Audience Needs and Expectations

In addition to the vast amount of raw experimental data expanding the "Data Center" and information contained in the "Molecule Pages", members of the AfCS, as researchers,

require graphic aids in their study of cell signaling to assist in visualizing new experiments and ideas.

The AfCS had begun to assemble signaling maps for its membership, but there was a desire to do more for the membership in this area. An opportunity was seen to address some of the problems associated with two-dimensional signaling maps while employing the advantages of the web environment. The "Signaling Maps" provided an opportunity to offer members of the AfCS, who are primarily researchers, professors, and experimentalists, simple pathway maps to assist in drafting new research ideas, to provide visual teaching tools, and to offer links to the vast database of the 'Molecule Pages" as well as other useful visual and written information. The project described in this thesis was created for this audience.

PROJECT DEVELOPMENT

Due to his knowledge of signaling networks and his insight into the needs of the AfCS membership, I worked with Dr. Gilberto Sambrano in the development of the "Signaling Maps" website. Dr. Sambrano discussed our project with the AfCS website personnel in San Diego, California, who gave us permission to proceed without restrictions on design[14]. Once an overall design was chosen based on identified membership needs and a set of goals, I developed the templates and manual for their use, a set of sample web pages, and animation.

[14] Information gathered by author through email correspondence with Dr. Sambrano.

Project Design

In developing a basic design for the signaling maps and website, goals were first identified to accommodate the cell signaling community and included the following:

1. Introduce a new design for the "Signaling Maps" that would complement the overall look of the AfCS site while providing unique esthetics, ease of use, and efficient use of space.
2. Introduce a standardized map with expansion features based on Dr. Sambrano's concepts.
3. Provide navigation for viewing the various maps by cell type.
4. Provide the main AfCS navigation.
5. Provide a submenu which would offer a text and references page, a downloads page, the map legend, and map enlargements.
6. Introduce a map interface providing links to the "Molecule Pages", animated or still graphics, and narratives.
7. Provide a Flash animation example.
8. Provide guidelines to users for the new website format.
9. Produce templates for the web pages.
10. Produce sample web pages using chemotaxis maps to provide an example of template usage.

11. Produce an instruction manual describing the use of the templates for AfCS members with little or no web experience so that the "Signaling Maps" could be expanded over time.

Project Development

Establishing a Web Page Framework

In order to meet the goals of my project, I began exploring possible layouts for a typical map page. Initially I considered a frameset in which I could organize the overall page into menus and targets. I experimented with a top navigation frame, a left-sided submenu and a small isoforms menu, with a frame on the right for the map and another below it for targeted molecule pages. I discarded this idea secondary to space issues and the limitation of one open molecule page at a time.

I wanted to ensure that viewers would be able to see an entire map legibly on their monitor and still have easy access to the menus, so various layouts were explored before finding a satisfactory design that would maximize space and allow a user to view a map without side-scrolling. Recognizing the increase in larger monitors around college campuses and that my target audience consisted of professors and researchers with access to these monitors, we decided to design the page based on an overall width of 1020 ppi, but keeping smaller monitors in mind, the menus were designed to fit into the 800x600 ppi format and

map design was limited to a width of 760 ppi or less so that they could be positioned on a smaller monitor for viewing without side-cropping.

After trying various positions for content, the most efficient design had a narrow horizontal top navigation menu for the cell types with pop-up menus for their associated maps, followed by a horizontal tab-menu with a main map, expansion maps, text page, and links to the submenu items. Directly below the tab menu was the map with a narrow space to the left for an isoforms list (Figure 3-1). In the later stages of development a navigation bar to the main site was added below the map.

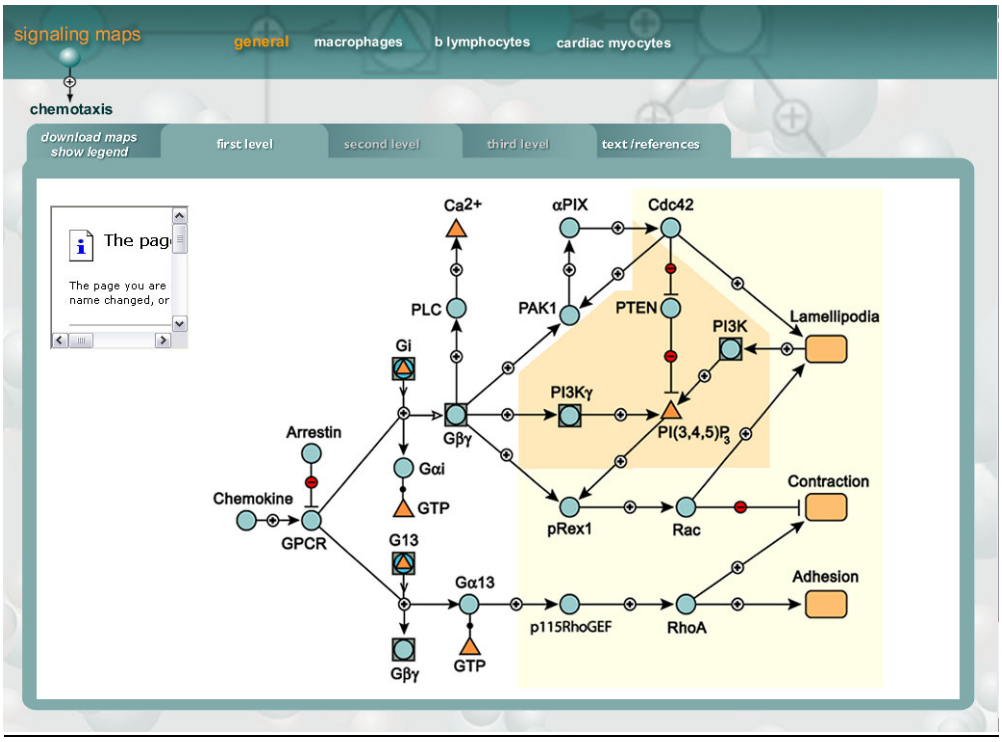


Figure 3-1. A signaling map page showing the layout.

Designing the Pathway Maps

While determining the webpage layout, I was also developing the actual signaling maps. Dr. Sambrano had developed a navigation and visualization system and wanted to introduce his ideas. His map design was based on a blue color scheme with a vertical orientation; however we were going to be placing these maps in a web environment where the overall color scheme was green and monitor orientation was horizontal. The color scheme was therefore revised to fit more naturally with the site colors and the format of the maps was changed to a horizontal orientation to avoid vertical scrolling where possible on monitor screens.

Because some maps would have detail expansion features, I also needed to develop a visual aid or cue to indicate what aspect of a map could be expanded. Initially I tried applying light color-coded background segments to the map, however it was later recognized that in some cases due to the complexity of the signaling network, it would be difficult to apply this technique to all maps (Figure 3-1). I therefore, later in the site development process, designed an icon which would indicate where a map could be expanded into a detail map and that would serve as a link to the expansion/detail map once the interface was established during web page development.

Once the design of the maps was agreed upon, I developed the legend graphic in Adobe Illustrator with descriptions of the various elements (Figure 3-2). I then took a sample map and reconstructed it in Adobe Illustrator giving it a three-dimensional appearance. I would use this graphic as an esthetic element in the introductory page.

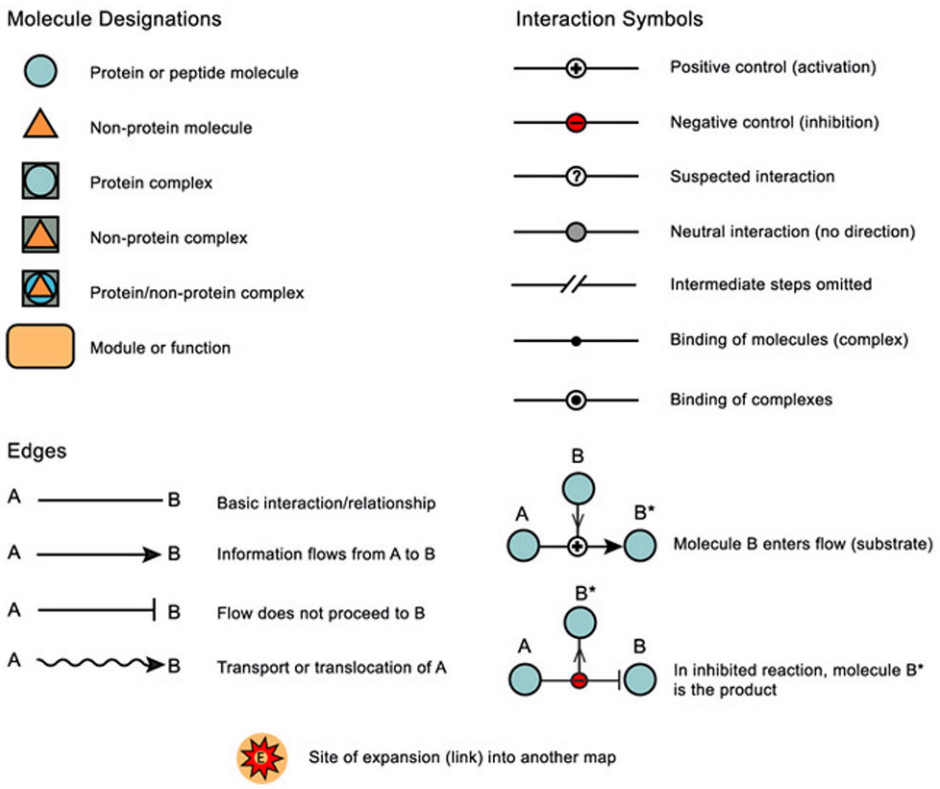


Figure 3-2. Legend graphics, including expansion icon added in the later stages of site development.

Web Page Development

I began the graphic design of the introductory page using Adobe Photoshop. I imported a screen shot of the main site menu and sampled the green menu colors from the imported image. I chose colors in the same family that would compliment the overall look of the site, mindful that the AfCS webmasters might later decide to add the established main site menu above my design. Next I imported the graphics I had created in Illustrator and placed them in layers so that I could experiment with various effects such as form, repetition, line, opacity, and gradients. Using these techniques, I created the top menu graphic. I chose an esthetically

pleasing font, which was later exchanged for a font matching the main site menu items. Headings were initially created with an upper case letter at the beginning of each menu item, however these were later replaced with all lower case text to be more consistent with the look of the overall site. I placed the three-dimensional graphic created earlier on the left and placed some subtle background effects using my map illustrations (Figure 3-3). From this design I would later create a derivative design for the actual map pages.

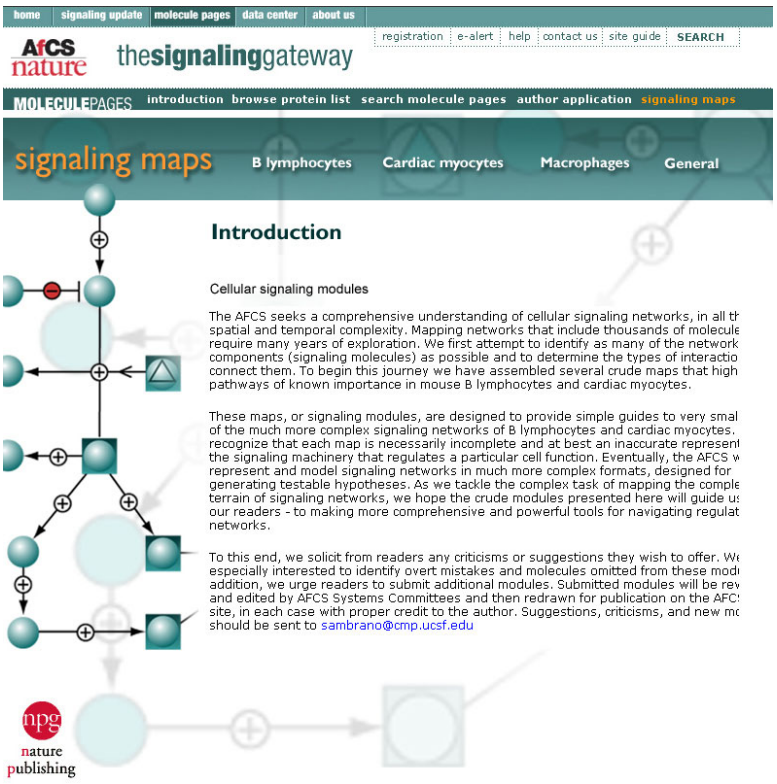


Figure 3-3. Early introduction page design showing the site's navigation menu on top.

I began to collect information on content for the top menu which would include map modules in the categories of General, B-lymphocytes, Macrophages, and Cardiac Myocytes.

I also obtained a list of maps that would be added under each of the categories and assigned relative links for each[15].

I imported my design into Macromedia Fireworks where I divided the overall image into slices that would become an HTML table and created pull-down (pop-up) menus based on the information I had gathered. A large table cell below the menu would later contain text. I converted the sliced graphic into optimized jpeg images and placed the images in an image folder within a site folder called "maps". I exported the HTML text into the site folder and named the introductory page "maps.htm".

Using Macromedia Dreamweaver, I reviewed the page and the code. I removed the jpeg image in the large table cell and inserted text provided by Dr. Sambrano. I adjusted the HTML code so that the menu would align top and left without a white border. I then tested the appearance of the page in Netscape Navigator and Internet Explorer and adjusted the code as necessary for an acceptable appearance in both browsers, before turning my attention to the secondary pages.

For the secondary pages I had four categories and wanted to give each a unique, but complimentary background image. With pictures provided by Dr. Sambrano and the AfCS website, I chose some cell images representative of each cell type. I also created a generic molecular image in Adobe Illustrator. I manipulated each image in Photoshop so that it contained the same colors used in the signaling maps. I then created patterns with the images and placed them on a green background. Finally, I desaturated each background image,

[15] http://www.signaling-gateway.org/molecule/maps

lowered the contrast, and brightened it. These background images were placed in the images folder (Figure 3-4).

Figure 3-4. Web page background images; top: macrophage, general; bottom: myocytes, B-cells

The secondary pages required a somewhat different look than the introductory page. I returned to Photoshop, using some of the same images I had created for the introductory page, and developed the design for these pages. In preparation for construction I had created a set of folder images with tabs in Illustrator which I imported into Photoshop. I arranged the folder images with the tabs below the main menu. I then exported the Photoshop file to Fireworks. Beginning with the general page for the first level secondary page, I imported the

general background image. I added the tab menu with roll-over images including links to the downloads, legend, and text pages, and provided generic titles for map detail expansions: “first level”, “second level”, and “third level”. I again added pop-up menus and sliced the overall image providing a large table cell for later placement of a signaling map image. The page was exported as before and saved in the “maps” folder. The process was repeated for the remaining secondary pages while utilizing work from the previous pages when possible (Figure 3-5).

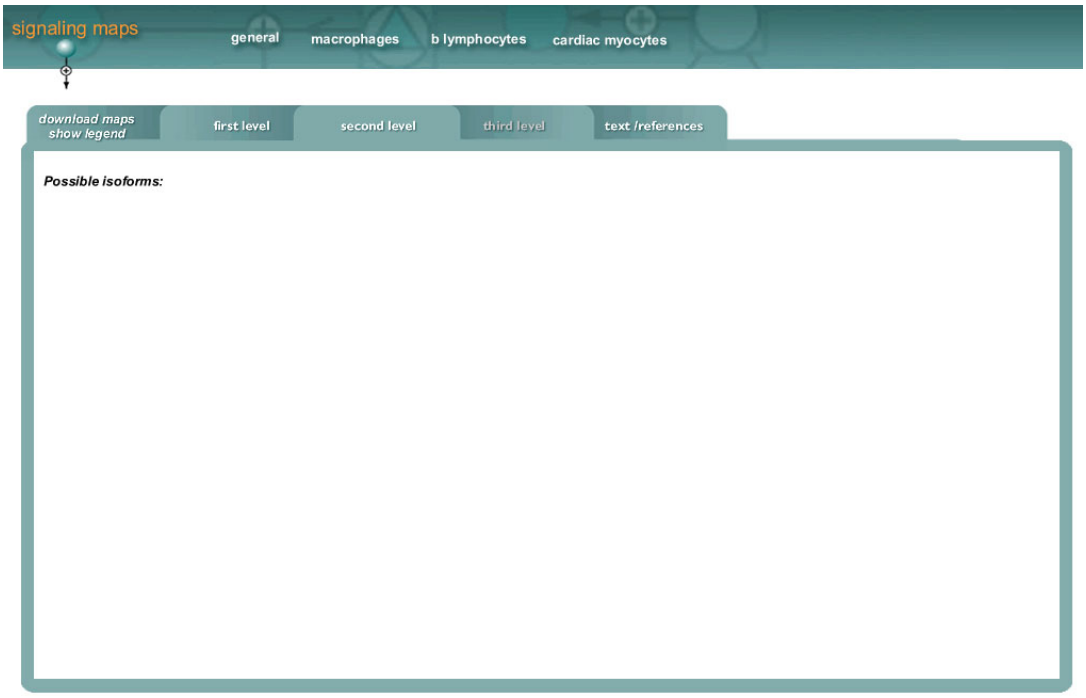


Figure 3-5. Layout of a secondary map page showing navigation tabs.

Developing the Interface

Each page was again exported to Dreamweaver and code was adjusted for appearance. Using the general main page, I examined possible coding for the map interface using the chemotaxis map image. While some molecules on the map would link directly to a single molecule page, others had more than one possible isoform and a list with links to each needed to be presented. I initially explored pop-up menus, but discovered several drawbacks. These included page reloading with selection of a hot spot using OnClick, and more importantly, an inability to add pop-up menus to pages built with Dreamweaver templates (Figure 3-6).

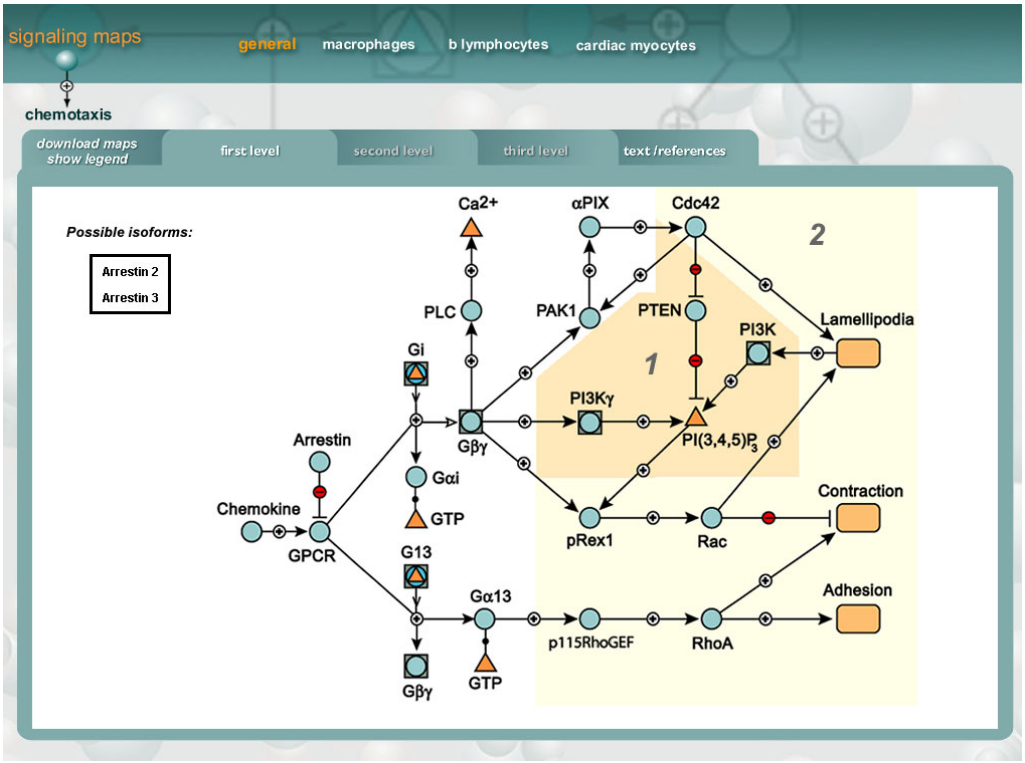


Figure 3-6. Trial page with an isoform pop-up menu on the left.

Upon reviewing HTML references and viewing multiple websites I found a solution using the inline frame (I-frame), a frame that can be placed anywhere within an existing page and set to any height and width. The I-frame could act as a target for isoforms lists, the contents of which could then be linked to the "Molecule Pages". Furthermore, loading the I-frame did not cause reloading of the main page. I placed the code for the I-frame inside a table cell to the left of the map image and set the height and width (Figure 3-7).

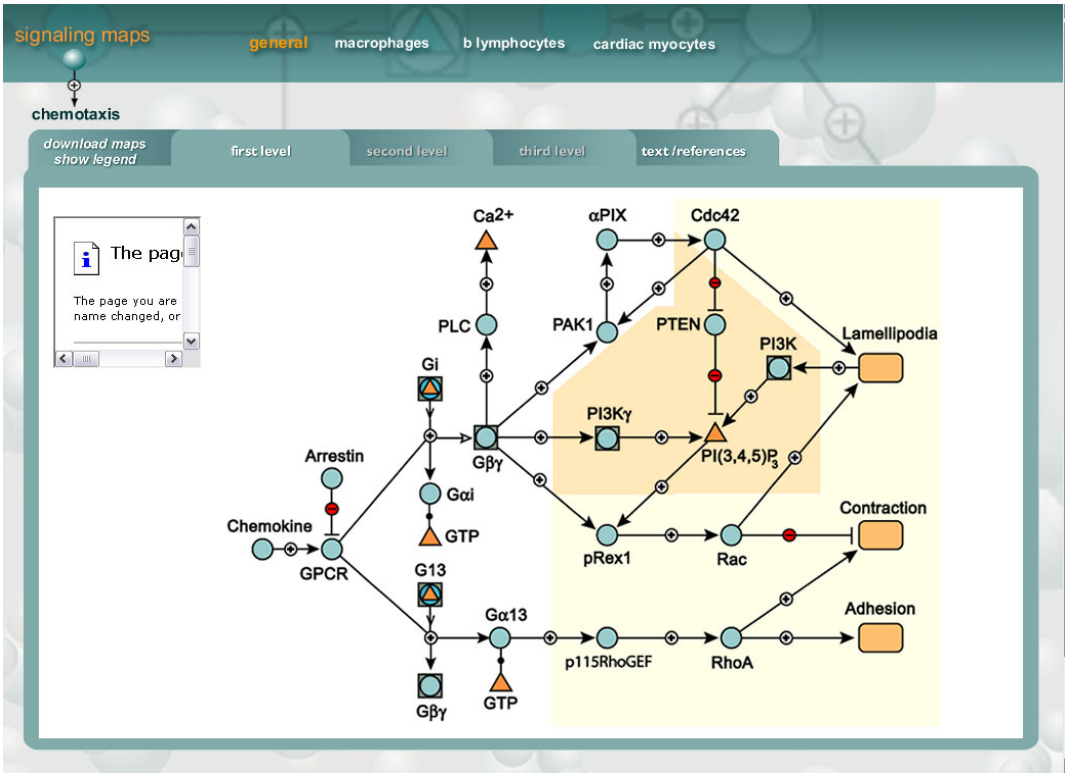


Figure 3-7. First level map page showing the I-frame on the left.

My next task was to control the new windows into which the "Molecule Pages" and special pages such as the legend would be opened. Upon reviewing internet and text

references on JavaScript, I entered code in the head section of the HTML code for the page that would allow me to control window size, resizability, scrollbars, and browser controls for new windows. I also had the option, through the JavaScript, of naming new windows so that new pages could open into existing pages or into new ones.

I then added JavaScript to links I had in place for the legend, enlargement, and downloads pages, giving each a unique window name so that all could be open simultaneously.

Returning to construction of the interface, I replaced the large white jpeg image holding space in the lower right table cell with an actual chemotaxis map. I then used Dreamweaver to create hot-spots over each molecule icon on the map image that would act as a link. For icons opening a single molecule page, I inserted JavaScript to control the size and appearance of the new window, making it slightly smaller than the existing page without a top browser menu. This choice was made so that a user could see that the map was still available. I then attached code to icons that would link to a list of isoforms and used the target "floater" to designate the I-frame. Appearances were checked in the two browsers, adjustments were made to the code as needed for appearance, and construction of the isoform page template was begun.

I saved my chemotaxis page as an HTML document in the "maps" folder. I would return to this page to construct a general first level template at a later time. I started a new HTML document in Dreamweaver which I would convert into the isoforms page template. I created a simple text page with a white background and used sans serif/Arial text. I then created 15 isoform titles with links to the "Molecule Pages" utilizing the JavaScript I had

used for the direct links from the map. I saved the document as a template, and then, using a list of isoforms provided by Dr. Sambrano, created the isoforms pages that would be used for the three chemotaxis maps, replacing the generic titles for the molecule names. I saved these documents in a folder named "isoforms" located inside the "maps" folder.

I opened the chemotaxis HTML document in a browser and checked the interface and I-frame target, ensuring that each link was finding the correct URL on the main website. I also checked the appearance of the new windows for size and placement. Work was forwarded regularly to Dr. Sambrano for his input and suggestions. Modifications were made to trim down the vertical height of the menus, freeing more space for the map, and he was involved in selection of the I-frame to display the isoform lists.

Expanding the Web Pages for the "Signaling Maps"

The same process described above was applied for the Chemotaxis-Actin and Chemotaxis-PIP3 pages and these were saved in the "maps" folder as well (Figure 3-8). A text and references page was also created in a similar manner; however a space for HTML text was placed in a large table cell in lieu of a map image with interface (Figure 3-9). Upon review of the three pages by committee advisor, Kim Hoggatt Krumwiede, the suggestion was made to reduce the entire design by 20%. This was discussed with Dr. Sambrano and concerns were raised regarding the ability to see the map elements clearly, so the page design was ultimately reduced by 10% in Fireworks. The aforementioned HTML and JavaScript modifications,

including the map interface then had to be re-entered in Dreamweaver due to over-writing of the code by the Fireworks software.

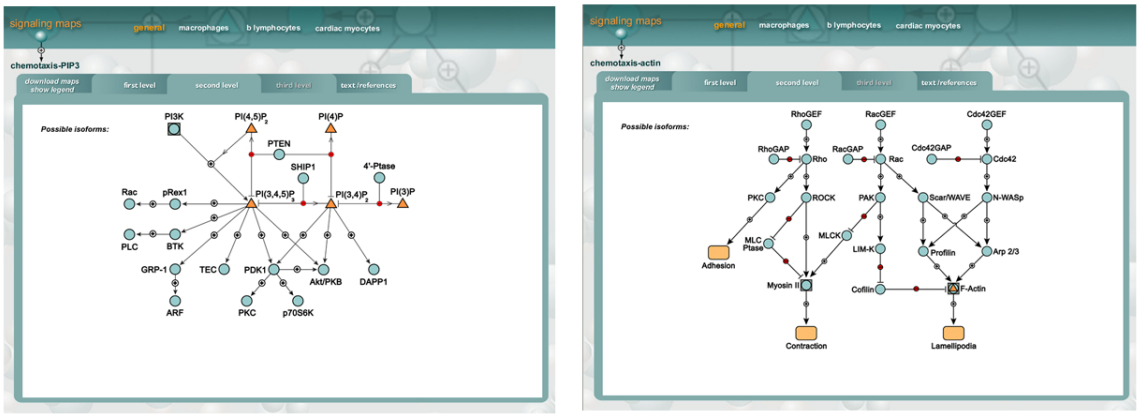


Figure 3-8. PIP3 and actin web pages, respectively (shown prior to insertion of I-frame).

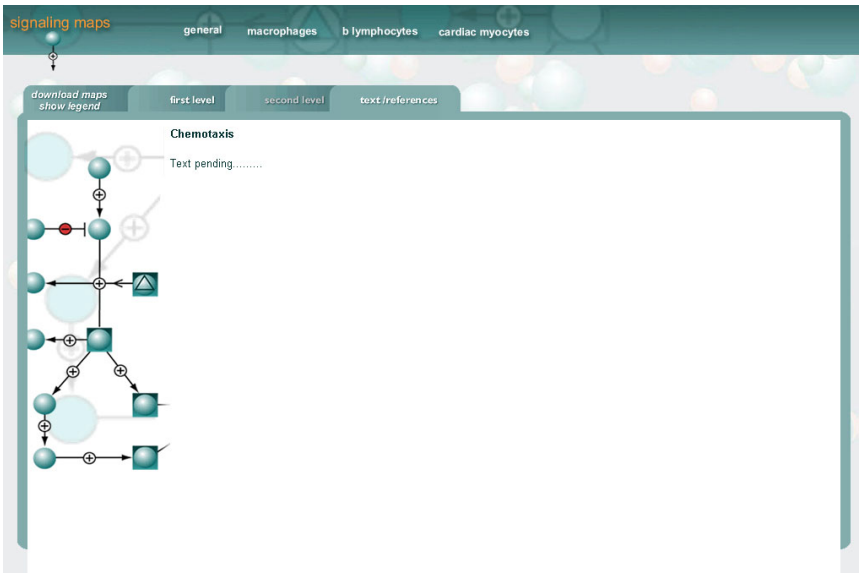


Figure 3-9. Text page layout.

Upon completion of the three chemotaxis pages, construction was begun for the associated pages. For the downloads page I used the same design elements found in the other pages to create the top image. I then created a new page in Dreamweaver and after placing the image, added the content for the page in sans-serif/Arial text. This page was placed in the "maps" folder and would be called up by a JavaScript-controlled link on the map pages. In Illustrator, I converted the three map images into JPEG files of monitor and print quality and placed these in a folder called "downloads". These would later be supplanted with the more space efficient PDF versions of the three maps (Figure 3-10).

Figure 3-10. Downloads web page.

I created the legend page in Fireworks, again using the same top design elements. I had constructed the actual legend in Adobe Illustrator and saved it for the web as a JPEG. I imported the image and then added text, including roll-over text images for the "print legend" command. I exported the optimized file as images and HTML. Opening the HTML document in Dreamweaver, I located my "print legend" roll-over images and utilizing HTML references, added code to call up the print command. I saved the legend in the "maps" folder (Figure 3-11). I began posted my test pages on my website and my progress was frequently reviewed by Dr. Sambrano, and less often by Kim Hoggatt Krumwiede and Lewis Calver of the Biomedical Communications Department at the University of Texas Southwestern Medical Center at Dallas.

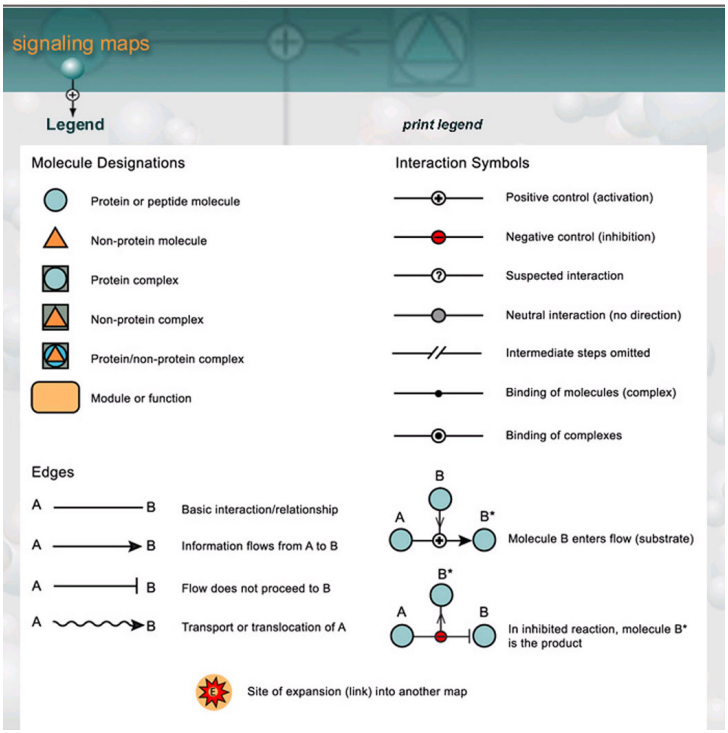


Figure 3-11. Legend.

The First Template Construction

Having completed many of the web pages, I began construction of the templates based on the pages I had developed. I resaved constructed first and second level pages as templates, replacing maps with white JPEG images and map-specific code with generic links. A third level page had not been developed for chemotaxis, therefore a template was constructed from the level two map and roll-over images and links were exchanged to reflect the appropriate third level page and tab selection. This process was repeated for all the cell-type categories.

The First Template Manual

With completion of the templates, I developed a manual providing step-by-step instructions for authoring the web pages of a new map series from the templates, preparations required to author the pages, and guidelines for the construction of a new map from the standardized format that had been developed.

Web Page and Template Redesign

As I was completing the manual, it was decided upon further review of the website design, that the tabs on the navigation menu of the maps pages with “first level”, “second level”, and “third level” designations should be replaced with actual map names, rather than having the names on the map images themselves. This would offer a more concise navigation to detail maps; however the navigation tabs that were in place were designed as roll-over images, not

HTML text; therefore persons using the templates would need to know how to create roll-over images. This, I felt, was too complex a task for anticipated template users and introduced a problem that required a complete redesign of the site's web pages.

After discussions with Dr. Sambrano, I decided to discard the existing HTML table holding the images that displayed a typical map page. I began again by recreating the chemotaxis page. I regenerated the top graphic and navigation system as an independent table and opened the generated HTML document in Dreamweaver. I placed the image for general pages in the background, and set alignment, text, and link color parameters for the page.

I then created a table of colored cells which I would use in place of the tab system to navigate between maps. This table would contain HTML text and therefore could be changed by template users to contain the names of specific maps. I built a third table below the navigation bar to hold a submenu, the I-frame, and the map with its interface. I inserted the code for the I-frame in the appropriate table cell and placed a blank JPEG image in what would be the map image and interface table cell.

I then returned to Fireworks and created a roll-over submenu for links to the text/references page, downloads page, legend, and map enlargement. I exported the images and text in the usual manner, opened the HTML document in a text editor, and pasted the JavaScript and HTML into the head section and table of my new page. I added JavaScript to allow for controlled new window appearance and checked the menus in a browser, debugging code as needed.

Once I had the general new design working and approved by Dr. Sambrano, I replaced the navigation map names with generic names and converted it into a template for

general first level pages (Figure 3-12). The chemotaxis page was then rebuilt from the template. The chemotaxis map image was added and the interface was reconstructed as before.

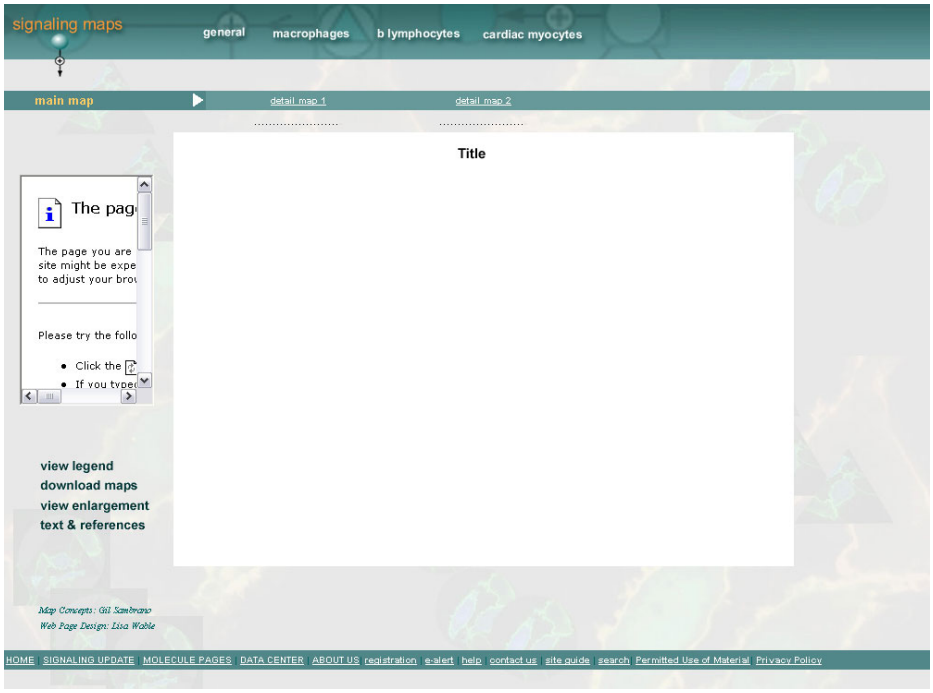


Figure 3-12. Sample map page template showing redesign.

Using the first template as a guide and utilizing the same techniques, I then constructed the text and references page template, and a general text page that would be used in association with map interface function boxes. Due to a shortcoming in the Dreamweaver template design, it was not possible to use a single template for each cell type/category and exchange background images, therefore a separate template had to be designed for each cell type, as well as for each type of page. This was done, giving each category a separate, but

graphically similar background image. The isoforms template required no changes (see Appendix B to view templates).

I recreated the previous pages from the new templates, including the introductory page, documenting my use of the templates for later rewriting of the manual. I tested the site in Netscape Navigator and Internet Explorer throughout the template and page construction process, debugging as needed. The site was posted on my website, reviewed by my committee members and it was agreed that I could resume work on the manual based on the redesign (see Appendix A to view "Signaling Maps" website).

The Final Template Manual

I saved portions of the manual describing the production of a new map, adjusting the instructions as needed to fit with the new web design. I also saved instructions on the production of the isoforms pages. The rest of the initial manual had to be rewritten.

Following discussions with Dr. Sambrano, I was asked to write the manual for persons using a text editor to construct pages from the templates. The templates had all been built using Dreamweaver for rapid menu updates. With the addition of a new map series, the top menu must be updated for every page in the "Signaling Maps" section of the site and Dreamweaver offered automatic updating of all pages in the site by updating templates only rather than every page individually. Nevertheless, the new pages could be built from an HTML document generated from these original templates if one desired to do so and menus could be updated for each existing page one at a time. The manual was therefore written for individuals who would be using a text editor; however notations were included in the manual

regarding the Dreamweaver template origin and the option of still utilizing this feature at a future date if desired. Instructions on how to do this were included with the manual (see Appendix C to view manual).

I organized the manual into subjects which included “Overview, “Making a Map”, “Creating a New Map Web Page”, “Samples of Code”, and “Web Page Data Sheets”. The sections were then broken down into subsections describing the steps necessary to complete one or more aspects of the web page development.

The “Overview” section provides a review of the new “Signaling Maps” layout. This section gives a general description of the menu design, map interface, and other features, providing the web page author a basic understanding of how the site works as a whole and how each page will be organized.

The “Making a Map” subject provides the guidelines for building a new signaling pathway map from the legend icons in Adobe Illustrator. Dimensions are limited to 750 pixels wide x 450 pixels tall for optimum viewing on the site. Readers are given a description of how to insert their Illustrator map into a Photoshop template, how to optimize and save their images, and where to save the new maps in the website folders for later use.

The next subject, “Creating a New Map Web Page”, is the largest section in the manual and is subdivided into the following sections: “Isoform Pages”, “Dowloads Page”, “Special Pages”, “Map Page”, and “Text & References Page”. A web page data sheet was designed to assist web page authors in gathering and organizing the material they would need to design a new set of pages. After being instructed to complete a data sheet, this section goes through the steps necessary to create and update web pages through the use of the templates.

Each section is devoted to construction of a particular type of web page, as the titles suggest. Readers are walked through the process of creating a page from the template, finding specific code in the template and replacing it with code for the map page they are developing. Each section provides numbered steps, illustrations, and sample code marked with numerical step labels to assist in the process. Code text is provided in a unique font style so readers can distinguish between instructions and code. Portions of the code that need to be modified are highlighted with blue text to further assist readers (Figure 3-13).

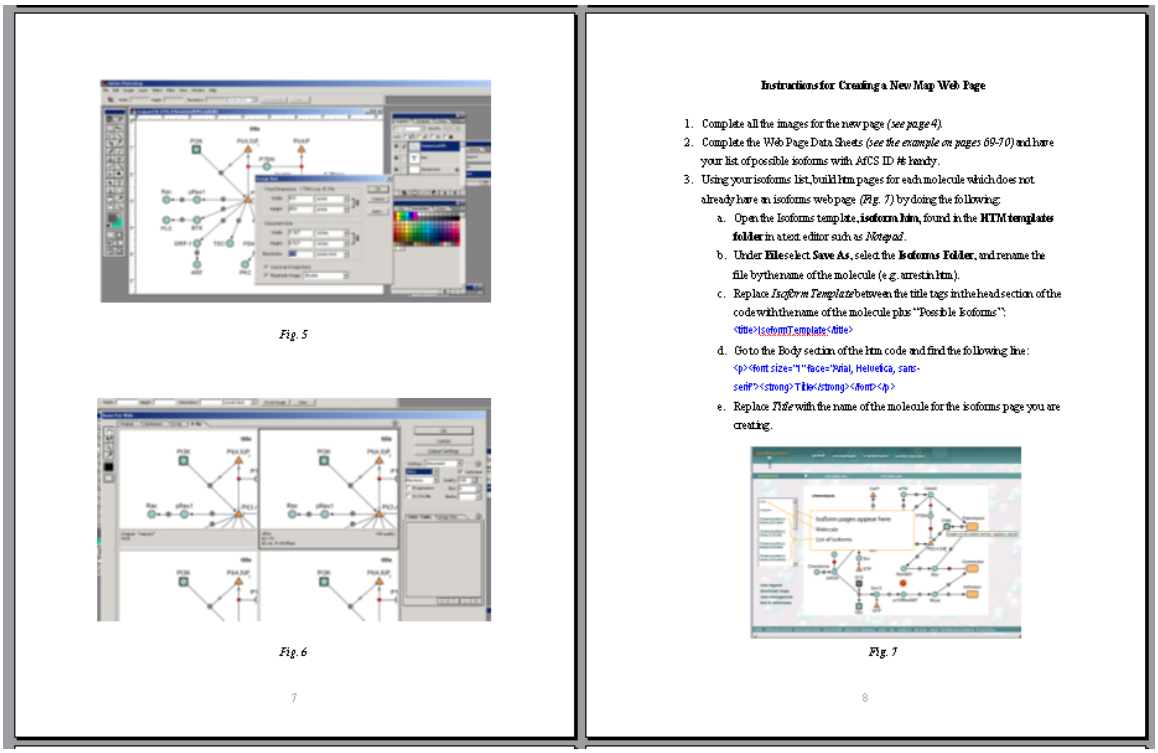


Fig. 5

Fig. 6

7

Instructions for Creating a New Map Web Page

1. Complete all the images for the new page *(see page 4)*.
2. Complete the Web Page Data Sheets *(see the example on pages 69-70)* and have your list of possible isoforms with AtCS ID #s handy.
3. Using your isoforms list, build htm pages for each molecule which does not already have an isoforms web page *(Fig. 7)* by doing the following:
   a. Open the Isoforms template, **isoform.htm**, found in the **HTM templates folder** in a text editor such as *Notepad*.
   b. Under **File** select **Save As**, select the **Isoforms Folder**, and rename the file by the name of the molecule (e.g. arrestin.htm).
   c. Replace *IsoformTemplate* between the title tags in the head section of the code with the name of the molecule plus "Possible Isoforms":
      <title>IsoformTemplate</title>
   d. Go to the Body section of the htm code and find the following line:
      Title
   e. Replace *Title* with the name of the molecule for the isoforms page you are creating.

Fig. 7

8

Figure 3-13. Sample pages from manual.

The "Map Page" section, being the most labor intensive, was further divided into the following subsections: "Main Map", "Secondary Expansion Map", "Tertiary Expansion

Map", "Creating Hotspots/Image Interface", "Automatic Menu Updating", and "Manual Menu Updating". Each subsection was organized as previously described with numbered step-by-step instructions. The first three subsections describe the code modification needed to produce each type of map page. The "Creating Hotspots/Image Interface" subsection provides instructions on creating the map interface using a program, such as Dreamweaver, to produce coordinate-specific links. Appropriate HTML and JavaScript code is provided for the reader to direct links to the Isoforms Window or directly to the "Molecule Pages" or other special pages.

The menu updating subsections describe the steps necessary to update the top menus of all the pages in the "Signaling Maps" website with the new map address and name. Step-by-step instructions are given for two types of web page authors, one for those using a text editor, and one for those using Dreamweaver. Instructions are also given for troubleshooting when pages are originally updated manually with the text editor and then updating is later switched over to automatic updating in Dreamweaver.

The next division of the "Creating a New Map Web Page" is the "Samples of Code" section. This portion of the manual is devoted to providing samples of code from each of the page types. The web page code is divided into subsections by color coding and labels are provided describing the purpose of the code and/or its correlation to the overall page (Figure 3-14). Also provided is a section with some basic HTML tags to assist authors constructing special pages.

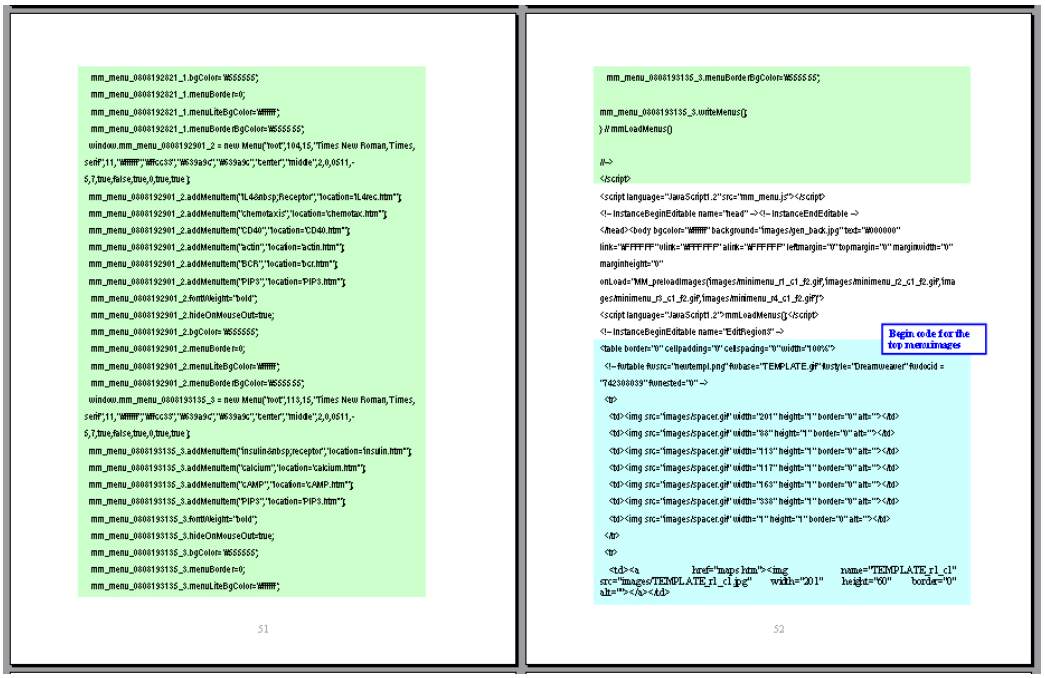


Figure 3-14. Sample manual pages showing web page code.

The final subject in the manual is the "Web Page Data Sheets" section. This section provides a blank "template" form for generating copies to use in organizing new pages, and it also provides an example of a completed data sheet to assist first time users of the form.

Calcium Signaling Animation

Following completion of the manual, I began work on a calcium signaling animation which would be accessed from the chemotaxis map interface and would serve as an example of web-based animation which could be incorporated into the signaling maps interface as an additional visual aid.

Technical information and content on intracellular calcium signaling was provided by Drs. Michael Berridge and Gilberto Sambrano. Upon reviewing the information provided, I developed an animation storyboard describing the events which would occur during the animation. The storyboard included zooms into various phases of the action and allowed for breaking the animation apart into scenes or segments which could then be programmed to play in succession (Figure 3-15). Dr. Berridge and Dr. Sambrano reviewed the storyboard and indicated a desire to show all action simultaneously without action zooms, so that the animation would play along a single continuous timeline. These modifications were therefore made, although the single timeline would introduce difficulties when modifications to the storyboard occurred during production.

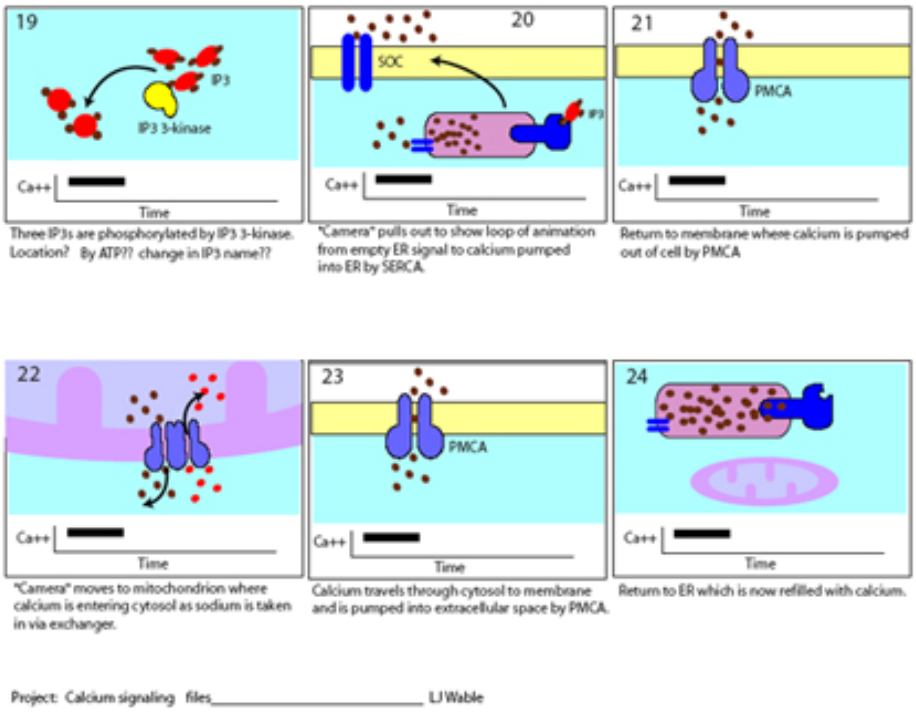


Figure 3-15. Page from original animation storyboard.

After the final storyboard was approved, I began construction of the animated players which included ions, molecules, and various transport structures. I also created the background image which included a close-up of a cell with its membrane, a segment of endoplasmic reticulum, and a mitochondrion. The graphics were all produced in Adobe® Illustrator 9.0 utilizing vector graphics to reduce file size. The drawings were then forwarded to Drs. Sambrano and Berridge for comment, modified as indicated, and finalized for animation production.

The animation was created in Macromedia Flash, a program dedicated to the production of web-based animation. All vector graphics were imported from Illustrator into the Flash library for utilization. The overall movie dimensions were set to 760 x 560 ppi to accommodate small monitors with an 800 x 600 ppi resolution. The frame speed was set at 12 fps; this was later increased to 14 fps when it was decided the animation moved somewhat slowly. The animation was developed by utilizing the "tween" function, wherein the Flash software interpolates the movement, opacity or shape of an object based upon a starting position/state in time and an ending position/state later in time. Utilizing the tween feature required separate layers devoted to each character in the animation. Due to the complexity of the animation and the large number of moving objects, particularly calcium ions, the total number of layers exceeded 180 in number.

As the animation was developed, drafts were continuously sent to Drs. Sambrano and Berridge for comment, and modifications were made as indicated. As the animation became a visual reality, my content advisors recognized shortcomings in the approved storyboard and many modifications were made. Because the animation was on a single timeline where

character interaction was time- and position-dependant, these modifications during production proved to be challenging, as the repositioning of a single object affected all events from that point forward in the timeline.

The animation was frequently tested during development utilizing Flash's bandwidth profiler to determine load time and performance at dial-up modem speed, the low-end internet connection. The animation was ultimately developed to a state deemed adequate as a representative of Flash animation in a web environment for cell signaling application. The animation was optimized and exported into a second Flash animation where it would occupy a single layer. Buttons for pause and play were added to two additional layers to allow viewers more control and the second animation was exported with a final file size of 627 kb. A web page was designed to display the animation, and an associated link was added to the chemotaxis map interface (Figure 3-16). The animation and its associated web page were placed in the "maps" folder and uploaded to the test site.

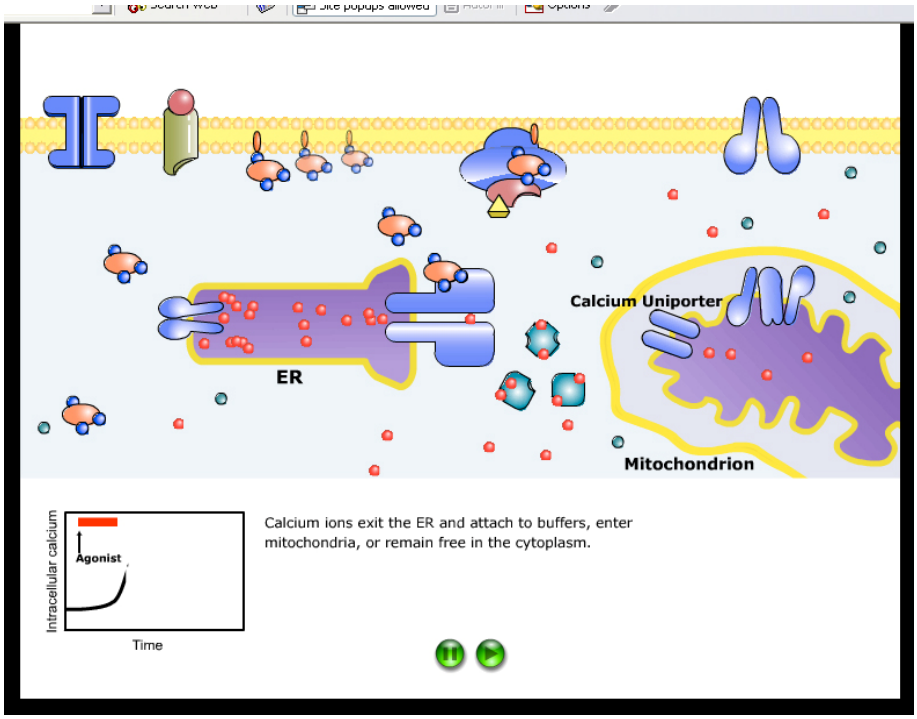


Figure 3-16. Snapshot from calcium animation.

Implementation

The completed web design, sample pages, and manual were reviewed by committee members and a copy of the manual along with a CD containing the website material was sent to Dr. Sambrano at UCSF. Dr. Sambrano presented the material to the programmers of the AfCS site in San Diego. Upon their review and further consideration by Dr. Sambrano, it was decided that although the HTML coding and choice of I-frames was an appropriate solution given the goal of this thesis, Dr. Sambrano would undertake development of the "Signaling Maps" without assistance from other AfCS members and would therefore redesign the programming of the new "Signaling Maps" section utilizing SVG images. The behavior,

look, and function of the new design would be utilized, but the underlying framework (programming) would be changed since concerns about ease of template use by persons with little or no web design experience would no longer be an issue[16]. This decision eliminated the use of the templates provided by this thesis project.

The use of SVG images with associated programming or related approaches such as Flash's SWF format require much higher web design skills than the simple requirements involved in adjusting the templates that were ultimately designed. Such programming would have eliminated assistance by the AfCS community in the expansion of the "Signaling Maps" section of the site and was thus discarded very early as an option.

While the template rejection was somewhat disappointing, the overall design from a user's perspective remained viable, and the AfCS via Dr. Sambrano would pursue reprogramming of the pages while retaining the overall appearance and behavior of the new pages should surveyed members of their organization find the new design desirable.

[16] Information gathered by author during email correspondence from Dr. Sambrano, including forwarded messages from AfCS website staff in San Diego.

DATA COLLECTION

A Review of Project Goal and Objectives

The goal of this thesis, as stated earlier, is to design a website template for the AfCS utilizing static and animated images and a visually-based database interface which can be utilized by key AfCS members to expand the online signaling maps database and serve as an example for other members of the cell signaling community interested in presenting and accessing information related to cell signaling pathways and their operative components.

The objectives of this project include meeting the research needs of the AfCS, developing an htm-based interface and graphics for the template, providing an example of template use, and integrating the new design with the AfCS website.

The major elements to be addressed in this project include ease of use by the viewer, clarity, visual esthetics, functionality, and straightforward reuse of the template for the production of additional maps which will be developed in the future by key AfCS members.

A Deleted Questionnaire

Within the goal of this thesis project was a desire to develop a website template which could be utilized by key AfCS members with little web design experience to expand the online

signaling maps of the AfCS website. This aspect of the goal was to be measured by surveying the actual AfCS members after they used the template to further expand the "Signaling Maps" section of the site. Questions within this survey were to be directed toward the usability of the instruction manual. However, because the template was declined in favor of new programming, there would be no production of pages from the template by AfCS members, and therefore a survey was not performed.

AfCS Membership Questionnaire

The AfCS questionnaire was developed to evaluate the strengths and/or weaknesses of the actual website and interface design of the "Signaling Maps" from a site user's perspective. The survey was designed to provide information about the user's computer and to determine whether the major elements of the thesis goal had been met, including ease of use by the viewer, clarity, visual esthetics, and functionality. Eighteen questions were included plus a section for written comments. The first question determined whether the evaluator was an AfCS member, as only members were to be surveyed. Questions two-five assessed the evaluator's computer. Questions six-eighteen were written as statements with responses ranging from "strongly disagree" to "strongly agree" and were designed to evaluate the aforementioned clarity, visual esthetics, and functionality of the new "Signaling Maps" design.

The survey was reviewed and approved by my thesis committee members. The survey was then adapted for online submission in Dreamweaver utilizing radio buttons for answers and a text area for comments. CGI script was developed to handle the submissions to a designated email address and the survey was then posted online. An online introductory page was developed with links to the old "Signaling Maps" site as well as to the test site, and instructions on what should be reviewed on the test site were included. Sample members of the AfCS were emailed a letter inviting them to participate in the survey and a link was provided to the introductory page (Appendix D).

Evaluation Audience: AfCS Members

The invitation letter was sent to 20 faculty members and researchers within the AfCS from a variety of institutions. Researchers and faculty were given one week to review the old and new (test) sites and were provided a link to the survey for electronic submission.

Evaluation Results

The results of the evaluation were positive overall, with some individual variation, as expected given the diversity of the research-based audience. The raw results were as follows:

Questions

1. Are you an AfCS member?

Yes -9 No -0

2. What type of computer are you using to view these sites?

PC-9 Macintosh-0 Other-0

3. What browser are you using to view these sites?

Internet Explorer <4 -0 Netscape Navigator <5 -0 Don't Know -1 Other -1

Internet Explorer 4 -1 Netscape Navigator 5 -0

Internet Explorer 5 -1 Netscape Navigator 6 -0

Internet Explorer 6 -3 Netscape Navigator 7 -2

4. What size monitor are you using?

12" or less -0 13-16" -3 17-19" -4 20-23" -2 Larger than 23" -0 Don't Know -0

5. What monitor resolution setting are you using?

800x600 -1 1024x768 -3 1152x864 -2 Don't Know -3 Other -0

Statements:

6. The top and side menu layout is efficient and straightforward.

Strongly Agree -2 Agree -6 Neutral Disagree -1 Strongly Disagree -0

7. The Downloads Page is a useful feature which I would utilize once expanded for all the signaling maps.

Strongly Agree -1 Agree -7 Neutral -1 Disagree -0 Strongly Disagree -0

8. The legend provides a concise explanation of the map molecules, edges, and interaction symbols.

Strongly Agree -2 Agree -5 Neutral -2 Disagree -0 Strongly Disagree -0

9. The overall webpage layout is clear and provides efficient use of space.

Strongly Agree -2 Agree -7 Neutral -0 Disagree -0 Strongly Disagree -0

10. I am able to view the map, top and side menu items concurrently.

Strongly Agree -4 Agree -3 Neutral -0 Disagree -2 Strongly Disagree -0

11. The map detail expansions are a useful feature I would like to see utilized in future maps.

Strongly Agree -6 Agree -3 Neutral -0 Disagree -0 Strongly Disagree -0

12. The map interface is a feature which makes better use of the web environment than the previous signaling map images.

Strongly Agree -5 Agree -4 Neutral -0 Disagree -0 Strongly Disagree -0

13. The map interface is simple to use.

Strongly Agree -3 Agree -4 Neutral -2 Disagree -0 Strongly Disagree -0

14. I would like to see more animations of the type represented here (refer to "calcium signaling").

Strongly Agree -5 Agree -3 Neutral -0 Disagree -1 Strongly Disagree -0

15. I would like to see animations such as the one shown here available on the Downloads Page.

Strongly Agree -2 Agree -4 Neutral -3 Disagree -0 Strongly Disagree -0

16. The Signaling Maps is an appropriate location for animations such as the one shown here.

Strongly Agree -2 Agree -6 Neutral -1 Disagree -0 Strongly Disagree -0

17. I find the new Signaling Maps design to be an esthetic improvement over the existing design.

Strongly Agree -2 Agree -5 Neutral -2 Disagree -0 Strongly Disagree -0

18. I would like to see this new Signaling Maps web design further developed and expanded to include more maps with similar interface features, with ultimate implementation on the AfCS site.

Strongly Agree -4 Agree -5 Neutral -0 Disagree -0 Strongly Disagree -0

Additional comments submitted with the survey are shown unedited below with time and date of submission noted, and were as follows:

September 20, 2004 at 15:04:30

well done !!

For the animation- it would be usefull to enable user control on moving to the next stage.

September 17, 2004 at 09:14:47

It would be good to ensure that there are numerous links to these maps from other locations in the AfCS web site.

September 16, 2004 at 18:21:08

Need to explain abbreviations, e.g., in the legends for the animated Ca site.

I could not view all of some pages.

There is a struggle between amount of information and simplicity of diagram. I think its about right in the maps shown. Of course many ineractions are not linear, e.g., the complex formations about scaffolding proteins. Animation may be one way to demonstrate these.

September 13, 2004 at 15:51:37

I found the animation extremely useful in helping me to visualize the process as a continuous and not merely linear phenomenon. As I am looking at it from a different perspective in terms of the knowledge I bring to the table, I may not be the principal audience the pages are aimed at. But If I am at the lower range of the target audience then let me say I felt more engaged in the calcium signalling process with a, fleeting perhaps, understanding of the players and their dependecies that was more substantial than when reading the abstract on the original page and also rather than the chronological listing on the map itself.

September 13, 2004 at 11:07:47

Survey item 6: Side menu worked fine. I disagreed with statement regarding top menu because I had trouble clicking on General and getting pulldown menu to appear so I could get to chemotaxis. But maybe this is because of the next comment:

- I am the lowest denominator of computer users. I tried to figure out how to check/change my monitor resolution but could not follow the "help" directions that I found. I am hopeless.

- I used Netscape but I am not absolutely certain it is version 7.

-Definition of interaction symbols:

- I suggest changing/clarifying the word "control" to either "interaction" or

"regulation" (in phrases such as "positive control", "negative control", and "control not specified". The phrases, positive and negative contols, have their own common usage that I think makes the current definitions less than ideal.

- Download of maps and animation, Text & Reference, Function Narrative: please display Alliance for Cellular Signaling prominantly on each page so that our contribution to the research community is apparent. I think that these will be used extensively and will serve to advertise the AfCS favorably.

- I read only one Function Narrative: the word ezrin is mispelled in the adhesion narrative.

- Calcium Animation is great; looking forward to more animations. Here are comments/suggestions for improvement:

1. The think that the title animation is too slow (and so is the transition from the end of animation to the acknowledgements).

2. The introductory yellow circle with purple blob inside is lost on me so I consider it a waste of of viewer's time. (It should be noted here, that distribution of the email inviting members to participate in the survey, overlapped with the posting of the most current animation draft. This participant viewed the animation draft which contained an introductory special effect involving a zoom-in of a cell, which was removed in the updated draft. No other variation between the older and newer animation existed and this difference was not deemed critical to the spirit of the survey.)

3. Having DAG just fade away without showing PKC interaction is a little

disappointing, but maybe you do not want distractions from calcium arm of pathway...

4. Because there is a vast excess of GTP over GDP in cells, I think it would be better to show GTP hanging around ready to jump on G alpha rather than having it slowly wander in from the margin.

5. G gamma is about a 1/4 of the size of G beta, so I would recommend making one lobe of the G beta/gamma complex smaller.

6. I would prefer to see more protein names remain labeled in the antimation.

Thanks for your efforts

September 10, 2004 at 15:34:51

The animation, like many scientific animations, is conceptionally simplistic, too simplistic for folks who know something about the system. Perhaps good for an introduction at high school/college level.

CHAPTER FOUR
Results

SUMMARY OF SURVEY RESULTS

A review of the responses from survey participants provided the observations which follow. (Also see Appendix D).

All nine evaluators were AfCS members and all were PC users. Five participants were using Internet Explorer, three utilizing version 6, one utilizing version 5, and one utilizing version 4. One person did not know what browser was being used and two were using Netscape Navigator 7, with one of those individuals remarking in the comments section that he was unsure of the Navigator version. Three participants had a monitor size which was in the 13-16" category; all other participants had monitors which where in the 17-19" range or greater. Five individuals had their monitor resolution setting at 1024x768 or greater. Three did not know the monitor resolution setting and one individual had his resolution set at 800x600 and remarked in the comments section that he/she did not know how to adjust the setting for higher resolution.

Eight out of nine participants found the menu layout to be efficient and straightforward; one did not. The individual who responded negatively remarked in the comments section that he experienced difficulty using the pull-down menu in Navigator, that he was uncertain whether he had the current version of the browser, and remarked "I am the

lowest denominator of computer users". Although it is not clear what the difficulty was, this participant was ultimately able to use the menu and view the test site.

Eight of nine evaluators stated that the Downloads page was a useful feature which they would utilize once expanded for all signaling maps; one individual was neutral. Seven individuals agreed that the legend provided a concise explanation of map molecules, edges, and interaction symbols; two were neutral.

All responders agreed that the overall webpage layout was clear and provided efficient use of space.

Seven participants stated that they could view the map, top and side menus concurrently; two disagreed. One of the two who disagreed had the monitor resolution setting of 800x600 ppi and the other had the 13-16" monitor and was uncertain of the monitor resolution setting.

All nine evaluators found the map detail expansions to be a useful feature they would like to see utilized in the future and all nine agreed that the map interface feature made better use of the web environment than the previous signaling map images. Seven responders agreed that the map interface was simple to use and two were neutral.

Responses to the sample Flash animation were variable, but largely positive. Eight evaluators wanted to see more animations of the type represented; one did not. Six wanted to have animations like the one shown available on the Downloads page, three were neutral. Eight agreed that the "Signaling Maps" is an appropriate location for animations such as the one shown and one was neutral. From the comments section of the survey which pertained to the animation, some suggested adding more molecular interactions. One individual suggested

adding a legend for the animation abbreviations. Another evaluator suggested adding more animation navigation controls. Other comments included: “I found the animation extremely useful in helping me to visualize the process as a continuous and not merely linear phenomenon. As I am looking at it from a different perspective in terms of the knowledge I bring to the table, I may not be the principal audience the pages are aimed at. But if I am at the lower range of the target audience then let me say I felt more engaged in the calcium signaling process with a, fleeting perhaps, understanding of the players and their dependencies that was more substantial than when reading the abstract on the original page and also rather than the chronological listing on the map itself.”, “Calcium animation is great; looking forward to more animations”, “I would prefer to see more protein names remain labeled in the animation”, “The animation, like many scientific animations, is conceptionally simplistic, too simplistic for folks who know something about the system. Perhaps good for an introduction at high school/college level”.

Of the nine individuals who responded to the survey, seven agreed that the new “Signaling Maps” design was an esthetic improvement over the existing design; two were neutral.

All nine evaluators agreed that they would like to see the new “Signaling Maps” web design further developed and expanded to include more maps with similar interface features, with ultimate implementation on the AfCS site.

Lastly, six out of the nine responders utilized the comments section of the survey; many provided suggestions. One individual suggested that the AfCS site have numerous links to the signaling maps from other locations on the website. One responder described a

struggle between amount of information and simplicity of diagram and remarked, “I think it’s about right in the maps shown”. Another evaluator suggested modifying some of the language used to describe interaction symbols in the legend. This same individual also requested that the Alliance for Cellular Signaling be displayed prominently on each page “so that our contribution to the research community is apparent. I think that these will be used extensively and will serve to advertise the AfCS favorably” (Figure 4-1).

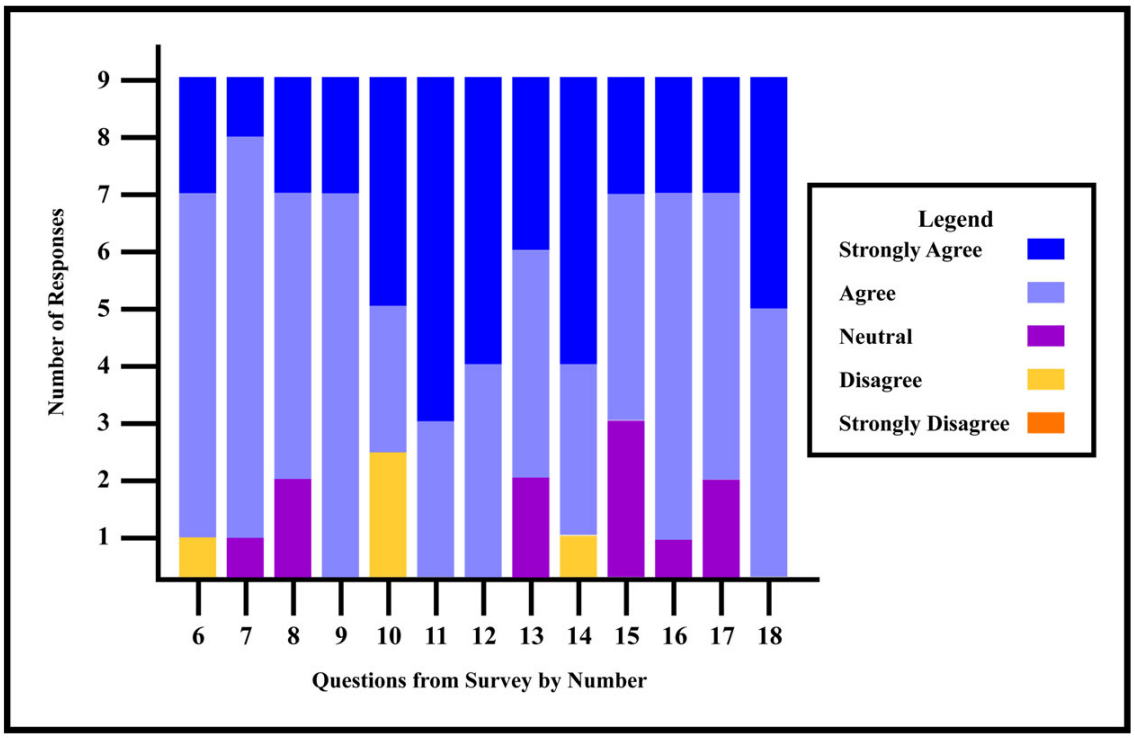


Figure 4-1. Summary of questionnaire responses.

INTERPRETATION OF SURVEY RESULTS

The response to the new "Signaling Maps" design was positive overall. There was no consistently negative feedback from the participants on any topic covered in the questionnaire or topics initiated by the evaluators in the comments section. Of the two individuals who experienced the site at a low resolution, both had adequate monitor size and the option to adjust their computer settings, however some shortcomings on PC usage hindered at least one individual. Providing instructions on this particular task to AfCS members may be of benefit in improving the viewing experience for these persons. Nonetheless, both of these individuals responded favorably to the webpage layout, both agreed the new design was an esthetic improvement, and most importantly, both wanted to see the design implemented on the AfCS site.

Evaluation of the maps themselves with interface and detail expansion features was positive with all responders agreeing the detail expansion feature was useful and that the new maps made better use of the web environment. Two of the nine participants were neutral on the simplicity of interface use, but none elaborated in the comments section, so no conclusion could be made on this point.

The majority of the participants found the new design to be an esthetic improvement over the existing design; however, two had no opinion, possibly indicating a lack of interest on this particular topic.

Opinions related to the animation were variable, but eight of the nine evaluators responded favorably to the animation and wanted to see more on the site. Only one was opposed to this option, relating in the comments section that the animation was too "simplistic" for the audience. The six positive responses to making animations available for download was perhaps due to membership background in research and affiliations with learning institutions where such visual aids can be useful in the classroom or lecture setting.

Based upon the survey results, the new "Signaling Maps" design accomplished all aspects of the thesis goal related to "Signaling Maps" site usage and viewer experience including meeting the needs of the AfCS membership, and providing clarity, functionality, and esthetics.

CHAPTER FIVE
Conclusions and Recommendations

THE PROJECT IN SUMMATION

The goals and objectives of this thesis have been described in this publication. I sought to answer the question: "Can a straightforward website template be developed utilizing static and animated images and a visually-based database interface which will provide a viable environment for the procurement of information related to cell signaling networks and their operative components?"

I set about answering this question by first identifying my audience and their needs, developing my project through research and correspondence with content experts, testing and revising my design, working through various setbacks, and finally posting my completed project online for evaluation by my target audience.

I produced all the website pages necessary to implement a new "Signaling Maps" design for the AfCS. I introduced Dr. Sambrano's pathway map concepts, including map uniformity, consistency, and scalability, to a web environment with favorable evaluation by his peers. I introduced a visual interface for signaling maps that offers map detail expansion and taps into an expansive molecule database, narratives, and animated illustration in a way that has not been demonstrated by other websites containing signaling maps, thus offering the cell signaling community a new way to look at presenting and obtaining information about pathways.

I produced a set of templates to expand the "Signaling Maps" site, tested the template by producing each of the chemotaxis map pages from the template, and I produced a manual with step-by-step instructions on template usage for AfCS members which I also tested by following the manual instructions to develop additional test pages.

I was assisted in the production of my project by software programs such as Macromedia® Flash, Fireworks and Dreamweaver, Microsoft® Word, and Adobe® Illustrator and Photoshop. Both Fireworks and Dreamweaver had several disadvantages, such as an inability to edit tables in Fireworks without erasing post-Fireworks editing, shortcomings in template settings in Dreamweaver including an inability to add pop-up menus to template-produced pages and background image limitations. Flash also introduced certain disadvantages, such as the need to place each "tweened" item on a separate layer, difficult drawing tools, single objects seen by the software as multiple objects requiring grouping, and an inability to adjust frame speed in sections of a timeline, forcing a single setting for publication.

Overall, I found the Adobe products to be more "user friendly" and did not face any limitations with the software I used to produce my webpage graphics and animation characters. One feature I did find very useful in Macromedia® Fireworks was its ability to accept a multilayered graphic from Adobe® Photoshop while maintaining the layers. This allowed me to make further modifications to my webpage design in Fireworks.

Microsoft® Word was used to produce the template instruction manual and was found to be adequate. Difficulties occasionally arose when placing graphics in the document, but these were overcome with trial and error, eventually resulting in a satisfactory outcome.

DISCUSSION

With the exception of the template declination, the results of the project were positive. The overall project was completed over a one and a quarter year period as anticipated. All aspects of project production were completed from creating the framework for the "Signaling Maps" site, to producing the templates with manual and creating web pages from those templates, to producing the sample Flash animation.

Although the final template design and site programming was declined, favoring SVG images over I-frames, my design was appropriate for the individuals that were to be involved in expanding the "Signaling Maps" pages anticipated at the onset of this project: persons with little or no web design experience. My templates required primarily simple copy and paste activities which did not require extensive training in specialized software. This design would have allowed AfCS members to "adopt" signaling map modules in the same spirit that molecule pages are adopted by members of the site for development, providing an opportunity for rapid growth of this section of the AfCS website.

CONCLUSION

In conclusion, the response to the new "Signaling Maps" design by a sample of the AfCS membership was positive, with all evaluators relating a desire to see the design implemented on the AfCS website. All aspects of the project were produced successfully. The pathway map design with interface and expansion features was received positively by evaluators, as was the animation by the majority of participants. The website template was produced and

successfully utilized by the author, as was the instruction manual. Unanticipated, by either the author or Dr.Sambrano, was a change in direction relating to expansion and maintenance of the "Signaling Maps" which occurred at the completion of my efforts. As a consequence of that event, evaluation of the manual in association with template usage by AfCS members was not possible since the template design was declined and no web page expansion would occur.

AREAS FOR FUTURE RESEARCH

Despite the design change decision for the AfCS website, several areas of future research present themselves. One desire that the programmers of the AfCS site and Dr. Sambrano had related to was the use of SVG images to display the map interface and various detail maps. Developing such a navigation system would eliminate the need for isoform pages, as well as separate pages for the detail maps. Future researchers may wish to explore this avenue further, although applying this method to a template for non-web designers is probably not feasible. This approach would also require a special plug-in for user browsers and possibly an alternate site for those viewers without the plug-in.

Another avenue of exploration along these same lines might be the use of Macromedia® Flash and the SWF format. Again, the same limitation in template design would apply.

Given the inability of this author to examine the full effectiveness of the instruction manual and template as it relates to the targeted user, further research in this area would be

indicated to define the best approach to presenting the unfamiliar tasks of template usage to an audience without web design experience.

APPENDIX A
The "Signaling Maps" Website

The website produced during development of this thesis is attached to this document. Items available for viewing include the introductory page with associated links, and the chemotaxis map pages which can be opened from the top menu under "General". To view this site open the folder "maps" and click on "maps.htm"; the introductory page will open in your browser.

APPENDIX B
The "Signaling Maps" Templates

The Dreamweaver and HTML templates are also attached to this thesis. To view these, open any one of the desired files found in either the folder labeled "templates" for Dreamweaver files or "HTMLtemp" for plain text templates in either a text editor or Macromedia Dreamweaver.

APPENDIX C
The "Signaling Maps" Template Instruction Manual

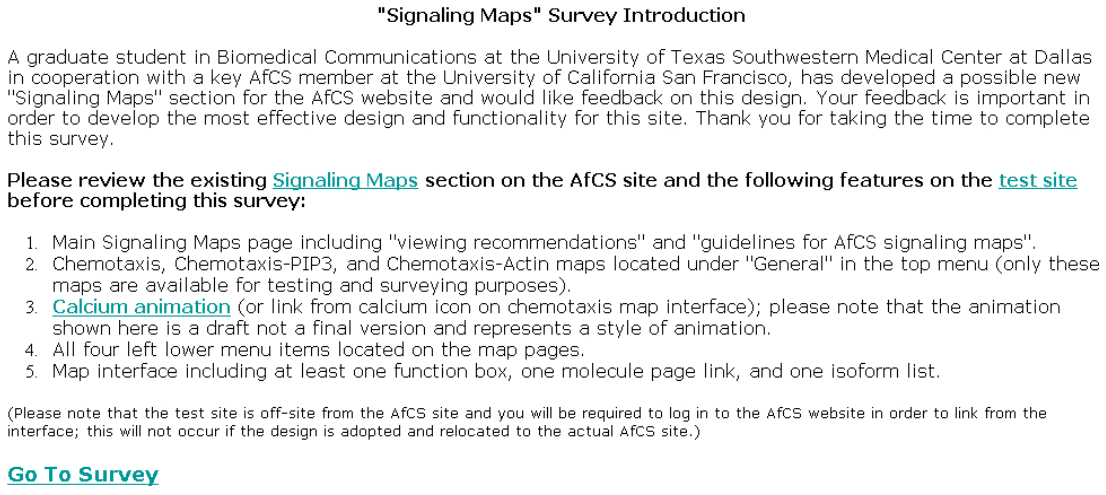
The instruction manual is also attached to this thesis as a PDF file. To view the manual, go to the folder labeled "manual" and click on "manual.pdf". The file will open in Acrobat Reader for viewing.

APPENDIX D
AfCS Membership Survey and Related Documents

The following text is the letter of invitation sent to sample AfCS members to participate in the survey.

> Dear AfCS Member:
>
> A possible new "Signaling Maps" section for the AfCS website has been developed. This site was developed by Lisa Wable, a graduate student in Biomedical Communications at the University of Texas Southwestern Medical Center at Dallas, in cooperation with Gil Sambrano, a key AfCS member at the University of California San Francisco. We are looking for a sample of AfCS members to participate in a survey regarding this site. Member feedback is important in order to develop the most effective design and functionality for this site.
>
> We have provided an introduction page with instructions on reviewing the current "Signaling Maps" and the test site. To participate in this survey click on the following URL or copy and paste it into your browser:
>
> http://ljwable.com/surveyintro.htm
>
> Thank you for your time.

The following image is the introduction page providing instructions for survey participants.



"Signaling Maps" Survey Introduction

A graduate student in Biomedical Communications at the University of Texas Southwestern Medical Center at Dallas in cooperation with a key AfCS member at the University of California San Francisco, has developed a possible new "Signaling Maps" section for the AfCS website and would like feedback on this design. Your feedback is important in order to develop the most effective design and functionality for this site. Thank you for taking the time to complete this survey.

Please review the existing Signaling Maps section on the AfCS site and the following features on the test site before completing this survey:

1. Main Signaling Maps page including "viewing recommendations" and "guidelines for AfCS signaling maps".
2. Chemotaxis, Chemotaxis-PIP3, and Chemotaxis-Actin maps located under "General" in the top menu (only these maps are available for testing and surveying purposes).
3. Calcium animation (or link from calcium icon on chemotaxis map interface); please note that the animation shown here is a draft not a final version and represents a style of animation.
4. All four left lower menu items located on the map pages.
5. Map interface including at least one function box, one molecule page link, and one isoform list.

(Please note that the test site is off-site from the AfCS site and you will be required to log in to the AfCS website in order to link from the interface; this will not occur if the design is adopted and relocated to the actual AfCS site.)

Go To Survey

The following images comprise the survey as it appeared online.

"Signaling Maps" Survey

Questions
Please select the single best answer.

1. Are you an AfCS member?

- ○ Yes
- ○ No

2. What type of computer are you using to view these sites?

- ○ PC
- ○ Macintosh
- ○ Other

3. What browser are you using to view these sites?

- ○ Internet Explorer <4
- ○ Internet Explorer 4
- ○ Internet Explorer 5
- ○ Internet Explorer 6
- ○ Netscape Navigator <5
- ○ Netscape Navigator 5
- ○ Netscape Navigator 6
- ○ Netscape Navigator 7
- ○ Don't Know
- ○ Other

4. What size monitor are you using to view these sites?

- ○ 12" or less
- ○ 13-16"
- ○ 17-19"
- ○ 20-23"
- ○ Larger than 23"
- ○ Don't know

5. What monitor resolution setting are you using?

- ○ 800x600
- ○ 1024x768
- ○ 1152x864
- ○ Don't Know
- ○ Other

Statements
Please select the single best response for each statement.

6. The top and side menu layout is efficient and straightforward.

- ○ Strongly Agree
- ○ Agree
- ○ Neutral
- ○ Disagree
- ○ Strongly Disagree

7. The Downloads Page is a useful feature which I would utilize once expanded for all the signaling maps.

- ○ Strongly Agree
- ○ Agree
- ○ Neutral
- ○ Disagree
- ○ Strongly Disagree

8. The legend provides a concise explanation of the map molecules, edges, and interaction symbols.

- ○ Strongly Agree
- ○ Agree
- ○ Neutral
- ○ Disagree

9. The overall webpage layout is clear and provides efficient use of space.

- ○ Strongly Agree
- ○ Agree
- ○ Neutral
- ○ Disagree
- ○ Strongly Disagree

10. I am able to view the map, top and side menu items concurrently.

- ○ Strongly Agree
- ○ Agree
- ○ Neutral
- ○ Disagree
- ○ Strongly Disagree

11. The map detail expansions are a useful feature I would like to see utilized in future maps.

- ○ Strongly Agree
- ○ Agree
- ○ Neutral
- ○ Disagree
- ○ Strongly Disagree

12. The map interface is a feature which makes better use of the web environment than the previous signaling map images.

- ○ Strongly Agree
- ○ Agree
- ○ Neutral
- ○ Disagree
- ○ Strongly Disagree

13. The map interface is simple to use.

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

14. I would like to see more animations of the type represented here (refer to "calcium signaling").

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

15. I would like to see animations such as the one shown here available on the Downloads Page.

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

16. The Signaling Maps is an appropriate location for animations such as the one shown here.

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

17. I find the new Signaling Maps design to be an esthetic improvement over the existing design.

- ○ Strongly Agree
- ○ Agree
- ○ Neutral
- ○ Disagree
- ○ Strongly Disagree

18. I would like to see this new Signaling Maps web design further developed and expanded to include more maps with similar interface features, with ultimate implementation on the AfCS site.

- ○ Strongly Agree
- ○ Agree
- ○ Neutral
- ○ Disagree
- ○ Strongly Disagree

Comments

Please enter any additional comments you have here.

Submit

Thank You

The following text displays the raw results obtained from survey participants. Two individuals submitted their names; these were omitted for privacy.

Monday, September 20, 2004 at 16:14:42
1group: 1yes
2group: 2PC
3group: 3IntExp4
4group: 4_13to16
5Group: 5_1024x768
6group: 6Agree
7group: 7Agree
8group: 8Agree
9group: 9Agree
10group: 10StronglyAgree
11group: 11StronglyAgree
12group: 12StronglyAgree
13group: 13StronglyAgree
14group: 14StronglyAgree
15group: 15Agree
16group: 16Agree
17group: 17Agree
18group: 18Agree
Submit: Submit

September 20, 2004 at 15:04:30
1group: 1yes
2group: 2PC
3group: 3IntExp6
4group: 4_17to19
5Group: 5_1024x768
6group: 6StronglyAgree
7group: 7Agree
8group: 8StronglyAgree
9group: 9Agree
10group: 10StronglyAgree
11group: 11StronglyAgree
12group: 12StronglyAgree
13group: 13StronglyAgree
14group: 14StronglyAgree
15group: 15Agree
16group: 16Agree
17group: 17Agree
18group: 18StronglyAgree

comments: well done !!

For the animation- it would be usefull to enable
user control on moving to the next stage.
Submit: Submit

September 20, 2004 at 14:50:38
1group: 1yes
2group: 2PC
3group: 3Other
4group: 4_13to16
5Group: 5DontKnow
6group: 6Agree
7group: 7Agree
8group: 8Agree
9group: 9Agree
10group: 10Agree
11group: 11StronglyAgree
12group: 12Agree
13group: 13Agree
14group: 14StronglyAgree
group15: 15StronglyAgree
16group: 16Agree
17group: 17Agree
18group: 18StronglyAgree
Submit: Submit

Friday, September 17, 2004 at 10:05:45
1group: 1yes
2group: 2PC
3group: 3IntExp6
4group: 4_17to19
5Group: 5_1024x768
6group: 6Agree
7group: 7Agree
8group: 8Neutral
9group: 9Agree
10group: 10Agree
11group: 11Agree
12group: 12Agree
13group: 13Agree
14group: 14Agree
15group: 15Agree
16group: 16Agree

17group: 17Neutral
18group: 18Agree
Submit:Submit

Friday, September 17, 2004 at 09:14:47
1group: 1yes
2group: 2PC
3group: 3Don't Know
4group: 4_20to23
5Group: 5_800x600
6group: 6Agree
7group: 7Agree
8group: 8Agree
9group: 9Agree
10group: 10Agree
11group: 11StronglyAgree
12group: 12StronglyAgree
13group: 13Neutral
14group: 14Agree
15group: 15Neutral
16group: 16Agree
17group: 17StronglyAgree
18group: 18Agree
comments: It would be good to ensure that there are numerous links to these maps from other locations in the AfCS web site.
****
Submit:Submit

Thursday, September 16, 2004 at 18:21:08
1group: 1yes
2group: 2PC
3group: 3IntExp5
4group: 4_13to16
5Group: 5DontKnow
6group: 6Agree
7group: 7Agree
8group: 8Neutral
9group: 9Agree
10group: 10Disagree
11group: 11Agree
12group: 12Agree
13group: 13Neutral
14group: 14Agree
15group: 15Neutral

16group: 16StronglyAgree
17group: 17Agree
18group: 18Agree
comments: Need to explain abbreviations, e.g., in the legends for the animated Ca site.

I could not view all of some pages.

There is a struggle between amount of information and simplicity of diagram. I think its about right in the maps shown. Of course many ineractions are not linear, e.g., the complex formations about scaffolding proteins. Animation may be one way to demonstrate these.
Submit:Submit

Monday, September 13, 2004 at 15:51:37
1group: 1yes
2group: 2PC
3group: 3NetNav7
4group: 4_20to23
5Group: 5_1152x864
6group: 6Agree
7group: 7Neutral
8group: 8Agree
9group: 9StronglyAgree
10group: 10StronglyAgree
11group: 11Agree
12group: 12Agree
13group: 13Agree
14group: 14StronglyAgree
15group: 15Agree
16group: 16Agree
17group: 17StronglyAgree
18group: 18Agree
comments: I found the animation extremely useful in helping me to visualize the process as a continuous and not merely linear phenomenon. As I am looking at it from a different perspective in terms of the knowledge I bring to the table, I may not be the principal audience the pages are aimed at. But If I am at the lower range of the target audience then let me say I felt more engaged in the calcium signalling process with a, fleeting perhaps, understanding of the players and their dependecies that was more substantial than when reading the abstract on the original page and also rather than the chronological listing on the map itself.
Submit:Submit

Monday, September 13, 2004 at 11:07:47
1group: 1yes
2group: 2PC
3group: 3NetNav7
4group: 4_17to19
5Group: 5DontKnow
6group: 6Disagree
7group: 7StronglyAgree
8group: 8Agree
9group: 9Agree
10group: 10Disagree
11group: 11StronglyAgree
12group: 12StronglyAgree
13group: 13Agree
14group: 14StronglyAgree
group15: 15StronglyAgree
16group: 16StronglyAgree
17group: 17Neutral
18group: 18StronglyAgree
comments: - Survey item 6: Side menu worked fine. I disagreed with statement regarding top menu because I had trouble clicking on General and getting pulldown menu to appear so I could get to chemotaxis. But maybe this is because of the next comment:
- I am the lowest denominator of computer users. I tried to figure out how to check/change my monitor resolution but could not follow the "help" directions that I found. I am hopeless.
- I used Netscape but I am not absolutely certain it is version 7.
-Definition of interaction symbols:
- I suggest changing/clarifying the word "control" to either "interaction" or "regulation" (in phrases such as "positive control", "negative control", and "control not specified". The phrases, positive and negative contols, have their own common usage that I think makes the current definitions less than ideal.
- Download of maps and animation, Text & Reference, Function Narrative: please display Alliance for Cellular Signaling prominantly on each page so that our contribution to the research community is apparent. I think that these will be used extensively and will serve to advertise the AfCS favorably.
- I read only one Function Narrative: the word ezrin is mispelled in the adhesion narrative.
- Calcium Animation is great; looking forward to more animations. Here are comments/suggestions for improvement:
1. The think that the title animation is too slow (and so is the transition from the end of animation to the acknowledgements).
2. The introductory yellow circle with purple blob inside is lost on me so I consider it a waste of of viewer's time.

3. Having DAG just fade away without showing PKC interaction is a little disappointing, but maybe you do not want distractions from calcium arm of pathway...
4. Because there is a vast excess of GTP over GDP in cells, I think it would be better to show GTP hanging around ready to jump on G alpha rather than having it slowly wander in from the margin.
5. G gamma is about a 1/4 of the size of G beta, so I would recommend making one lobe of the G beta/gamma complex smaller.
6. I would prefer to see more protein names remain labeled in the antimation.
Thanks for your efforts, *******
Submit:Submit

Friday, September 10, 2004 at 15:34:51
1group: 1yes
2group: 2PC
3group: 3IntExp6
4group: 4_17to19
5Group: 5_1152x864
6group: 6StronglyAgree
7group: 7Agree
8group: 8StronglyAgree
9group: 9StronglyAgree
10group: 10StronglyAgree
11group: 11StronglyAgree
12group: 12StronglyAgree
13group: 13StronglyAgree
14group: 14Disagree
15group: 15Neutral
16group: 16Neutral
17group: 17Agree
18group: 18StronglyAgree
comments: The animation, like many scientific animations, is conceptionally simplistic, too simplistic for folks who know something about the system. Perhaps good for an introduction at high school/college level.
Submit:Submit

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VITAE

Lisa Jo Wable was born in Madison, Wisconsin, on November 30, 1963, the daughter of Mary Lou Wable and George E. Wable. After completing her work at Notre Dame High School, Salinas, California in 1981, she entered California State University, Stanislaus in Turlock, California. She received the degree of Bachelor of Science with a major in biological sciences from California State University, Stanislaus in May, 1985. During the following two years she was employed as a research/greenhouse technician, Hollister and Gilroy, California. In January, 1988 she entered the Palmer College of Chiropractic-West, Santa Clara, California. She received the degree of Doctor of Chiropractic from Palmer College of Chiropractic-West in March, 1991. Upon successful completion of the California Chiropractic State Board exams, she received her chiropractic license and entered private practice. In 1995 she authored a comprehensive chiropractic assistant course for schools in California and Arizona and worked as a post-secondary instructor until 1996, Santa Clara, California. In 1998 she relocated to Mesquite, Texas and began art courses in 1999 within the Dallas Community College District and expanded her art portfolio. In May, 2002, she entered the Graduate School of Biomedical Sciences at the University of Texas Health Science Center at Dallas. She was awarded the degree of Master of Arts in Biomedical Communications in December, 2004. Since that time she has been self-employed as a biomedical illustrator, Mesquite, Texas.

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