

Sophic's SCan-Mark Explorer™ Overview

"An Integrated Knowledge Environment to Support Modern Oncology"¹

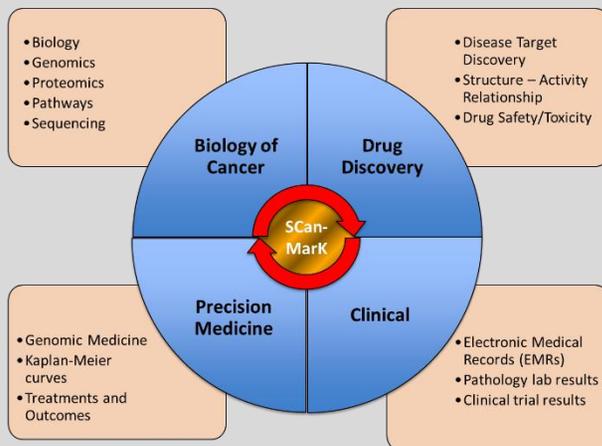
SCan-Mark Explorer™ is a project-centric, integrated knowledge environment that supports collaborative cancer research, drug discovery and the development of precision medicine. Sophic's goal is to:

- Accelerate scientific discoveries
- Find new diagnostics and drug therapies
- Improve diagnoses, treatments and patient outcomes.

During a 3-year, NCI SBIR-funded project, Sophic scientists collaborated with a scientific advisory board that included expert NGS researchers from academic and government labs, seasoned clinicians treating patients at hospitals, and scientists developing and testing new drugs. The SAB team provided Sophic scientists with ongoing input and guidance on developing a scientifically sound system that would help find solutions to real-world research and clinical patient care challenges.

SCan-Mark's knowledgebase includes a cancer biomarker database, mined and manually curated by Sophic PhDs from full text clinical papers, that provides over 30 critical data elements for well-studied breast, ovarian, colorectal, non-Hodgkin's lymphoma and melanoma biomarker targets. These promising biomarkers, Sophic Cancer Biomarker Objects (SCBOs), are integrated into a knowledgebase that includes well-known, FDA-approved individual biomarkers and panels of biomarkers.

The SCan-Mark Explorer "knowledge environment" provides both researchers and clinicians with quick access to valuable information intended to accelerate research and support clinical decisions.



Research – The Biology of Cancer

Scientists can accelerate their research by using the SCan-Mark knowledgebase to explore the underlying pathways and mechanisms that are the root cause of the cancer. Integrated pathway databases and annotated biological entities can be used to convert data, such as next-generation sequencing data, to knowledge about cancer biology. Data from clinical samples, model organisms, and cell lines can be combined into the knowledgebase and explored for novel mechanisms and targets for intervention.

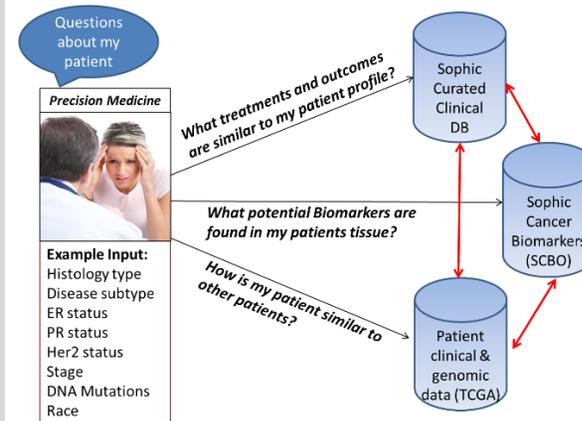
New Drugs and Therapies

The SCan-Mark platform can integrate and mine information from sources of chemical, biochemical, *in vitro*, and *in vivo* data to create a holistic view of the drug development process. By integrating information about early stage drug development with genomic alterations and late stage pre-clinical and clinical data, including data from biosimilars, potential successes and failures can be identified earlier.

Clinical Integration

To reach the goal of precision medicine, information from clinical and experimental laboratories needs to be integrated to allow the analysis of mechanistic and correlative outcome prediction². The SCan-Mark platform was developed to handle "big data" from "omics" experiments, as well as integrate the results with clinical data. As a collaborative platform, SCan-Mark integrates the data from sources within an organization, as well as around the world, into a single knowledge environment.

Precision Medicine brings "omics" to Oncologists



One of the biggest challenges in precision and personalized medicine is to bring the newest knowledge being generated in the clinical research, genomics, proteomics, and metabolomics realms into the hands of the oncologist. Using a patient-centric model, new patients can be compared to similar patients, and most relevant and potentially actionable outcome data can be delivered to the oncologist in a succinct, easy-to-understand format.

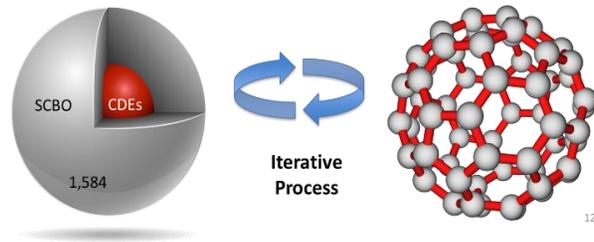
¹ Toward an Integrated Knowledge Environment to Support Modern Oncology" Blake, et al, The Cancer Journal, July 2011

² Suh, et al., "Tissue Banking, Bioinformatics, and Electronic Medical Records: The Front-End Requirements for Personalized Medicine," Journal of Oncology, vol. 2013, Article ID 368751, 12 pages, 2013

Sophic Cancer Biomarker Objects - SCBOs

A **SCBO** is a biomarker target supported by detailed experimental results from full text papers. **SCBOs** can include differentially expressed mRNAs or Proteins, Gene mutations, Mutant proteins, miRNAs, or any other measured feature that shows biomarker activity.

SCBOs have up to 33 **Critical Data Elements (CDEs)** mined and manually curated from full text papers or information from high quality data sources such as clinical trials. A scientist's query assembles **SCBOs** and **CDEs** into knowledge maps that can be displayed by the system.



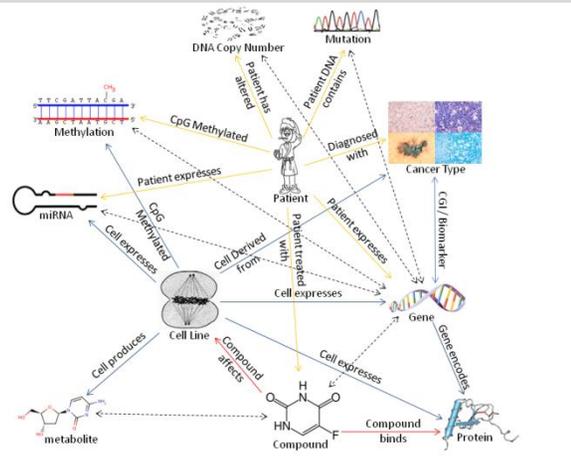
The world of biomarker research has expanded in recent years with potential biomarkers coming from both clinical and basic research laboratories. An Integrated Knowledge Environment requires a primary or central object to be used to integrate research and clinical information. To this end Sophic developed the Sophic Cancer Biomarker Object (SCBO) described above. SCBOs can be used as the key to connecting validated scientific relationships between research and clinical data. This central information hub acts as a transit point for the flow of structured data derived at the bench (i.e. next-generation sequencing, immunohistochemistry, and expression microarrays) and clinical information derived from the clinic (i.e. patient diagnoses, biomaterial test results, treatments, therapies and patient outcomes). SCan-MarK provides a continuous bi-directional exchange of information, exposing new, valid, scientific and semantic relationships. This “learning process” is the key to delivering an integrated knowledge environment to support modern oncology research and clinical patient care.

Integrated Enrichment Data Sources

Scientific information viewed in isolation is rarely as enlightening as information viewed in a network of valid, scientific or semantic relationships. Visualization of “knowledge networks” provides a broad, connected view of complex scientific and research maps. SCan-MarK uses SCBOs as anchors for connecting related information found in over 27 enrichment databases and provides scientists access to any number of research databases which can be expanded quickly and easily.

Flexible, User-Defined Data Model

SCan-MarK is delivered with an integrated oncology data model that provides users with easy access to clinical and genomic enrichment databases. This model allows end-users to search and discovery new knowledge, beginning day one. The flexibility of the data model allows rapid integration of new data sources and maximizes the value of the data by instantly making the new knowledge available for search and discovery across an organization.



Conceptual Data Model of the SCan-MarK system showing connections between the scientific concepts necessary for an integrated knowledge environment.

Project-Centric, Collaborative Knowledge Environment

The globalization of research and medicine has increased the necessity to collaborate, combining data and experience from different locations. The SCan-MarK configuration allows this collaboration to occur by allowing users and data to be assigned to projects. User access levels can be assigned relative to the projects, thereby protecting sensitive data, including HIPAA-regulated patient data, from unauthorized access.



Contact Sophic for more information on SCan-MarK Explorer

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