出國報告（出國類別：會議）

104 年度國際健康產業園區布局規劃美國訪問團

服務機關：衛生福利部醫事司

姓名職稱：林奏延次長、王宗曦司長、張禹斌科長

派赴國家：美國

出國期間：104 年 11 月 30 日至 12 月 07 日

報告日期：104 年 12 月 10 日

行政院及所屬各機關出國報告提要

報告名稱：104 年度「國際健康產業園區布局規劃」案美國考察團

出國計畫主辦機關：衛生福利部醫事司

出 國 人：林奏延次長、王宗曦司長、張禹斌科長

出國類別：考察

出國期間：104 年 11 月 30 日至 104 年 12 月 07 日

出國地區：美國

報告日期：104 年 12 月 10 日

內容摘要：

本考察係衛生福利部為配合國家發展政策與自由經濟示範區推動方向，進行國際健康產業布局規劃，以提升臺灣整體醫療產業的發展，並進一步帶動臺灣醫療服務高附加價值化，擬向國外介紹臺灣國際健康產業布局規劃目標，同時吸引國外醫療機構與醫療相關產業業者來臺並與臺灣醫療機構或健康產業業者進行合作人才交流、技術、投資或通路等合作契機。

今年 11 月 30 日至 12 月 7 日規劃前往美國西岸參訪 3 城市，西雅圖、聖地牙哥及舊金山，衛生福利部由林奏延次長率團，王宗曦司長及張禹斌科長陪同出席，透過考察美國西岸健康產業發展現況，從其產業發展與相關政策推展經驗作為國際健康產業布局規劃方向的參考；另外也透過參訪相關製藥、醫材業者、研究機構及醫院，藉以發掘與進一步和台灣醫院、業者合作的可能性。

本考察實際參訪 6 家醫院及醫療機構、3 家研究機構及 2 家健康產業企業，並於西雅圖及舊金山分別舉辦招商說明會。由於美國於醫藥品、醫療器材、醫療服務或各種生醫技術研究等領域皆走在全球最尖端，此三城市擁有高素質人力、世界級的研究機構與生醫產業聚落，醫院與產業、研究機構間彼此鏈結合作。

因此本考察除學習先端研究技術、醫療經營 know-how 與瞭解當地生醫產業間如何進行價值鏈結或國際合作外，也針對台灣與美國雙邊醫院、企業間合作之可能性進行探討。且透過面訪與面對面招商說明會之洽談方式，更能直接深入瞭解產業鏈中每個角色，對於與台灣業者間之合作需求與期待，以有效促進未來雙方企業得以合作之目標。

報告大綱

表目錄

圖目錄

壹、 目的

一、 緣起

因應亞太區域經貿加速整合之挑戰，創造我國經濟成長及產業轉型之新動能，配合國家發展政策之推動方向，健康產業已成為台灣政府未來重點發展的產業之一。為協助國內健康產業得具備與國際競爭之產業基礎，與其他國家間之合作及合作模式之建立將是重要關鍵。

本考察係衛生福利部為配合國家發展政策與自由經濟示範區推動方向，進行國際健康產業布局規劃，以提升臺灣整體醫療產業的發展，並進一步帶動臺灣醫療服務高附加價值化，擬向國外介紹國際健康產業布局規劃目標，同時吸引國外醫療機構與醫療相關產業業者來臺並與臺灣醫療機構或健康產業業者進行合作人才交流、技術、投資或通路等合作契機。

美國為全球醫療最大市場與最先端技術發源地，整體醫療水準發達，為全球都想學習之楷模。其在國際生醫市場的競爭優勢主要是由於在研發領域的投入高於各國，而其中帶動產業發展的主要政府機構為美國國立衛生研究院(National Institutes of Health，NIH)，該機構除資助研究院和所屬的實驗室外，80%資金是投入於大學和非營利性的研究機構，是鼓勵將實驗室中的新科技轉移到私有公司或商品化的關鍵。

衛生福利部於 2014 年曾考察美國東岸及中部地區，醫療、生技發展較具特色的三個州(Minnesota、North Carolina 及 Massachusetts)，拜訪生技產業園區 Research Triangle Park，全美排名第一及第二的 Mayo Clinic 與 Massachusetts General Hospital，以及數家全球知名研究機構和生醫企業，瞭解其發展過程及成功契機，做為形成健康產業聚落的借鏡。今年則主要考察美國西岸各城市中，擁有高素質人力、世界級研究機

構，以及新創生醫產業蓬勃發展的三大城市 Seattle、San Diego 與 San Francisco，進行國際健康產業鏈的媒合與布局規劃。爰此，本次美國三城市之參訪，除了瞭解醫療機構、新創生醫產業與世界級研究機構的發展與彼此鏈結情形外，另一重點即為找出台灣與美國可能合作之模式，為台灣的健康產業鏈找尋未來利基市場。

二、 參訪重點摘要

本次美國參訪團總共參訪 11 處不同之健康產業業者與機構，其中醫療服務業者部份共參訪 5 家教學研究醫院，及 1 家眼庫，其中包含 1 家燒燙傷中心、2 家兒童專門醫院；在生技製藥與醫材業者參訪方面，共參訪 1 生技研究業者，及 1 家生技製藥業者；在研究機構部分，共參訪 3 家科學研究機構。

三、 參訪目的

(一)了解美國製藥與醫材廠商對於投資台灣之興趣、以及找尋台灣本土合作伙伴時包含資金、技術能力…等之評估條件。

(二)了解美國製藥與醫材廠商目前經營海外市場之現況及與海外廠商之合作模式。

(三)了解美國製藥與醫材廠商與研發機構最新之產品研發狀況，從中尋找適合台灣廠商參與之製程環節與產品。

(四)了解美國業者/機構產品或制度可導入台灣或供作為台灣政府政策參考之可能性。

貳、 行程表

下表為本次整體行程概要。

表 1　美國參訪團整體行程概要

天數／日期	行程概要
第一天 11 月 30 日	下午：18:10 抵達西雅圖
第二天 12 月 1 日	上午：參訪 University of Washington Medicine 及 Harborview Medical Center
	下午：參訪 Adaptive Biotechnologies 及 Institute for Systems Biology
第三天 12 月 2 日	上午:參訪 SightLife 及 Fred Hutchinson Cancer Research Center
	下午：於 Hilton Garden Inn Seattle Downtown 舉辦說明會
第四天 12 月 3 日	上午：參訪 Seattle Children’s Hospital
	下午：移動至聖地牙哥
第五天 12 月 4 日	上午：參訪 The Scripps Research Institute
	下午：參訪 Salk Institute
第六天 12 月 5 日	移動至舊金山
第七天 12 月 6 日	上午：UCSF School of Medicine (校園參觀)
	下午：University of San Francisco (校園參觀)
第八天 12 月 7 日	上午：參訪 Five Prime Therapeutics 及 Uinversity of California San Francisco Medical Center
	下午：於 Hilton San Francisco Union Square 舉辦說明會，晚間由舊金山搭機返台，抵台時間為 12/9 早上 05:15

參、 內容說明

一、 參訪機構及參訪流程說明

參訪機構共有 5 家教學研究醫院、1 家眼庫、3 家研究機構與 2 家健康產業企業、其名稱詳下表所示：

表 2　參訪機構名單彙整

醫院及醫療機構	University of Washington Medicine & Harborview Medical Center
	Sight Life
	Fred Hutchinson Cancer Research Center
	Seattle Children's Hospital
	University of California San Francisco Medical Center
機構	Institute for Systems Biology
	The Scripps Research Institute
	Salk Institute
企業	Adaptive Biotechnologies Corporation
	Five Prime Therapeutics Inc.

參訪執行重點，針對企業與機構的重點，在於瞭解該參訪對象的產品研發狀況、及對台灣國際健康產業進行合作交流的意向，以及是否有適合導入台灣的產品與制度；而在醫院方面，則著重於對方醫院之設施設備、以及營運管理方式之觀摩。

在企業與機構參訪的流程上，首先由訪問對象以簡報方式，說明其技術或產品內容，以及其在海外或在台灣事業的拓展現況與未來方向，再由衛生福利部介紹台灣國際健康產業的發展概況、以及可能之產業合作模式，並於雙方初步掌握彼此狀況後，互相提問以促進雙方更進一步之瞭解。透過此種直接進行意見交流之方式，不僅可使衛福部更瞭解美國業者對於與

台灣企業進行合作之意願與實際需求條件，更進一步可作為未來台灣國際健康產業布局規劃政策的研擬方向。

表 3　參訪行程執行方式

當日流程
1.雙方介紹及交換名片
2.參訪對象簡介業務內容
3.衛生福利部說明台灣健康產業發展現況與未來規劃布局
4.雙方針對與台灣健康產業譯者合作可能性進行意見交流
5.贈送禮品及紀念照片拍攝
6.企業/機構參訪

二、 醫療機構參訪

本次美國參訪共拜訪五家教學研究醫院與一家眼庫，依據參訪時間順序分別為University of Washington Medicine & Harborview Medical Center、SightLife、Fred Hutchinson Cancer Research Center、Seattle Children’s Hospital 及 UCSF Medical Center。以下就五間醫療機構之背景與參訪結果要點分別進行介紹。

(一)University of Washington Medicine & Harborview Medical Center

1.背景概要

華盛頓州立大學醫學院(University of Washington School of Medicine)創立於 1946 年，是當時西北各州唯一的醫學院，隨著醫學院發展，當地醫院已不能滿足臨床教學的需求。1951 年，華盛頓州議會批准

建立醫學院的附屬醫院。此後，在醫學院院長 George Aagaard(1914-1997)的大力推動下，醫院建設得以順利進行。1959 年 5 月 4 日，華盛頓大學醫院(UW Medicine)正式開業。

根據 2015U.S. News & World Report，UW Medicine 為全美第一的醫學院，其醫學院及醫院研究單位在蛋白質組學及結構基因組學具有領導地位，醫學院和工程學院曾獲得美國國立衛生研究院(NIH)首次頒發三個基因組學研究獎項中的兩個獎項。2013 年獲得 NIH 超過 10 億元美金研究資金，為全美排名第二僅次於 Harvard，許多已經成立和處於起步階段的生物技術公司都起源於華盛頓大學醫學院的研究。

在全美醫院排名中，UW Medicine 有 3 個專業領域排名全美前十，分別為復健科(第四名)、癌症(第七名)、糖尿病和內分泌科(第八名)。UW Medicine 擁有 4 個醫學中心、專門提供急救運輸服務的西北空運(Airlift Northwest)，以及與 9 個鄰近的診所形成網絡，提供初級和次級醫療服務，同時為福瑞德哈金森腫瘤研究中心(Fred Hutchinson Cancer Research Center)和西雅圖兒童醫院(Seattle Children’s)的合作夥伴。

4 個醫學中心分別為華盛頓大學醫學中心(University of Washington Medical Center)、港景醫學中心(Harborview Medical Center, HMC)、西北醫院醫學中心(Northwest Hospital & Medical Center)以及山谷醫學中心(Valley Medical Center)，此次參訪的 HMC 是世界知名、且為西北四個州(華盛頓州、蒙大拿州、愛達荷州及阿拉斯加州)最大的第一級成人及兒童創傷及燒傷醫學中心。HMC 員工 4,500 人，共有 413 張病床，其中四分之一為加護病房床位。2014 年共有 17,000 名住院病患、64,500 名急診病患，以及 247,350 名門診病患。HMC 為領先採用早期移除燒燙傷組

織的醫院之一，亦為第一個試驗以暫時性人工皮膚移植治療燒燙傷患的主要醫學機構。

圖 1　Harborview Medical Center 外觀

資料來源：網路公開資料

2.參訪概要

本次參訪 UW Medicine 主要意見交流對象為華盛頓大學醫學系研究所副所長 Dr. John T. Slattery、臨時執行總監 Mr. Geoff Austin、行政營運總監 Ms. Cynthia Dold，以及國際發展部主任 Dr. Jody Li 就 UW Medicine 的營運模式以及與外界的合作關係與我方交流；而 Harborview Medical Center 則是由病患關係主任 Ms. Tracy Gooding 為主要接待，臨床主任 Ms. Anne Newcombe 介紹並帶領參觀急診病房與相關系統制度、燒燙傷中心主任 Dr. Nicole Gibran 則介紹及帶領參觀傷燙傷中心病房以及提相關系統制度。

Dr. Slattery 表示 UW Medicine 為以華盛頓大學醫學系及其附屬醫院、Harborview Medical Center、Valley Medical Center、西北空中救護車、

UW Neighborhood Clinic、Northwest Hospital & Medical Center、UW Physicians 等八個機構組成的聯盟，管理單位為華盛頓大學醫院。由於此八個機構互有專門科目，彼此之間以 u-link 系統共享病患醫療紀錄，有效提升病人於不同院區內就診時接受準確治療的效率。而國際發展部主任 Dr. Li 亦表達，目前 UW Medicine 正積極拓展海外觸角，協助開發中國家建立醫療照顧的機構，同時也與中國的疾病管制中心有國際轉診的合作關係。

UW Medicine 的研究單位主要為華盛頓大學醫學系，雖然憑藉其聯盟內醫院之間有豐富臨床試驗資源，然而在與外界的研究合作上，仍然是由實驗室個別發展及尋求資金，並無一主導單位。而目前華盛頓大學醫學系與長庚醫學系研究所有學術研究合作，但目前仍無互相交換或外派學生的實例。

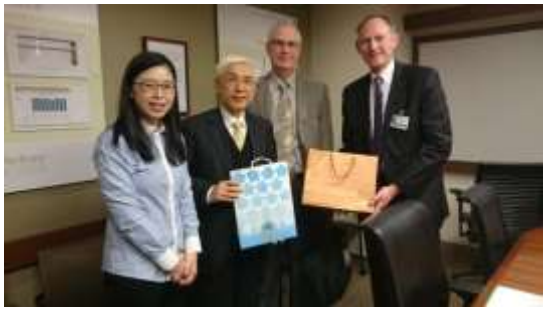
Ms. Newcombe 解說 Harborview Medical Center(HMC)為美國西北區域(華盛頓州、蒙大拿州、愛達荷州及阿拉斯加州)最大的第一級成人及兒童創傷及燒燙傷醫學中心，雖共有 411 張床，但由於服務全西北區域，每年急診病患有超過 6 萬 5 千人次，目前此醫學中心特過更嚴格的篩檢降低住院病患的數量。院區內急診及創傷中心共有 51 間診間，其中有 5 間專門為疾病及藥品相關之診間，包含傳染病的單獨隔離(獨立出入口)診間。

HMC 的急診(包含燒燙傷)的現場應變處理分為三層級，第一層級為消防單位，當消防單位到現場第一步評估病患傷勢後，將試病患受傷狀況回報；第二層級為救護車，運送傷勢較輕的病患至 HMC 接受治療；第三層級為急救人員，若病患傷勢較為嚴重，則救護車會配有急救人員至現場提供緊急照顧。此制度的引入有效降低資源浪費，同時也提高急救服務的品質。而

HMC 內駐有兩組消防小隊，HMC 負責訓練消防隊的醫療知識，而消防隊也提供護理人員相關燒燙傷知識訓練。

UW Medical Center 及 HMC 兩者皆服務面積達全美 25%、但人口卻不到全美 5%的西北部地區，為了減少病人長途奔波並提升非都市地區的醫療服務品質，UW Medicine 本其使所有人都能獲得良好醫療服務的使命，建立了一套遠距醫療系統，讓各地的醫生能夠透過此網路平台，在線上諮詢各領域之專家，透過遠距會診的方式，提供給非都市區域病患更高的醫療服務水準。此系統同時也提供護理熱線，以同樣的平台提供護理及分創諮詢。

表 4 UW Medicine & Harborview Medical Center 參訪情形

 衛福部林次長奏延與王司長宗曦與 UW Medicine 研究所副所長 Dr. John T. Slattery 交換名片	 UW Medicine 方報告業務內容並與及衛生福利部、台灣野村進行意見交流
 衛福部林次長奏延、王司長宗曦與 UW Medicine 的 Dr. Slattery 及 Interim Executive Director Mr. Geoff Austin 交換禮物	 衛福部林次長奏延與 Harborview Medical Center 病患關係總監 Ms. Tracy Gooding 交換名片

<table>
<tr>
<td> 
Harborview Medical Center 核磁共振診間一隅</td>
<td> 
Harborview Medical Center 臨床總監 Ms. Anne Newcombe 向衛福部解說急診室診間標誌系統</td>
</tr>
<tr>
<td> 
Harborview Medical Center 燒燙傷主治醫師 Dr. Nicole Gibran 與衛福部意見交流</td>
<td> 
衛福部林次長奏延與 Dr. Gibran 交換禮物</td>
</tr>
</table>

(二)SightLife

1.背景概要

SightLife 於 1969 年由太平洋西北區國際獅子會創辦，是美國眼庫聯盟(Eye Bank Association of America)及國際防盲協會(International Agency for the Prevention of Blindness)的會員之一，為美國唯一致力於消除受損眼角膜導致的失明之全球非營利組織，SightLife 和捐贈者家庭會建立緊密關係提供關懷(捐贈者家庭滿意度 95%)，而需要眼角膜的患者可以透過線上的預定，就會由 SightLife 進行媒合及提供全程協助，平均每天協助超過 50 名成人/兒童移植眼角膜，2014 年共協助 29 個國家共 17,000 個眼角膜移植。除眼角膜移植手術媒合外，其同時在全球 25 個

國家擁有合作夥伴，包含 15 個在地眼庫(位於印度、尼泊爾、巴拉圭、衣索比亞)及數百名眼角膜手術外科醫生，提供醫療器材、手術訓練課程及各種資源，2014 年起共培訓 38 名外科醫生。

圖 2　SightLife 合作夥伴

(順時針為捐贈家庭、醫院、移植器官組織/銀行、殯儀館、法醫/驗屍官)

資料來源：網路公開資料

2.參訪摘要

本次參訪主要對象為 SightLife 營運長 Mr. Bernie Iliakis 及全球事業部長 Ms. Claire Bonilla，進行 SightLife 的運作模式解說以及雙方合作方式做意見交流。

營運長 Mr. Iliakis 首先帶領我方參觀 SightLife 總部並解說 SightLiufe 沿革與目前營運模式：SightLife 原身為美國獅子會眼庫，於 1960 年代間創立，發展迄今每年進行近 1 萬個眼角膜移植手術，大部分

在合作的國外開發中國家。SightLife 除了眼角膜採集、保存、及移植外，亦提供合作夥伴相關技術的訓練，及輔助成立該地區眼庫相關之財務模型分析、眼庫的流程規劃及藍圖設計等等。

SightLife 成功及迅速的擴展主因為美國相關法規制度：(1)醫院在病人過世之後必須立即通報器官庫、眼庫及組織庫，(2)更新駕照時詢問捐贈器官之意願，提升器官捐贈率，並有效鏈結捐贈同意書紀錄於國家醫療系統中。

全球事業部長 Ms. Bonilla 則解說目前 SightLige 正著手規畫進行與亞洲八國合作的前導計畫：此計畫將建立一網路系統平台，將 SightLife 處理眼角膜的作業流程、眼庫動線設計、國際眼庫認證等相關資訊公布於此平台，以利亞洲八國建立或強化其眼庫，期望於 2016 年底開始實行。評估台灣眼科手術技術、保存眼角膜的能力、健保 IC 卡完整醫療資訊紀錄等，具有成熟國際級眼庫的能力，Ms. Bonilla 表達希望將台灣納入 SightLife 於亞洲八國合作前導計畫一員的強烈意願。

除此之外，Ms. Bonilla 也提及目前 SightLife 與台灣眼庫的合作模式尚有：(1)規劃財務模型，使眼庫的能自行收益平衡、永續經營；(2)提供研究用眼角膜，以供台灣眼角膜移植醫生研究及開發新技術使用；(3)提供國際眼角膜移植認證訓練。

表 5　SightLife 參訪情形

<table>
<tr><td> 
衛福部林次長奏延與 SightLife 營運長 Mr. Bernie Iliakis 和全球事業部長 Ms. Claire Bonilla 交換名片</td><td> 
SightLife 營運長 Mr. Iliakis 向衛福部林次長奏延及醫事司王司長宗曦解說 SightLife 沿革</td></tr>
<tr><td> 
SightLife 眼庫眼角膜樣本整理室一隅</td><td> 
SightLife 眼庫 24 小時聯絡室一隅</td></tr>
<tr><td> 
SightLife 全球事業部長 Ms. Bonilla 解說 SightLife 事業版圖及全球合作夥伴</td><td> 
SightLife 與我方討論眼庫合作可能及模式</td></tr>
<tr><td colspan="2"> 
我方贈與禮物予 SightLife</td></tr>
</table>

(三)Fred Hutchinson Cancer Research Center

1.背景概要

Fred Hutch 創辦人為 William B. Hutchinson 博士，其原先在西北太平洋糖尿病研究所工作，為紀念其死於肺癌的弟弟 Fred Hutchinson 而在研究所中設立研究中心，並於 1975 年獨立成一研究機構。Fred Hutch 目前研究人員超過 200 人，共分為基礎研究分部(Basic Sciences Division)、臨床研究分部(Clinical Research Division)、人體生物學分部(Human Biology Division)、公共健康科學分部Public Health Sciences Division)以及疫苗與傳染疾病分部(Vaccine and Infectious Disease Division, VIDD)五個分部，研究領域包含各種癌症以及其他疾病，包括乳癌、肺癌、口腔癌、結腸癌、HIV/AIDS 等 28 種領域，並針對先端治療資訊進行研究。

Fred Hutch 除了是美國頂尖癌症研究所之一外，也以骨髓移植技術聞名於世。骨髓移植的先驅 Dr. E. Donnall Thomas(1990 年因為骨髓移植獲得諾貝爾生醫獎)，於 1974 年加入 Fred Hutch，多年的研究下使得 Fred Hutch 成為國際骨髓移植的權威，更是相關治療如臍帶血、幹細胞移植等先端技術研究者。另外，基礎科學部研究人員也於 1988 年開始研究愛滋病病毒 HIV，且在 1994 年與華盛頓大學進行疫苗試驗合作，目前 Fred Hutch 的疫苗與傳染疾病分部為世界上最大的 HIV 病毒研究中心，且扮演全球 HIV 病毒疫苗試驗的樞紐。

Fred Hutch 也積極拓展與其他國家的合作，2014 年 Fred Hutch、中國河南省腫瘤醫院、中國疾病預防控制中心職業衛生與中毒控制所三方簽約，建立腫瘤生物樣本庫。希望針對亞裔人種進行研究，目前進行幽門螺桿菌分型與胃腺癌關係的研究，而 2015 中國主席習近平夫人也曾和比爾蓋茲夫婦一同參觀 Fred Hutch。

圖 3 Fred Hutchinson Cancer Research Center 外觀

資料來源：網路公開資料

2.參訪摘要

本次主要參觀引導為溝通協調員 Mr. Jeremy Webb，向我方簡要介紹 Fred Hutchinson 歷史沿革以及研究經費來源與分配。之後則由資深副總 Dr. Eric C. Holland 帶領執行總監 Dr. Steven G. Self、指導教授 Dr. Chu Chen、系統總監 Dr. Meei-Li Huang、管理總監 Dr. Lena Yao，以及設備及營運部長 Mr. Scott Rusch 與我方分享 Fred Hutch 合作機制，並就與台灣未來可能合作機會意見交流。

Dr. William Hutchinson 於 1956 年設立 Pacific Northwest Research Foundation，原先為專門提供研究資金的基金會，在 1964 年其身為胞弟棒球明星弟弟 Fred Hutchinson 因肺癌症過世的， Dr. Hutchinson 轉而致力於癌症相關研究。目前為美國癌症研究的重點機構，並曾有三位諾貝爾獎得主於此工作。

Fred Hutch 的每年研究經費預算約 4 億 5 千萬，70%研究金費主要來自 NIH，30%%則來至 Bill and Melinda Gates 基金會以及其餘外界捐款。目

前這些經費除了於 Fred Hutch 本身研究使用之外，每年亦有約 15%用來資助新創公司，並鼓勵員工投入創新治療領域。

Dr. Holland 說明 Fred Hutch 的研究成果帶領了許多 spin-off 公司的成立，包含本次參訪企業之一的 Adaptive Biotechnology。雖 spin-off 的契機比較屬於獨立研究實驗室主導，然 Fred Hutch 內有一專責 Business Development Unit 將會協助新創公司的籌設所有相關文件及處理相關法規規範議題；此機構亦協助 Fred Hutch 與外界機構研究合作相關合約文書。

Dr. Yao 表示，目前 Fred Hutch 為致力於人種多樣的病理研究，亦伸展國際觸角，現與中國及烏干達皆有研究合作計畫進行中，與其餘各國醫院合作的模式，主要合作模式為利用雲端技術共享病理資料，及多樣性的人種樣本變異。

表 6 Fred Hutchinson Cancer Research Center 參訪情形

我方與 Fred Hutch 設施與營運長 Mr. Scott Rusch 及 Dr. Chu Chen 交換名片

<table>
<tr>
<td> 
Fred Hutch 公共關係處 Mr. Jeremy Webb 向衛福部林次長奏延及醫事司王司長宗曦解說 Fred Hutch 歷史沿革</td>
<td> 
Fred Hutchinson 照片及使用過的球衣與球具</td>
</tr>
<tr>
<td> 
雙方就未來與台灣可能合作模式進行意見交流</td>
<td> 
Thomas Building 命名來源之諾貝爾獎得主 E. Donnall Thomas 與其夫人肖像</td>
</tr>
</table>

(四)Seattle Children’s Hospital

1.背景概要

西雅圖兒童醫院(Seattle Children’s)為美國西岸第一的兒童醫院，擁有超過 100 年歷史，1898 年創辦人 Anna Herr Clise 小兒子於死於急性風濕病，因而在 1907 年創辦醫院，致力於兒童到青年的身心發展。目前醫院共有近 60 個兒科分科，5,174 名員工，323 張病床，其中有 45 張兒童加護病床及 19 張新生兒加護病床。為華盛頓、阿拉斯加、蒙大拿及愛達荷各州的兒童和青少年轉診中心，也負責華盛頓大學醫學院(2015 年被 businessinsider 評為全美第一醫學院)所有兒童醫學相關的教學及臨床研究。2015U.S. News & World Report 評估為全美第六名的兒童醫院。

在資訊科技面，西雅圖兒童醫院於2013年6月導入IBM PureData System，可匯集並分析來自於 10 種系統的資料，醫院可透過其分配資源而醫生可以在短時間內回顧歷史數據評估治療方案。

西雅圖兒童醫院的研究機構為全美國前五大的兒童醫學研究機構，機構員工 1,135 人，旗下有九個研究中心各自負責一專業領域如癌症免疫療法、神經科學及兒童行為發展等。臨床和實驗室占地約330,000平方英尺。根據官網資料 2014 年度研究經費約為 9 千多萬美元，主要資金來自於美國國立衛生研究院(NIH)。

圖 4 Seattle Children’s Hospital 外觀

資料來源：網路公開資料

2.參訪摘要

本次參訪由全球業務開發暨國際醫療副院長溫志剛醫師、Chief Research Institute Officer Dr. Eric Tham，以及大數據分析師 Mr. Ryan Sousa 就西雅圖兒童醫院的國際醫療服務，以及其透過 PEDSNet 平台與美國其他地區之領導兒童醫院分享病理資料等詳情向我方解說。

Seattle Children’s Hospital 為美國西岸最大兒童醫院，服務區域面積全美最大，所及包括華盛頓州、阿拉斯加、蒙大拿及愛達荷州。院區總床數有 115 床，提供 50 個專科門診，員工數達 5,900 名，每年服務病人數約 20 萬人。西雅圖兒童醫院亦提供全球各地病患治療醫療服務，國際醫療服務病患前 10 名分別來自加拿大、日 本、德國、中國、英國、法國、澳洲、墨西哥、義大利及沙烏地阿拉伯。

西雅圖兒童醫院專門研究人員高達 1,135 人、科學家有 714 名，實驗室面積達 330,000 平方英呎，合作夥伴達 26 個團體。齊下設有包含心臟、癌症及白血病、顱 面整型、神經神經內外科等共 9 個專門研究中心，研究能力享譽勝名。2014 年度由國家衛生研究所提供研究經費逾 6 千萬美元，其他外部資金部份更達 9 千萬美元，全美排名位居第五名。

西雅圖兒童醫院由於服務範圍廣大，與 UW Medicine 體系相同，針對偏遠地區特別致力於 Tele-medicare，透過與合作的 41 個各地診所及關連醫院間的遠距醫療諮詢，使病患僅使位於偏遠地區皆能享受良好照顧並獲得專家的建議。而西雅圖兒童醫院針對無論何種國籍、需要長期住院的病童家庭，於 Family Resource Center 免費提供翻譯員提供語言協助，也有領航員協助家屬了解西雅圖兒童醫院診療的流程及體系。

UW Medicine、Fred Hutchinson Cancer Research Center 與西雅圖兒童醫院各自享有西雅圖兒童醫院 3 分之 1 的股份。因此，此三機構間的共同研究合作非常密切，為了共同免除兒童病患痛苦的願景，主要的研究方向已能創造出實際應用於治療的成果為目的，也因此三機構之間提倡研究成果商業化，也共同創立了許多新創公司。

西雅圖兒童醫院與全美其他七間兒童醫院透過 PEDSNet 的計畫將彼此病患間的電子醫療病例互相分享，此計畫推動及領導的單位為美國聯邦政府衛生局，願景為治癒兒童疾病，同時亦以免除因肥胖而引起的各種疾病為主軸，為 Accountable Care Act 成立的 11 個 network 之中的一個。透過跨平台大數據的分析，期望未來達到在診療病理紀錄一登入系統的瞬間，即能直接將可能引發疾病或病因回傳給醫生做診斷建議參考。

表 7 Seattle Children's Hospital 參訪情形

<table>
<tr>
<td> 
我方與西雅圖兒童醫院國際醫療副院長 Dr. Mark Wen 交換名片</td>
<td> 
西雅圖兒童醫院禱告室實景</td>
</tr>
<tr>
<td> 
Dr. Mark Wen 向衛福部及台灣野村成員簡報西雅圖兒童醫院國際醫療現狀</td>
<td> 
衛福部林次長奏延贈與禮品予 Dr. Wen</td>
</tr>
</table>

<table>
<tr>
<td> 
Dr. Wen 向衛福部林次長奏延及醫事司王司長宗曦解說 Family Resource Center 提供之服務</td>
<td> 
西雅圖兒童醫院內部以不同主題命名各區域，此為海洋區</td>
</tr>
<tr>
<td> 
兒童病房一隅，病房皆為單人房</td>
<td> 
全員合照(左起:駐西雅圖台北經濟文化辦事處吳副處長鎮祺、衛福部張科長禹斌、Dr. Mark Wen、衛福部林次長奏延、Chief Research Information Officer Dr. Eric Tham、衛福部王司長宗曦、大數據分析師 Mr. Ryan Sousa</td>
</tr>
</table>

(五)University of California San Francisco (UCSF) Medical Center

1.背景概要

UCSF Medical Center(加州大學舊金山分校的教學醫院)，是全美排名第八的醫院。2015 年新啟用的 Mission Bay 院區，即位在 2003 年設立的 UCSF Mission Bay biomedical research campus(生醫研究中心)旁邊，讓研究人員與醫生更方便合作或執行臨床試驗。該院區擁有三個醫院：(1)UCSF Benioff Children‘s Hospital，UCSF 擁有舊金山地區唯一的兒童醫院，且將其挪至新院區，內有 50 個兒科分科、183 床位。(2)70 床

位的 UCSF Betty Irene Moore Women’s Hospital 婦女醫院、(3) 36 床位的 UCSF Bakar Cancer Hospital 癌症中心，其中癌症醫院位於 UCSF Helen Diller Family Cancer Research Building 癌症研究大樓旁，方便研究人員和醫生直接合作。

院區採用多項高科技設備，其中最值得注意的是由 Aethon Inc 所製造的 25 台輔助機器人「TUGs」，此機器人可以一次負重 1,000 磅(454 公斤)且每天可以移動 12 英哩(19.2 公里) ，於各分科中分擔庶務工作包括運送食物、藥品、檢體等，且設有需用指紋開啟的安全裝置，提升醫護人員照顧病患的效率及專注力。大部分病房配有床邊平板電腦可以操控病床前方大螢幕，隨時與外界聯繫或使用娛樂設備，降低病患心理壓力。在空間設計上則擁有寬敞且高科技的手術室、隔音設備、兒童醫院有彩繪 MRI 儀器，提高就診環境舒適度及品質。

圖 5 UCSF Medical Center Mission Bay 院區採用高科技設備與友善環境

資料來源：網路公開資料

2.參訪摘要

本次參訪UCSF Medical Center主要由Dr. Richard Tsai介紹Memory and Ageing Research Center 及其鄰近研究中心，而建築師暨 UCSF Mission Bay 室內設計專案師 Ms. Mary Phillips 帶領我方參觀 UCSF Medical Center於Mission Bay院區內的三棟醫院。

UCSF Medical Center於Mission Bay的院區於2015年2月啟用，目前院區內有 Betty Irene Moore Women’s Hospital、Bakar Cancer Hospital、Benioff Children’s Hospital 等三家專門醫院，以及心血管研究中心 Smith Cardiovascular Research Building、包含全美唯一記憶於老化研究中心的Sandler Neurosciences Research Building…等九座建物。此院區佔地約56.9公頃，其中29.2公頃為地產開發商Catellus捐贈、13.2公頃來自舊金山市政府捐贈、14.5公頃則是UCSF購入之資產。

Mission Bay的院區作為UCSF相關醫學及生技研究重鎮，亦吸引了許多生技業者將公司設立於其鄰近地點，如：Nektar Therapeutics、FibroGen、Tunitas Therapeutics等，國際基因序列機大廠Illumina亦於此設立舊金山分部。

Sandler Neurosciences Research Building 內 Memory and Ageing Center 為全美唯一專門針對老人失智症的研究中心，此中心除了提供老人失智症、阿茲海默症、帕金森氏症等高齡好發腦部病變的治療及研究外，亦進行相關研究之臨床試驗。

Benioff Children’s Hospital 與 Betty Irene Moore Womean’s Hospital 及 Bakar Cancer Hospital 三棟建物互相連結，總共有289床病床，其中183床為專屬兒童醫院，106床則為成人病床。三間醫院共有

20 間手術室，8 間隸屬兒童手術專用、8 間專屬成人手術專用，另外 4 間則為機動性手術室，依實際需求分配為兒童或成人手術室。

另外，此三間醫院的病房皆為單人房，房內皆配有可變換為單人床墊的沙發，供家屬休息使用；每間病房內皆配有 oneview 媒體系統，透過枕頭邊的遙控器或病床邊平板裝置，與病床前方的大螢幕電視連結，系統內除了提供電視電影節目外，還有專責此病患的醫療團隊資訊可隨時向其詢問病況相關資訊、病患個人目標設定、病患病情相關之健康照顧資訊…等，大幅提升病患住院的滿意度。

表 8　UCSF Medical Center 參訪情形

<table>
<tr>
<td> 
Dr. Richard Tsai 向衛福部林次長奏延及王司長宗曦簡介記憶與高齡研究中心</td>
<td> 
腦神經科學教授 Dr. Howard Rosen 歡迎衛福部林次長奏延及王司長宗曦蒞臨參觀</td>
</tr>
<tr>
<td> 
UCSF Medical Center 於 Mission Bay 院區的專案管理暨室內設計師 Ms. Mary Phillips 與林次長奏延意見交流</td>
<td> 
Ms. Mary Phillips 為我方介紹 Benioff Children’s Hospital 區域</td>
</tr>
</table>

院區內呈現醫護人員、病患及家屬共同創造的馬賽克藝術品

Ms. Mary Phillips 為我方介紹病房 oneview 媒體設備

Oneview 媒體牆功能介紹

衛福部林次長奏延贈與禮品予 Ms. Mary Phillips

於 UCSF Benioff 兒童醫院前與 Dr. Richard Tsai 合影

三、 研究機構參訪

本次美國參訪共拜訪三家研究機構，依據參訪時間順序分別為 Institute for Systems Biology、The Scripps Research Institute 與 Salk Institute。以下就三家機關機構之背景與參訪結果要點分別進行介紹。

(一)Institute for Systems Biology

1.背景概要

系統生物學中心 Institute for Systems Biology (ISB)是全世界第一個系統生物研究機構，在創立短短幾年中，已發展成為美國重要的癌症研究中心之一，在預防性醫學及個人化醫療上有舉足輕重的地位。系統生物學一詞即由 創辦人 Hood 所提出，該學門的主要任務在將各種關於 RNA、DNA、基因、蛋白質、細胞及組織等知識整合成一個完整的模式，需要結合生物、化學、物理、運算、數學等策略來加以實現，因此目前的 9 個實驗室中都有來自不同領域的學者，也與台灣交大、成大等國內多所大學已建立合作網絡。

ISB 目前正在進行一項 100K Wellness Project，期望透過蒐集大量、雲端的個人健康、基因數據，來達到其提出的 P4 醫療概念(Predictive 預測性, Preventive 預防性, Personalized 個人化 and Participator. 參與性)，在 2015 年已完成 107 人的試驗研究，且目前在積極尋找全球的醫療與研究合作夥伴中。

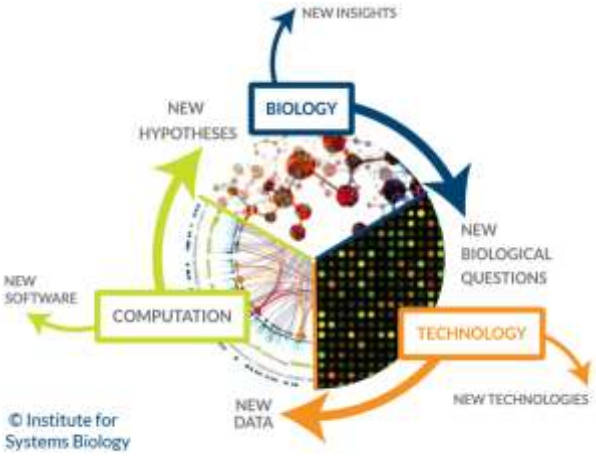


圖 6　系統科學示意圖

資料來源：網路公開資料

2.參訪摘要

Institute for Systems Biology (ISB)由生物學家 Dr. Leroy Hood、免疫學家 Dr. Alan Aderem 及蛋白質化學家 Dr. Ruedi Aebersold 於 2000 年共同創辦，為全球第一個系統生物研究機構，旗下員工超過兩百人、目前擁有九個研究機構及實驗室，期望透過建立大量之個人健康資料庫，來提升預防性醫學及個人化醫療。

ISB 所提倡之 P4 醫學模式：即預防性(Preventive)、個體化(Personalize)、預測性(Predictive)及參與性(Participatory)，強調從個人的健康身理狀態，走向預測未來疾病、進而預防、有別於同質性、大眾化之治療方式，目前除了印度、澳洲、歐洲等地區外，亦積極尋找全球之醫療與研究合作夥伴。

本次參訪我方拜訪帶領 Price Lab 之 Dr. Nathan Price 並於其探討台灣加入其 100K Wellness Project 之可能。Dr. Price 表示 ISB 與海外合

作模式最大之關鍵在於如何將 Coaching 系統一併輸出，透過 Coach 對於參與研究計畫之人員進行建康管理諮詢及使得健康管理研究計畫得以落實，因此在選擇海外合作夥伴中特別考量各地文化差異及配合度，台灣參與的可能性將後續審慎評估 coaching 系統的可置入性後再探討。

表 9　Institute for Systems Biology 參訪情形

<table>
<tr><td colspan="2"> 
Dr. Nathan Price 向我方簡介 100K Wellness Project</td></tr>
<tr><td> 
衛福部王司長宗曦與 Dr. Nathan Price 針對台灣及 ISB 合作可能意見交流</td><td> 
衛福部王司長宗曦贈與禮品予 Dr. Nathan Price</td></tr>
</table>

(二)The Scripps Research Institute

1.背景概要

受到胰島素發展的啟發(1923 年諾貝爾生醫獎)，Ellen Browning Scripps 女士於 1924 年創立 Scripps 內分泌診所，專門診斷、治療和研

究糖尿病及其他免疫、代謝疾病。並於 1956 年更名為 Scripps 診所與研究中心,且於 1993 年 The research institute 成為一獨立的非營利機構。

目前 The Scripps Research Institute(TSRI)是世界最大的私立非營利綜合性醫學研究及教育機構之一，研究領域涵蓋基礎醫學，化學，生物學等方向，共有 12 個系及 12 個研究中心。目前聖地牙哥總部和 2004 年建立於佛羅里達州的兩處研究中心共擁有近 3000 名科學家及員工中，有 270 名教授、700 名博士後研究員及 225 名博士生，研究機構中目前有 3 名諾貝爾獎得主和 17 名美國國家科學院院士。

TSRI 與產業界密切結合(由於每個新藥需投資超過 10 億美元因此需要產業的投資)，目前有超過 30 個商業合作夥伴包括知名藥廠 Novartis、Pfizer、Johnson&Johnson、Bristol- Myers Squibb，總計領導研究超過 30 種藥物，且自 1980 年以來亦分拆(spin-off)了超過 50 間的製藥及治療研究機構。其擁有超過 950 個專利數亦是全美研究機構中最多的。

圖 7　The Scripps Research Institute 院區

資料來源：網路公開資料

2.參訪摘要

本次參訪主要由溝通專員 Ms. Madeline McCurry-Schmidt 帶領我方於 The Scripps Research Institute (TSRI)各子研究中心參觀，後續接著

由聯盟經理 Dr. Diana van de Hoef 向我方簡報 TSRI 營運現況，以及與業界目前合作模式，並針對未來可能與台灣加強合作之處進行意見交流。

The Scripps Research Institute 為全世界最大之私人非營利綜合性科學研究及教育機構之一，目前成員中有 2 名諾貝爾獎得主。TSRI 主要研究領域涵蓋基礎醫學、化學及生物學等方向，與超過 30 家企業如 Novartis 、Pfizer 等有商業合作，自 1980 年以來從該機構 spin-off 成立企業超過 50 家，與產業合作非常緊密。

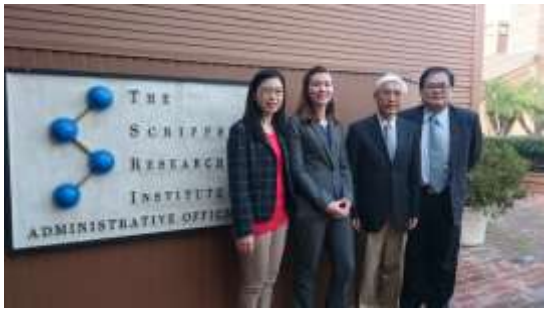
目前於美國加州及佛羅里達州共擁有 2 研究園區，加州園區之實驗室空間分別位於 15 棟建築內，總樓板面積達 1 百萬平方英呎，總員工數超過 2,000 人，其中包含 200 個部門成員、355 個博士候研究員、165 個研究所學生，以及約 1,200 名之技術員。佛羅里達園區於 2009 年啟用，目前員工數達 600 人以上。

TSRI 於生物科技領域有卓越發展，每年於科學期刊登載發表論文達 1000 篇以上、每年公開揭示超過 200 個發明、於美國獲得之專利接近 700 個，高於美國各研究機構，而兩個研究園區內課程皆以遠距線上串流直播。

研究資金來源 90%為國立衛生研究院補助，剩餘 10%則來自產業合作夥伴，TSRI 雖著重於生物及化學的基礎研究，但仍以可轉譯研究為方向，因此在研究成果有商品化潛力，或已可進入第一階段的臨床試驗時，則會將此研究成果技轉而 spin-off 成新創公司，TSRI 則專注焦點於基礎研究。透過此模式已有八種新藥品上市，分別治療癌症、糖尿病、心臟病、免疫疾病…等。

TSRI 內有一專責單位協助研究成果商業化，為各研究室提供尋找最適產業夥伴以及研究資金尋求之協助，目前研究成果商業化之推動多數仍為各別實驗室為主要推動單位。而 TSRI 與緊鄰的 Scripps Health 醫院體系過去曾為附屬關係，但現今各自獨立，合作關係較沒有以前密切。

表 10　The Scripps Research Institute 參訪情形

<table>
<tr><td> 
溝通專員 Ms. Madeline McCurry-Schmidt 與衛福部林次長奏延及王司長宗曦交換名片</td><td> 
Ms. McCurry-Schmidt 向我方介紹 TSRI 建築規劃設計</td></tr>
<tr><td> 
Ms. McCurry-Schmidt 向我方介紹分子模型</td><td> 
聯盟經理 Dr. Diana van de Hoef 與我方簡報 TSRI 與產業合作關係</td></tr>
<tr><td> 
衛福部林次長奏延贈與禮品予 Dr. van de Hoef</td><td> 
Ms. McCurry-Schmidt 與衛福部成員合影</td></tr>
</table>

(三)Salk Institute

1.背景概要

Salk Institute 創辦於 1960 年，創辦人為研發出小兒麻痺疫苗的 Dr. Jonas Edward Salk。其位於 La Jolla 海邊，緊鄰 Scripps Research Institute 及加州聖地牙哥分校(UC San Diego)，常進行跨領域的學術合作。Salk Institute 目前有 54 名教職員，325 名研究人員，235 名博士後研究員，5 位諾貝爾獎得主，致力於治癒疾病的生物研究，主要研究項目為分子生物學、基因研究、腦神經科學、植物生物學等。

Salk Institute 擁有國家癌症研究所(National Cancer institute, NCI) 指定的「癌症研究中心」，此癌症中心含括整個研究所將近一半的研究資源，2013 年和另外兩家也由 NCI 指定的「UCSD 綜合性癌症中心」和「Sanford Burnham 基礎癌症中心」合作為「聖地牙哥國家癌症研究所研究中心委員會(SD NCI C3)」一同共享資源。

另外在 2014 年 Salk Institute 和史丹佛大學合作成立「卓越幹細胞與基因組學研究中心」(Center of Excellence in Stem Cell Genomics)，提供針對癌症、糖尿病、內分泌失調、心臟疾病等疾病的幹細胞治療進行深入研究的合作平台、且與加州和世界各地共享基因組數據。

目前與業界合作的方式為 Salk Institute 主導研究、業界獲得授權及共同開發腦神經科學、內分泌、腫瘤學等等項目。共分拆(spin-off)了超過 33 間的生技公司並擁有超過 509 個專利數。

圖 8　Salk Institute 實驗室中庭

2.參訪摘要

Salk Institute 為致力於疾病治療之研究機構，以各研究室為獨立客體向外接洽研究合作事宜，因此本次參訪主軸由負責年會及特殊禮品的 Ms. Judith Hodges 帶領參觀，另拜訪近日論文獲得 Nature 科學期刊刊登的 Dr. Ye Zheng，由其解說其免疫研究實驗室最新研究及發現。

Salk Institute 共擁有約 50 個研究實驗室，其中三分之一實驗室之研究領域以神經科學為主，其餘包含分子生物學、基因研究、植物生物學等領域，開放性的建築鼓勵各實驗室間的相互交流合作。

Salk Institute 年度研究預算約為 1 億美元，現今已從過去 100%由國家衛生研究所補助，轉而成為 60%來自於宣導某特定研究的慈善公益團體，例如多重器官硬化基金會等，投注資金於多重器官硬化相關研究。

此次參訪亦造訪 Dr. Ye Zheng 主導之實驗室，其主要研究領域為免疫治療，目前研究題目主要為免疫治療於應用於多重器官硬化、紅斑性狼瘡等與受 T 細胞破壞自身免疫系統之疾病；透過操控實驗鼠身上的免疫細胞，尋找免疫疾病治療的嶄新突破。

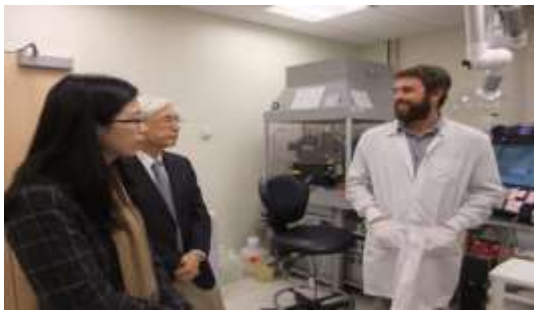
Salk Institute 本著鼓勵研究創新的精神、使研究學者盡情享受做研究的樂趣，相較其餘研究機構，更加著重於基礎研究本身，而非研究成果商品化為目的。然體系內亦設置 Office of Technology Development 協助研究成果商業化事宜，在過去 7 年內已創造 200 多件可移轉之技術研發。

Salk 內亦提供幹細胞實驗室等基礎核心研究實驗室，此類實驗室的創立是為了提升各研究室的工作效率。此種核心實驗室的功用主要為協助各類研究室基礎研究的需求，例如幹細胞實驗室可協助所有以幹細胞研究為基礎的研究室培育幹細胞、並提供幹細胞培植教育訓練…等，不僅提升工作效率同時也鼓勵了各研究室之間的互動交流。

表 11　Salk Institute 參訪情形

<table>
<tr>
<td> 
Ms. Judith Hodges 帶領衛福部及台灣野村成員參觀 Salk Institute 院區</td>
<td> 
Ms. Hodges 解說 Salk Institute 建築歷史</td>
</tr>
<tr>
<td> 
Dr. Ye Zheng 歡迎我方蒞臨參觀</td>
<td> 
Dr. Ye Zheng 向衛福部林次長奏延解說其帶領之免疫實驗室最新研究發現</td>
</tr>
</table>

Ms. Hodges 向我方介紹 Salk Institute 沿革及產業合作現狀



Salk Institute 員工帶領參訪團參觀幹細胞核心研究實驗室

衛福部成員贈與禮品予 Ms. Hodges

四、 企業參訪

本次美國參訪共拜訪一家生技研究企業、面談一家生技製藥業者，依據參訪時間順序分別為 Adaptive Biotechnologies，以及 Five Prime Therapeutics。以下就各企業概要介紹說明如下：

(一)Adaptive Biotechnologies

1.背景概要

Adaptive Biotechnologies 創立於 2009 年，為 Fred Hutchinson Cancer Research 的 spin-off 公司，創辦人為原研究中公共健康科學與人體生物學分部的博士研究人員 Dr. Harlan Robins, Dr. Chris Carlson, Dr. Edus Warren，與 Dr. Harlan Robins 的兄弟 Chad Robins。研究領域為後天/

適應性免疫系統，並且提供臨床護理診斷服務。結合高通量定序法(high-throughput sequencing)及生物信息學(bioinformatics)，對編碼T細胞和B細胞受體的基因進行免疫測序(immunosequencing)，主要提供實驗室研究癌症和其他免疫媒介疾病及臨床護理診斷。公司在2014年獲得維京全球投資(Viking Global Investors)的1.05億美元融資，且於2015年1月透併購位於南舊金山，且同樣也是提供免疫測序服務的Sequenta公司，因此目前員工人數大約為150人。

目前上市產品：(1)clonoSEQ為臨床檢驗產品，可診斷造成高復發率的淋巴癌細胞。(2)immunoSEQ為一免疫測序的研究系統，獲得CLIA(臨床實驗改進法案修正案)認證，可提供客戶(像是實驗室或藥廠)進行內部免疫測序。

圖 9　immunoSEQ檢測工具組

資料來源：網路公開資料

2.參訪摘要

本次參訪主要會談對象為科學合作總監 Dr. Catherine Sanders、計算生物資深專案經理 Dr. Marissa Vignali，以及產品商業長 Mr. Brian Hansen，雙方就 Adaptive Biotechnologies 之研究技術，以及生物資料庫與台灣可能合作機會意見交流。會後參訪企業總部時亦與共同創辦人暨科學長 Dr. Harlan Robins 針對雙方生物資料庫合作進行簡略商談。

Adaptive Biotechnologies 創立於 2009 年，創立的契機為仍在 Fred Huthcinson 癌症研究中心任職的 Dr. Harlan Robins 及 Dr. Chad Robins 所研發出的基因序列技術，由於此序列技術的成功，產生許多後續相關研究及分析的需求，因此兩位創辦人於 2009 年創立了此公司。而研發出主要分析技術為 immunoSEQ，已於 2010 年上市，提供客戶分析其送回之基因序列中 T 細胞及 B 細胞受體的服務。近年來由於免疫學研究的發展，目前 immunoSEQ 的運用領域也超出了癌症的範圍，拓展至傳染病、過敏症、賀爾蒙等等。

Adaptive Biotechnologies 主要客戶及合作對象為各大藥廠、研究單位、獨立研究學者、醫院等，這些機構在對各自的生物樣本做基因序列的排序後，將此排序送回 Adaptive Biotechnologies 做精準的 T 細胞及 B 細胞受體強化分析。此分析結果的應用多元，例：臨床試驗過程中之檢體、研發藥品的實驗檢體、病患投藥前後的檢體等。而 Adaptive Biotechnologies 由於研究的是基因序列的分析，因此可接受的生物檢體種類多元，任何可取出 DNA 的生物檢體皆可。

由於 Adaptive Biotechnologies 技術可廣泛應用，從眾多客戶端也累積了眾多的生物樣本，因此 Adaptive Biotechnologies 建立了一個有 17

億筆獨特 DNA 序列的生物資料庫，其客戶可以透過其網路平台取得此生物資料庫，加以運用在其研究上。此外，在取得客戶同意後，Adaptive Biotechnologies 也會在其平台上公開客戶以公開發表的研究論文及其相關聯之生物樣本序列，以供後續他人研究參考。

Adaptive Biotechnologies 近年快速成長，亦考量拓展海外市場，目前有意於亞洲區域尋求分公司設立地點，首要屬意日本或新加坡，但對已擁有豐富病理生物資料庫的台灣亦有濃厚興趣，期望能串聯兩者的生物資料庫，同時也樂見彼此共同合作，以研發有效治療登革熱的方法。

表 12　Adaptive Biotechnologies 參訪情形

<table>
<tr>
<td> 
衛福部林次長奏延與科學合作總監 Dr. Catherine Sanders 交換名片</td>
<td> 
Dr. Sanders 向我方簡介 Adaptive Biotechnologies 歷史沿革及產品</td>
</tr>
<tr>
<td> 
衛福部王司長宗曦與 Adaptive Biotechnologies 討論 Bio Bank 合作可能</td>
<td> 
衛福部林次長奏延贈與禮品予 Adaptive Biotechnologies，右起：Dr. Catherine Sanders、產品商業長 Mr. Brian Hansen、衛福部林次長奏延、計算生物資深專案經理 Dr. Marissa Vignali</td>
</tr>
</table>

	
Dr. Marissa Vignali 帶領我方參觀企業總部	Adaptive Biotechnologies 共同創辦人暨科學長 Dr. Harlan Robins 與衛福部林次長奏延針對雙方 Bio Bank 合作意見交流

(二)Five Prime Therapeutics

1.背景概要

Five Prime Therapeutics 創辦於 2001 年，創辦人及現任 CEO 為 Lewis T. "Rusty" Williams, M.D., Ph.D.，是一家處於臨床階段的生物技術上市公司，目前的員工數為 123 名員工。其主要的研究領域為蛋白質治療，来阻止癌症细胞和發炎性疾病的擴散。該公司擁有超過 5,700 個人體細胞外蛋白庫，並藉由其研發出之蛋白質篩檢技術(高通量篩檢技術)，快速找出蛋白質治療的新標的。

目前研發產品有(1)利用人體自身免疫系統治療類風溼性關節炎和 6 種癌症的 FPA008、(2)治療胃癌的 FPA144、(3)針對乳癌及肺癌細胞的 FP-1039，皆已進入第一階段臨床試驗研究，並與國際主要藥廠如 Bristol-Myers Squibb(針對 FPA008)、GlaxoSmithKline 等皆有簽訂研發及商業化合作協議。

圖 10　Five Prime Therapeutics 目前各新藥研發情形

資料來源：Five Prime Therapeutics 公開資訊

2.參訪摘要

本次參訪主要會談對象為商業開發總監 Dr. Jim Adair、資深醫學總監 Dr. Kartik Krishnan、臨床事業副總 Ms. Lenna Kimball，以及法規事務執行長 Ms. Carmen Ladner，雙方特別針對 FPA144 及未來其他臨床試驗藥品於台灣尋求合作夥伴進行意見交流。

Five Prime Therapeutics 已成立約 30 年，於 2013 年 9 月在 Nasdaq 上市，目前為 Nasdaq 生技指數之一成員。過去主要著重於與治療藥物的前端研究，將研究成果轉移給各大藥廠做後續開發，近年來才將重心轉移至臨床研究，正式踏入臨床試驗領域。主要的研究方向為免疫治療，目前美國主管機關針對免疫治療相關研究並無特別法規規範，僅以 FDA 對於製藥及臨床試驗等相關法規為準則。

Five Prime 目前尚無上市產品，但有四種藥品進入臨床試驗階段，其中有兩種藥品更獲得國際大藥廠的合作協議：針對六種癌症的 FPA008 於 2015 年 10 月授權與 BMS (Bristol-Myers-Squibb)合作，目前已進入 Phase 1B 臨床試驗階段；針對部分類型肝癌、頭癌及頸癌的 FP-1039 則是與 GlaxoSmithKline(GSK)簽訂合作協議，由 GSK 提供進行臨床開發的相關資金。

由於目前仍著重其產品的臨床開發，對於藥品開發後的商品化程序仍持保留態度，較傾向於技轉給策略夥伴進行商品化相關事宜，台灣製藥業者在未來十分有機會與其合作進行產品的商品化程序。

表 13 Five Prime Therapeutics 參訪情形

 衛福部林次長奏延、醫事司王司長宗曦與臨床試驗副理 Ms. Lenna Kimball、法務執行總監 Ms. Carmen Ladner、資深醫事總監 Dr. Kartik Krishnan 交換名片	 商業開發總監 Dr. Jim Adair 向我方簡介 Five Prime 事業重心及產品
 雙方就 FPA144 於台灣臨床試驗合作可能意見交流	 Dr. Jim Adair 解說 Five Prime 與國際藥廠合作模式

衛福部成員贈與禮品予 Five Prime

左起：衛福部醫事司張科長禹斌、商業開發總監 Dr. Jim Adair、資深醫事總監 Dr. Kartik Krishnan、法務執行總監 Ms. Carmen Ladner、衛福部林次長奏延、臨床試驗副理 Ms. Lenna Kimball、衛福部醫事司王司長宗曦

五、 說明會辦理情形

本次於 Seattle 及 San Francisco 各舉辦一場說明會，邀請當地醫療、健康產業關聯業者共約三十六家（兩場各約十八家業者）參與活動，當日執行議程如下表。

12 月 2 日於 Seattle 的 Hilton Garden Inn Seattle Downtown 舉辦活動，12 月 7 日於 San Francisco 的 Hilton San Francisco Union Square 舉辦活動。

委託野村總和研究所協助衛生福利部以英文進行簡報，並輔以他國與台灣企業合作並成功推展大陸及東南亞市場之案例，讓與會者得以順利了解台灣醫療產業之政策規劃及市場商機。最後開放 Q&A，由衛生福利部及野村總合研究所針對各自專業部分一一回答參與者，兩場活動皆相當成功。

(一)Seattle 說明會：

本次西雅圖說明會共計有 18 間公司/機構報名參加，大部分與會者對於台灣市場概況及在台進行臨床試驗之相關法規規定等議題特別感到興趣。

表 14　Seattle 說明會議程

時間	議程	備註
15:00－15:10	主辦機關開場致詞 衛生福利部 林奏延次長	英文致詞
15:10－15:40	演講：台灣醫療生技產業的國際合作介紹	英文演講
15:40－16:10	各機關簡介(各 1 至 2 分鐘) 各與會機關人員	英文進行
16:10－16:30	Q&A	英文進行
16:30－17:00	會後交流	英文進行

Seattle 說明會 Q&A 彙整如下表。

表 15　Seattle 說明會 Q&A 彙整

參與者提問	衛生福利部答覆
台灣臨床試驗是否如同中國需要所有使用設備、藥材皆須使用國產產品？	台灣臨床試驗法規目前尚無針對使用儀器設備皆須為國產之規定，然建議在台灣申請臨床試驗前，先確認其試驗項目之相關法規規定
針對其製造之實驗器材，台灣市場的可能需求為何？	台灣目前尚有醫院機構籌建中，未來或有需求，將持續接洽
台灣是否具有製造行走輔助儀器或義肢的廠商？與國外慈善機構合作的意願為何？	台灣有許多義肢及輔助儀器業者，會後將提供相關名單並協助洽談合作
台灣業者在與美國業者合作	目前尚無自業界獲得相關議題詢問，將會持

的過程中，是否有針對法規或制度面遇到的瓶頸及課題？	續接洽並協助台灣業者轉達相關議題

表 16　Seattle 說明會執行情形

 衛生福利部林次長進行開場致詞	 台灣野村美國協辦人員 Mr. Richard Greenberg 進行介紹引言
 台灣野村總研簡書敏顧問師簡報情形	 現場與會人員聆聽簡報情形
 各機構與會人員進行任職機構簡介	 與會人員與衛生福利部及台灣野村代表進行 Q&A 情形，互動熱絡

與會人員與衛生福利部進行會後意見交流情形，互動熱絡

與會人員進行意見交流情形，互動熱絡

(二)San Francisco 說明會

本次舊金山說明會共計有 18 間公司/機構報名參加，大部分與會者積極詢問臨床試驗合作機會、針對部分產品台灣業者的媒合機會與合作對象情報。

表 17　San Francisco 說明會議程

時間	議程	備註
15:00－15:10	主辦機關開場致詞 衛生福利部 林奏延次長	英文致詞
15:10－15:40	演講：台灣醫療生技產業的國際合作介紹	英文演講
15:40－16:10	各機關簡介(各 1 至 2 分鐘) 各與會機關人員	英文進行
16:10－16:30	Q&A	英文進行
16:30－17:00	會後交流	英文進行

San Francisco 說明會 Q&A 彙整如下表

表 18　San Francisco 說明會 Q&A 彙整

參與者提問	衛生福利部答覆
台灣是否有具有血漿生產能力製造商？	建議最適聯繫單位為台灣血液基金會，會後將協助與其洽談工作
台灣是否有生產人工關節之廠商？	台灣已有具國際競爭力之骨材廠商，會後將持續接洽並協助其合作對談
對於在台灣進行臨床試驗有興趣，考慮在台設點或與台灣業者合作	若有相關需求，將於會後持續接洽並協助其相關程序諮詢

表 19　San Francisco 說明會執行情形

<table>
<tr>
<td> 
衛生福利部林次長進行開場致詞</td>
<td> 
協辦人員 Mr. Richard Greenberg 進行介紹引言</td>
</tr>
<tr>
<td> 
現場與會人員聆聽</td>
<td> 
各機構與會人員進行任職機構簡介</td>
</tr>
</table>

與會人員與衛生福利部醫事司王司長宗曦進行 Q&A 情形，互動熱絡

與會人員進行 Q&A 情形，互動熱絡

與會人員會後意見交流情形，互動熱絡

肆、 心得與建議

本次透過參訪美國製藥與生技業者，了解對方對於尋找潛在的台灣合作對象意願以及條件，作為未來媒合台美雙方企業之基礎，以及政府制定相關政策之參考。

本次美國參訪團總共參訪 11 處不同之業者、機構與機關，其中醫療服務業者部分共參訪六家醫療相關機構，分別為五家教學研究醫院及一家眼庫；在製藥與生技業者參訪方面，共參訪一家生技研究業者及一家生技醫療器材業者，另亦參訪了三所研究機構。針對各參訪對象之心得與建議分述如下。

一、 心得

美國近年來推動醫療及健康產業不遺餘力，特別是大數據的應用及相關法規的制定上，有幾項優點將可做為台灣相關政策擬定之參考範本；而在醫院建置及經營上，根據主要患者特性打造友善環境之經營方式，同時藉由軟體系統的資訊豐富性提升病患舒適度及滿意度，亦是台灣各大醫院在經營上最欠缺考慮的地方。此外，美國一直以來經由國家衛生研究所挹注各大研究中心研究資金，無論疾病治癒抑或基礎醫學生物研究，透過國家力量來培植研發能量，亦吸引產業投注資金及研發合作，進而帶動整體產業發展。上述各項心得詳細內容如下：

1．完善法規制度配合，提高醫療效率：

(1)美國暨全球最大眼庫 SightLife 的主要成功因素為相關配套法規的施行，因此可於最快時間內掌握眼角膜捐贈者及後續手術作業流程，台灣目前已有良好醫療技術及完整健保病例，若能與 SightLife 合作再進一步加強財務面及流程面的控管認證，並仰賴政府普遍推展國人對於眼角膜捐贈的意識，相信快速使台灣具備國際眼庫的水準。

(2)SightLife 成功及迅速的擴展主因為美國相關法規制度：a.醫院在病人過世之後必須立即通報器官庫、眼庫及組織庫，b.更新駕照時詢問捐贈器官之意願，提升器官捐贈率，並有效鏈結捐贈同意書紀錄於國家醫療系統中。本國在 104 年「人體器官移植條例部分條文修正案」增訂發放身分證、駕照或健保卡等證件場所應擺放器官移植意願書，該類場所之人員，應向申請或換發的成年民眾，詢問其器官捐贈意願，預計可擴大器官勸募的觸達機會，與(2)之作法類似。本國規劃國家型眼庫係希望朝財務自給自足方式規劃，SightLife 可提供經驗供本國參考，SightLife 對台灣推動眼庫表達合作意願，協助台灣眼庫取得國際認證，提高品質，將持續接觸交換意見，另外，繼續與 SightLife 商談提供研究用眼角膜，供本國醫師提升技術之訓練之用。

(3)台灣醫療相關資料庫相當多樣化，尤以健保資料庫著稱，在生物資料庫的建置也達 26 個，相較於 Adaptive Biotechnologies 透過客戶提供之樣本採集累績其生物資料庫，以及 PEDSNet 聯盟以公權力促進各大兒童醫院共享病理資料，台灣有健保 IC 卡、電子化病歷、生物資料庫建置的法令規定…等，已有非常完善的資料蒐集環境，但迄今各醫療院所各自的豐富生物樣本資料庫及病歷資料卻沒能互通共享，以提昇醫療效率及後續創新研發根基，實為可惜。

(4)P4（Predictive 預測性、Preventive 預防性、Personalized 個人化、Participator 參與性）醫療概念在 ISB（Institute for Systems Biology）研究機構正在透過雲端蒐集資料來分析及研究，反觀本國的資料庫，在個人健康資料蒐集，可透過全民健保資料庫、國民健康署癌症資料庫、疾病管制署資料庫蒐集，而基因數據則可由 26 個生物資料庫加以蒐集，且可與中央研究院主導的台灣生物資料庫合作，當資

料庫資料來源多元化後，後續本國就可與 ISB 合作，商談如何有效分析這些資料。

2．以國家力量大量投注資金持續鼓勵研究開發，促進產業整體發展：

(1)美國研究機構經費主要來源皆為國家衛生研究所 National Institute of Health (NIH)，無論是致力於疾病治療的 UW Medicine、Seattle Children's Hospital 體系的 Seattle Children's Research Institute、佔有癌症及骨髓移植領導地位的 Fred Hutchinson Cancer Research Center…等，抑或專門研究中心 Institute for Systems Biology、The Scripps Research Institute、以及 Salk Institute 其主要研究資金來源皆為 NIH，以國家力量培植整體研發能力，進而產生豐富研發成果吸引業界合作，進而獲得再一波業界的資金挹注，推動整體產業發展，因此造就美國在全球健康醫療產業持續領先的地位。

(2)The Scripps Research Institute 致力於轉譯醫療的研究發展，而 Salk Institute 致力於疾病治療的研究，兩間研究機構雖運作模式不同，對於研究的目的也不盡相同，但仍皆以研究疾病病理為基礎，將具有商品化條件的研究成果技術轉移至產業，因此也形成許多成功的生技製藥公司，為一以研究機構為核心帶動產業發展的成功案例，值得台灣研究機構參考。

3．技術研發與商品化之完整配套制度：

(1)本次參訪學術研究機構中，皆於機構內部設立專責單位負責研究成果商業化之程序。雖各研究單位在現階段與產業界鏈結合作尚以特定項目的研發為合作重心，此合作模式主軸仍為各研究實驗室各自獨立，然而在研發成果發展出商業化潛力後，機構內的專責商品化單位將會

接手相關事宜，如此的制度使各專責單位在整體健康產業鏈上各司其職，研究學者更能專注於研究工作，也提升研發效率及能量。

(2)The Scripps Research Institute(TSRI) 為全世界最大之私人非營利綜合性科學研究及教育機構之一，內有一專責單位協助研究成果商業化，為各研究室提供尋找最適產業夥伴，及研究資金尋求之協助。TSRI 研究資金來源 90%為國立衛生研究院補助，其餘 10%則來自產業合作夥伴。在研究成果有商品化潛力，或已可進入第一階段的臨床試驗時，則會將此研究成果技轉而分拆（spin-off）成新創公司，這種作法國內可作為借鏡。

4．病人優先，友善且具特色就醫環境之營造：

(1)本次參訪對象之 Seattle Children’s Hospital 及 UCSF Benioff Children’s Hospital 兩所兒童醫院，皆不遺餘力地打造提升病患就醫滿意度之環境。如西雅圖兒童醫院，特地為國際醫療病患及不熟悉醫療體系的家屬們設立 Family Resource Center，免費提供語言翻譯服務以及醫療系統導航服務，協助家屬了解醫院服務流程以及運作體制。

(2)UCSF Benioff Children’s Hospital 則是在營建期間即考慮兒童病患的需求，不但硬體設備以符合使用者角度出發設計，更規劃提供教育服務的空間讓病童得以繼續學業發展。此外，UCSF Benioff Children’s Hospital 及其相連的 Betty Irene Moore Women’s Hospital 及 Bakar Center Hospital 皆僅提供單人病房，提升病患住房隱私，在對家屬及病患皆非常友善的環境下，同時也以 oneview 媒體牆系統提供病患相關醫療資訊及個人目標設定，鼓勵病患自我激勵，加快療效及痊癒。相較之下，台灣的醫院則往往注重於醫療的提供，

卻忽視了透過加強病患心靈感受，實可提升病患對治療的接受度及就醫的滿意度。

5.醫院與產業結合

(1) 西雅圖兒童醫院、華盛頓大學醫學院、Fred Hutchinson 癌症研究中心的合作 即是以醫療為核心，透過針對病理治療的研究成果，大力推動及提倡成果商業化，進而創造出許多新創團隊，也帶動了健康生技產業的發展，此實 例提供台灣醫療及產業鏈結一個非常好的參考。

(2) 美國 Accountable Care Act，也就是所謂的 Obamacare 提倡的其中一個重點即為以中央政府的力量主導，在「提升整體醫療 品質及服務、加速治療研究發展」的願景下，帶動全美主要兒童醫院在彼此競爭的環境中，仍能互相分享醫療病理資料，此模式亦非常值得台灣醫療體系做為參考。

二、 建議

藉由本次參訪，可分別由政策面、產業面與制度面出發，給予國內相關產業發展政策與制度給予建議，其內容分述如下：

(一)政策面

1.明確化重點產品領域，集中給予研發補助

相較於美國廣泛投注資金於各大研究機構的做法，台灣由於受制於國內市場有限之因素，致使較大眾化之藥品與醫材領域上，本土廠商不易扶植，如何運用有限資源發揮最大效益為最大的議題。因此，對台灣而言，較為適合的研發補助方式，應當由政府選定幾個已具一定發展基礎的特殊領域後，擬定適當之研發補助政策，以使政府資金可集中於個別領域，以期效能得以最大化。

2.能持續 follow up 國外企業/機構研發成果之機制

由於台灣本身持有之技術有限，再加上部分國內中小企業對於國外廠商/機構所持有技術之不了解，政府應該持續追蹤具與台廠合作潛力之國外廠商，或建立國外廠商資料庫，讓民間企業得以充分掌握國外廠商之技術、產品或製程需求，拓展與國外廠商合作之機會與可能性。

本部已於 104 年整理分析臺灣國際健康產業之國際市場障礙、臺灣推動健康產業可行模式、潛在客戶開發、執行策略，並將參訪單位及說明會參與的廠商，優先列入持續追蹤聯繫對象，作為民間企業與國外廠商之橋樑。

(二)產業面

1.整合醫療與 IT 技術，將醫療效益發揮最大化

在面對醫療行為轉以個人化取代大眾化的趨勢下，醫療與 IT 技術的結合將更為密切。我國從 2007 年開始推動電子化作業，擁有全世界最完整的單一醫療就診系統資料庫，在朝向 P4 醫療(個人化、預測性、預防性、參與性)發展已定下穩固的基礎。而在導入 P4 醫療應用前，如何繼續完善技術的建置外，可參考 UCSF Medical Center 於 Mission Bay 院區之三醫院病房內所使用之 oneview 媒體系統，擴大醫院的串聯，增加與民眾溝通，同時與推動中的健康照護服務整合，透過主動式的監測，整合創新的服務模式，是我國未來政策推動的主要方針。

2.整合醫療與 IT 技術，強化臨床與研究鏈結，推動產業發展

美國目前健康產業最重要的法案 Accountable Care Act，也就是所謂的 Obama care，其中提倡一個主要重點即為以中央政府的力量主導，在「提升整體醫療品質及服務、加速治療研究發展」的願景下，帶動全美主要兒童醫院在彼此競爭的環境中，仍能互相分享臨床病理資料，以此調整研究

方向，回饋於臨床治療上，亦帶動整體產業發展，此模式亦非常值得擁有健全醫療體制及完整電子化病歷資料的台灣醫療體系做為參考。

(三)制度面

1.參考外國眼庫相關法規機制，提升台灣眼庫自給自足能力

本次參訪美國眼庫 SightLife 過程中，知悉美國全民在每次替換駕照時，皆會被詢問其捐贈器官意願，並直接註記在其駕照或身分證件上。而美國國民死亡通報制度規定，醫療院所於病患過世時必須通報眼庫、器官庫、組織庫，而此三生物組織庫會以同一窗口聯繫病患家屬接洽捐贈事宜。因此，不同於台灣器官捐贈登記制度缺乏實際追蹤單位，美國生物組織庫可於第一時間掌握大體訊息，再加上良好的器官捐贈推廣及登記制度，相較於其他國家，美國生物組織庫較不易面臨組織短少問題。而台灣既有健保 IC 卡已存有相關病歷資料，全民登記制的制度亦可協助生物組織庫追蹤大體訊息，目前缺乏的僅為各系統間的串接及通報制度，以及對大眾有效宣導器官捐贈等訊息，若能在相關制度上補強，則可預期台灣眼庫能早日進入自給自足階段，成功在台灣消除因眼角膜受損引起的盲疾。

2.參考外國生物技術經驗，台灣再生醫學及細胞治療務實發展

長期以來美國都扮演著全球生物技術領航者之角色，但在該國政府於 2001 年開始限制境內幹細胞研究(即限制不得以聯邦政府經費贊助任何有關胚胎幹細胞研究)時起，其不僅影響到該國病患醫療權益外，也使得美國於生技領域領先之優勢，被其他先進國家大幅超越。為解決前述發展困境，美國政府於 2005 年時，通過了「幹細胞治療及研究法(Stem Cell Therapeutic and Research Act of 2005，Bill：H. R. 2520)」(於同年 12 月 20 日正式生效)，希望透過修改「公眾健康服務法」(Public Health

Service Act；簡稱 PHS 法)，來鼓勵境內幹細胞研究發展，除擬恢復先前於生技領域領先之地位外，亦期望能為境內病患提供更多可能之醫療服務。除此之外，此項法案名稱雖包含「幹細胞治療及研究」等用詞，但其實質規範範疇，僅包含(一)鼓勵人類骨髓及臍帶血收集、追蹤及資料庫建置；(二)人類臍帶血銀行之適格條件；(三)建立國家級細胞移植計畫；(四)強化公眾教育及資訊流通等，而並未包含具高度倫理爭議之人類胚胎幹細胞研究部分，截至 2015 年為止，其該法於 2010 年時，已歷一次修正，即“Stem Cell Therapeutic and Research Act of 2010”，Bill：S.3751(2010 年修正法案)，而目前其國內兩議院，正嘗試再研提新修正法案，以符實務發展。我國在細胞治療及再生醫學已發展多年，可參考美國作法及日本作法，對國內相關法令、辦法及流程，重新檢視或修正。

伍、附件

一、 SightLife-SightLife Global Programs 簡報資料

二、 Fred Hutchchinson Cancer Research Center 簡報資料

三、 Seattle Children’s Analytics and Big Data Initiatives 簡報資料

四、 TSRI-Scripps Research Institute 簡報資料

五、 Five Prime Corporate Overview 簡報資料

六、 UW Medicine 簡介資料

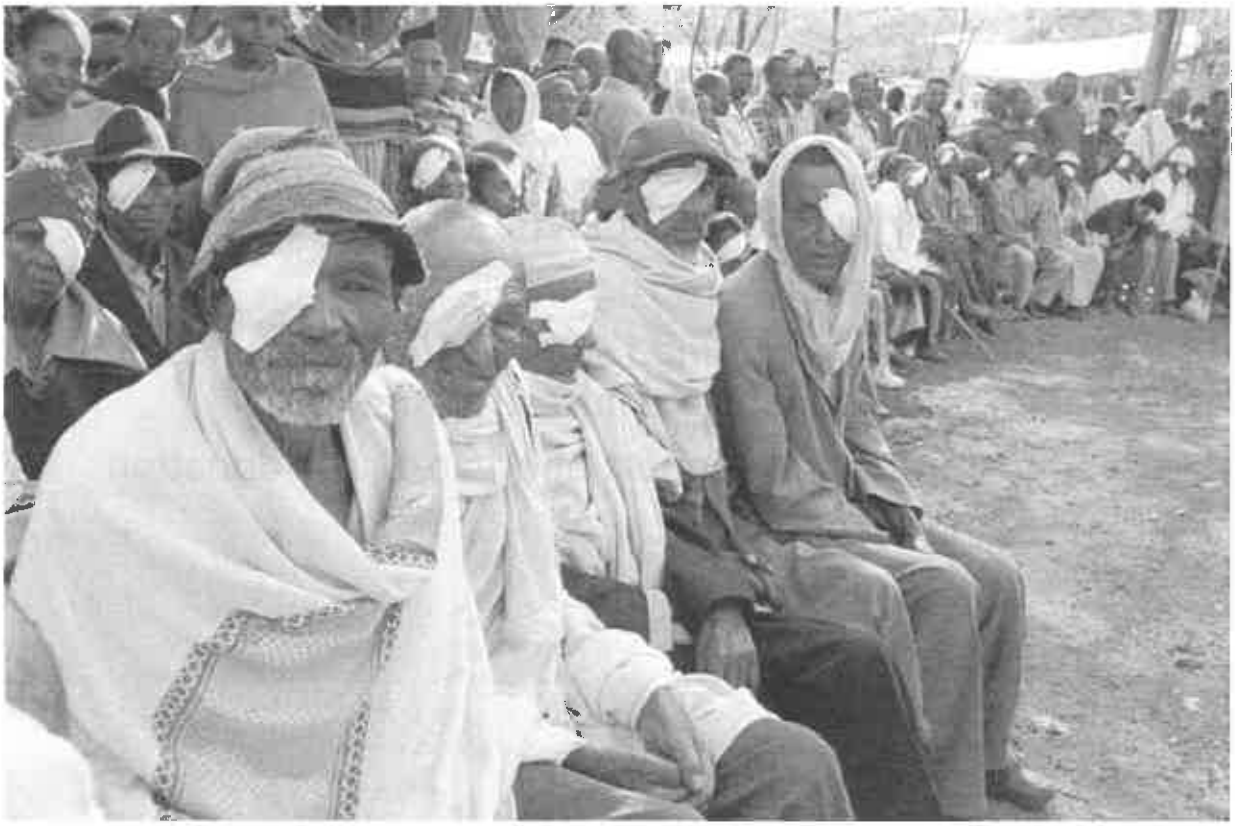
七、 Seattle Children’s Hospital 簡介資料

八、 Seattle Children’s Research Institute 簡介資料

九、 UCSF Medical Center 簡介資料

十、 SALK 簡介資料

SightLife:
Global Programs Overview



Fulfilling the Mission: *The Need & Demand*

10 Million Corneal Blind are Waiting to Be Treated

Where the World's Corneal Blind Live

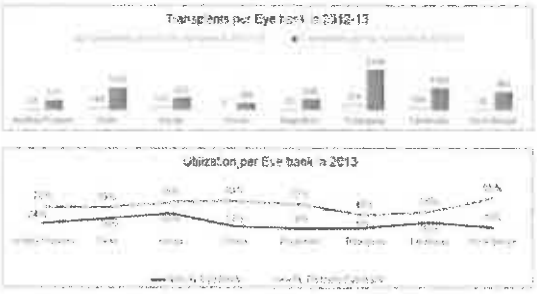
The size of each country reflects the population of corneal blind.
Colors represent readiness for eye banking and corneal transplantation.

90% of the 10 million people with curable corneal blindness live in developing countries

SightLife

Prioritizing Partners – 7 Criteria

1. Large corneal blind population
2. Legal & regulatory structure
3. Infrastructure (trained surgeons/demand, hospitals, nurses, and other health care infrastructure)
4. Awareness and support of organ/tissue donation
5. Scaling potential
6. Sustainability potential
7. Key partner fit



Source: EBAI statistics 2012-2015, SightLife Analysis

Results to Date

- Eye bank production rates have grown an average of **+30%** year over year (for SightLife partners)
- Utilization rates have increased from an average of 17% to an average of **67%** in 2015
- Established EBAI-SightLife Cornea Distribution System for India
- Established India's First Tissue Cutting Centre
- Eye banking roles have become a recognized profession; training and development:
  - Tissue evaluation technician
  - Recovery technician
  - Eye bank management
  - Donation counseling
- Advanced corneal surgical technique with PK, DSEK trainings

	2010	2014	2015
Tx Total	3,741	9,967	12,709*

*forecast

Policy & Regulation Situation

Passed

✓ 2014 THOTA "Transplantation of Human Organs and Tissues Rules, 2014". Making it legal to recover the cost of recovery and processing

Needed

❑ Mandate for Hospital Cornea Retrieval Program (HCRP) in all large govt. hospitals

❑ Mandatory notification of death

❑ National donor registry

❑ Recognition of "first consent"

❑ National health reimbursement policies

Products & Research

✓ Invested in development of low cost cornea media (MK) in India

✓ Funded multiple research projects e.g.

- Transplant success rates
- Patient behaviors
- Attitudes toward donation

Advocacy & Education

✓ Created Hospital Cornea Retrieval Program (HCRP) across India, responsible for 4,500+ Tx in 2015

- Staffed & trained over 93 Eye Donation Counselors

✓ Drove donor awareness around religious, cultural and cast barriers/opportunities

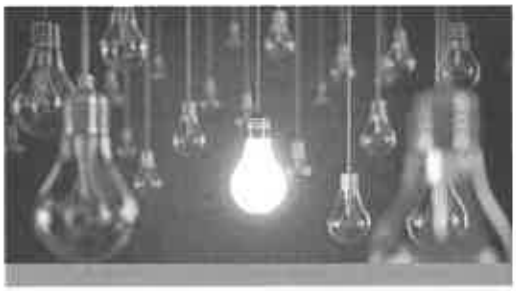
Roshan and Ritu, best EDC awards 2015

Entrepreneurial Spirit

HV Desai Eye Hospital, Pune

Collaboration

- ✓ 21 global partnership with eye banks and hospitals
- ✓ Connecting subject matter expertise from SightLife US, eye hospitals around the globe to share best practices and raise the bar on the profession globally
- ✓ Partnering with other global health organizations to solve complex issues for corneal blindness (e.g. Orbis, PATH)



Surgeon Training

- ✓ Over 50 corneal surgeons and fellows trained in 2015
- ✓ Launched standard curriculum for PKP
- ✓ Introduced new curriculum/training focused on short immersion for cataract surgeons to do Penetrating Keratoplasty

Technical Innovations

- ✓ **Global Eye Bank Management (GEMS)** for helping with workflow and archiving eye bank data
- ✓ **Cornea Distribution System (CDS)** facilitates distribution of excess tissue to surgeons across states in India, over 1200 placed since January of 2015!
- ✓ In 2016 we'll change the landscape of **Patient Care** using mobile and networking technology to build capacity in rural regions

GET INVOLVED – external message

Investing in global programs

- ❖ Support our work with financial donation
- ❖ Stay informed about our Global Program efforts
- ❖ Source high-quality tissue from our eye bank – by supporting SightLife you help fund our global mission
- ❖ Learn about our surgeon training program

http://www.sightlife.org/Get-Involved/Creating-Opportunities

Fred Hutchinson Cancer Research Center

Overview of Hutch facilities

FRED HUTCH

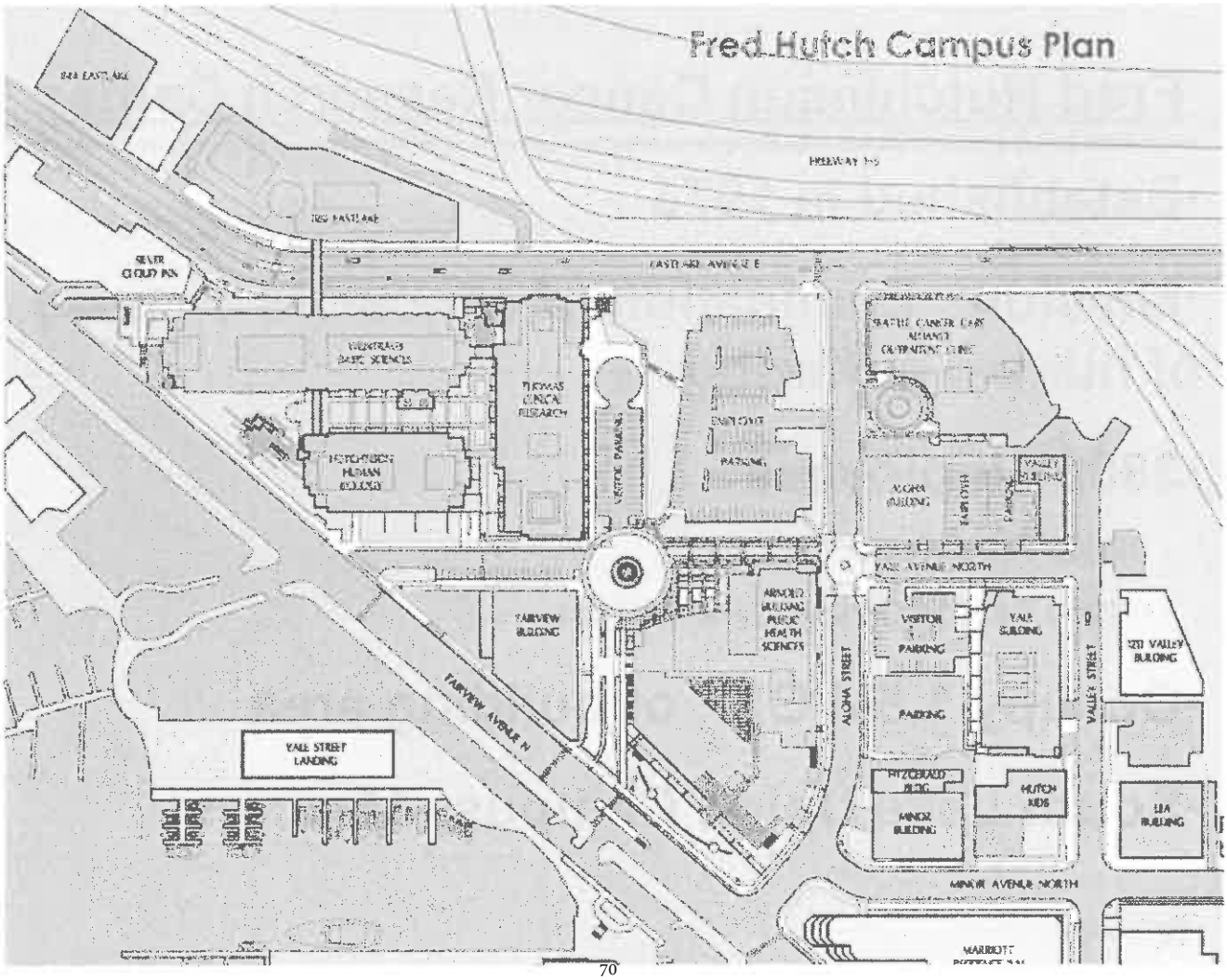
Fred Hutchinson Cancer Research Center

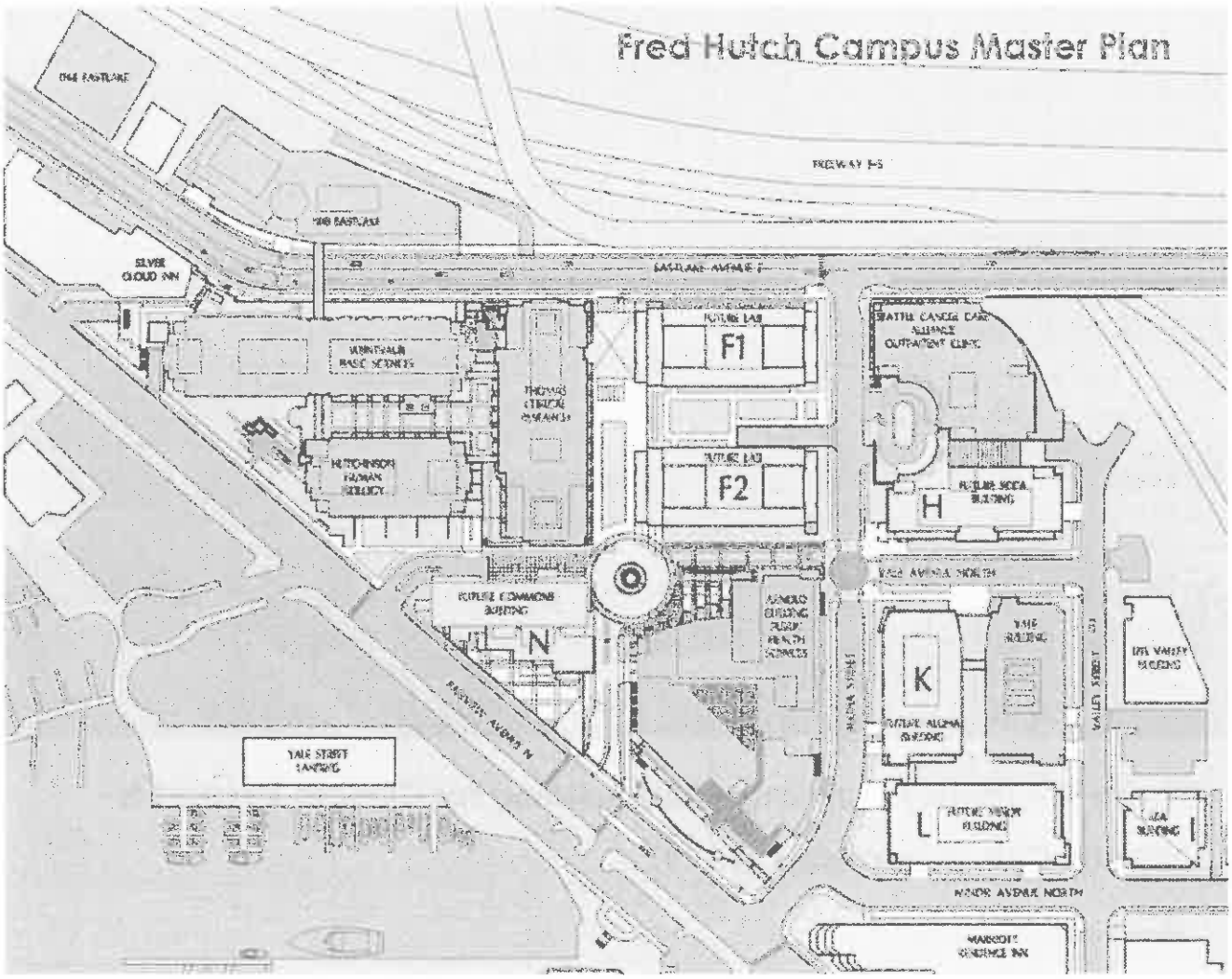
- Established in 1975
- Mission: Elimination of cancer as a cause of human suffering
- 3800 employees
  - 2600 Fred Hutch
  - 1200 Seattle Cancer Care Alliance
- Occupy 1.5M GSF of building area
- South Lake Union Campus -15 acres

FRED HUTCH

Fred Hutch Campus

FRED HUTCH





Phase I – Weintraub and Hutchinson Buildings – Lab Buildings for Basic Sciences and Human Biology

305,000 GSF, completed in 1993

FRED HUTCH

Phase II – Thomas Building – Lab Building for Clinical Research

229,000 GSF, completed in 1997

FRED HUTCH

Phase III – Seattle Cancer Care Alliance -Outpatient Clinic Building

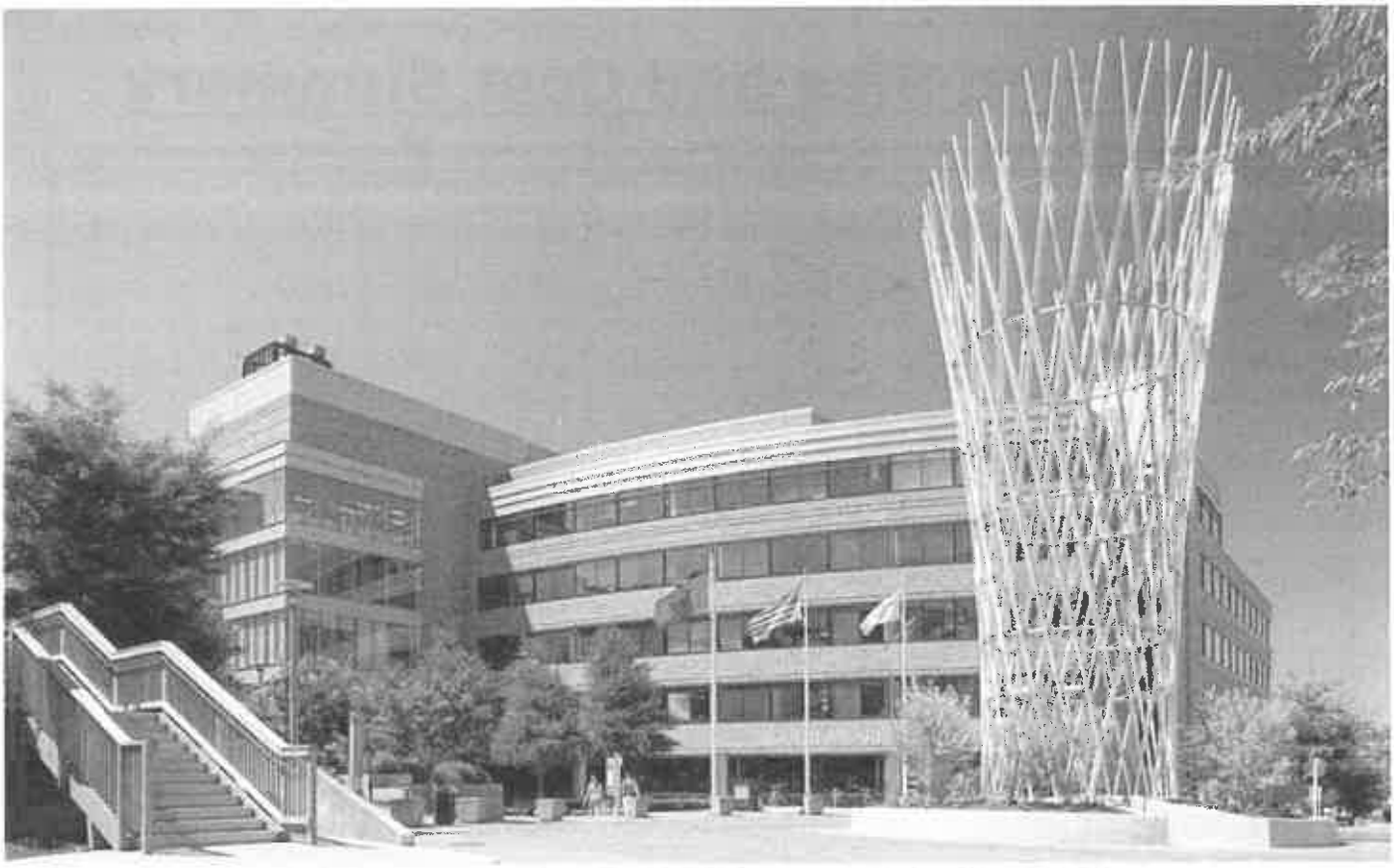
160,000 GSF, completed in 2001 / Expanded in 2006

FRED HUTCH

Phase IV – Yale Building -Office Building for Administration

132,000 GSF, completed in 2002

FRED HUTCH



Phase V – Arnold Building -372,000 GSF, completed in 2004

FRED HUTCH

Eastlake Building –188,000 GSF, completed in 2012

FRED HUTCH

Building Size and Cost Summary

Building	Year Completed	Type	Area (gsf)	Total Cost ($M)*	Construction Cost / GSF
Weintraub & Hutchinson	1993	Lab	305,000	$175	$423
Thomas	1997	Lab	229,000	$134	$467
SCCA	2000	Clinic	217,000	$157	$453
Yale	2001	Office	132,000	$53	$243
Arnold	2003	Office	372,000	$182	$314
Eastlake	2012	Office/ Lab	188,000	$92	$369
Total			1,442,000	$949	$382

FRED HUTCH

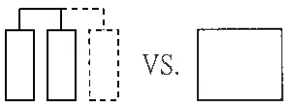
*Costs escalated to Q3 2015

Sustainability Program

- Energy Conservation program
- Water Conservation Program
- Recycling Program
- Transportation Program
- LEED building Construction
- Community involvement, advocacy and sharing of knowledge

FRED HUTCH

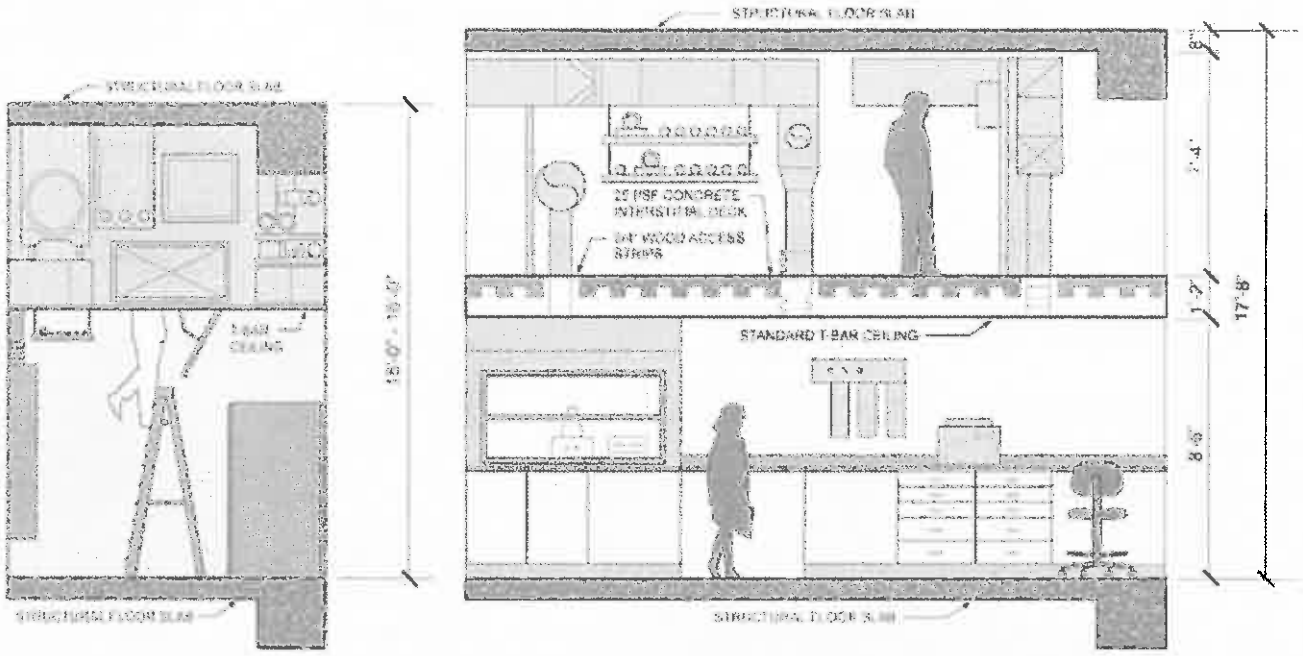
Energy Efficiency



- Right size systems
  - small multiples
  - fan walls, hot water tanks
- Outside air and Evaporative cooling for data center
- Zoning floor for after hours operations to turn off HVAC
- Reduce air changes in labs after hours
- Re-use office air for lab air. VAV air for labs
- Vacancy sensor vs Occupancy sensors for lighting control in offices

FRED HUTCH

Interstitial Design



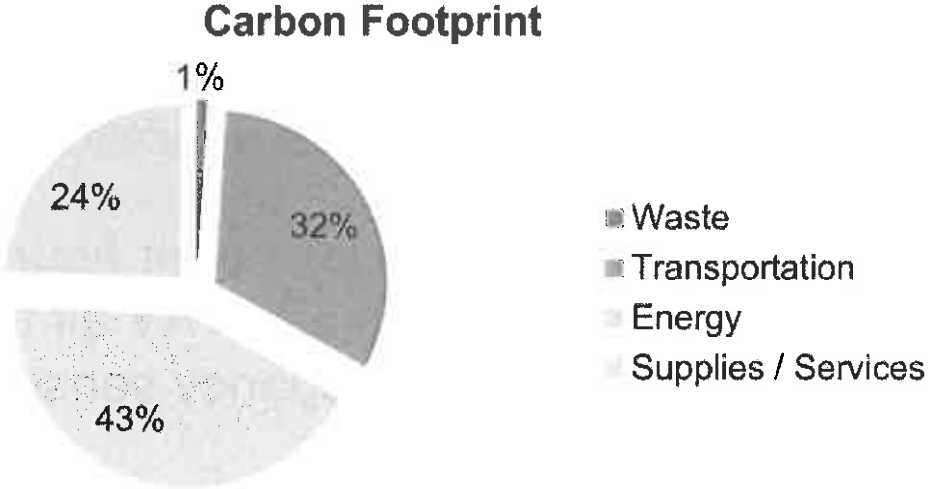
Conventional Lab Building

Interstitial Lab Building at FHCRC

FRED HUTCH

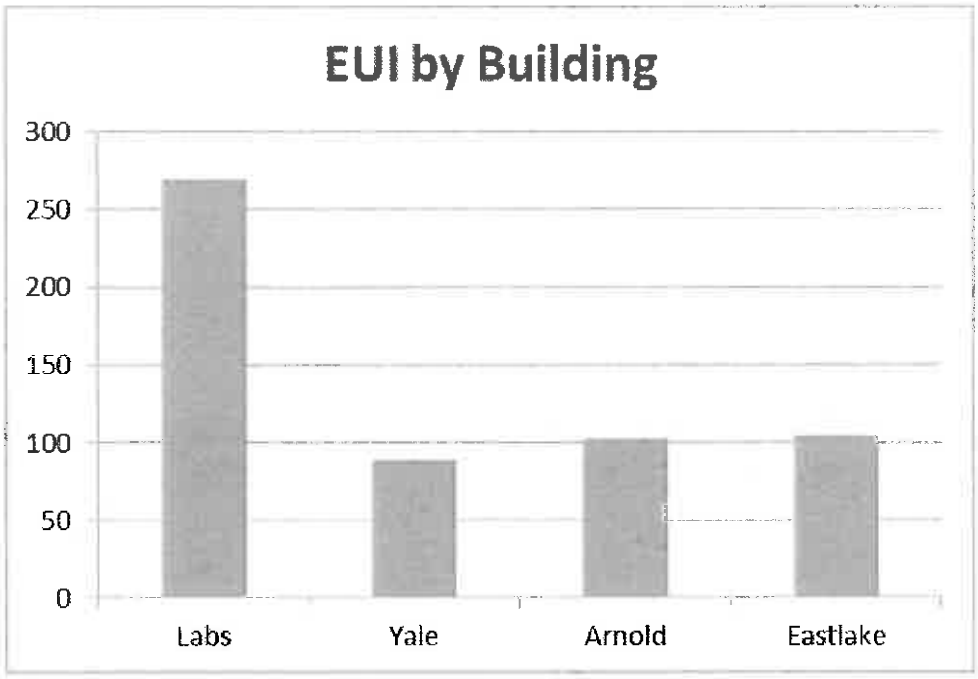
FHCRC's CO2 Emissions Inventory

14,000 tons

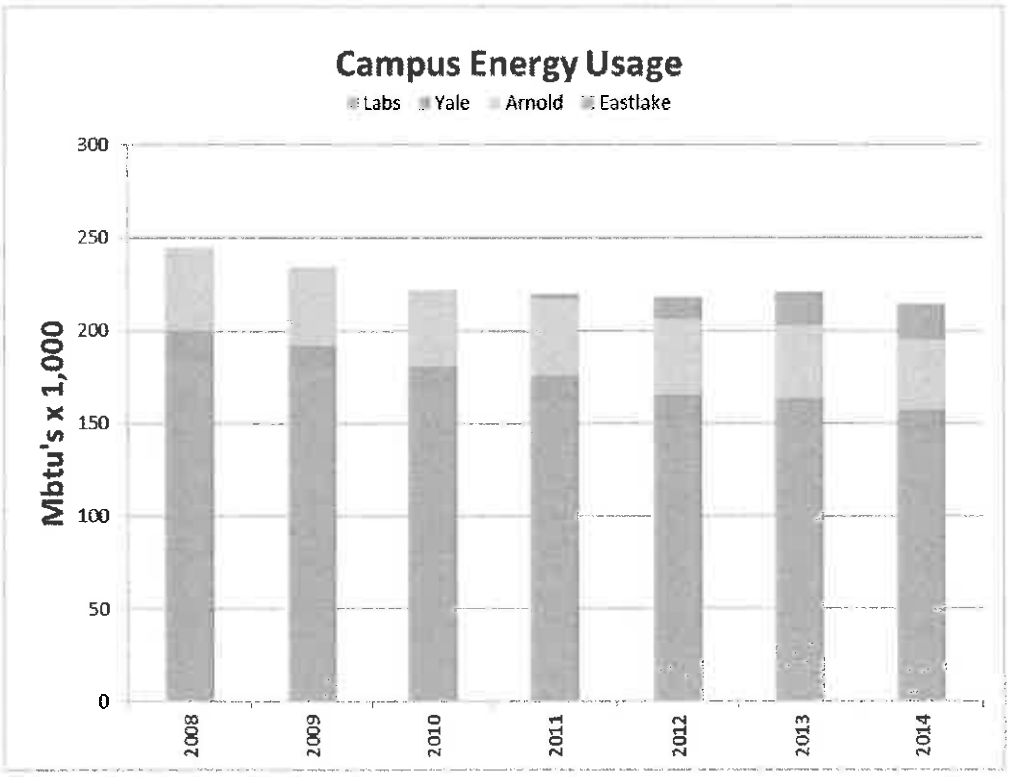


FRED HUTCH

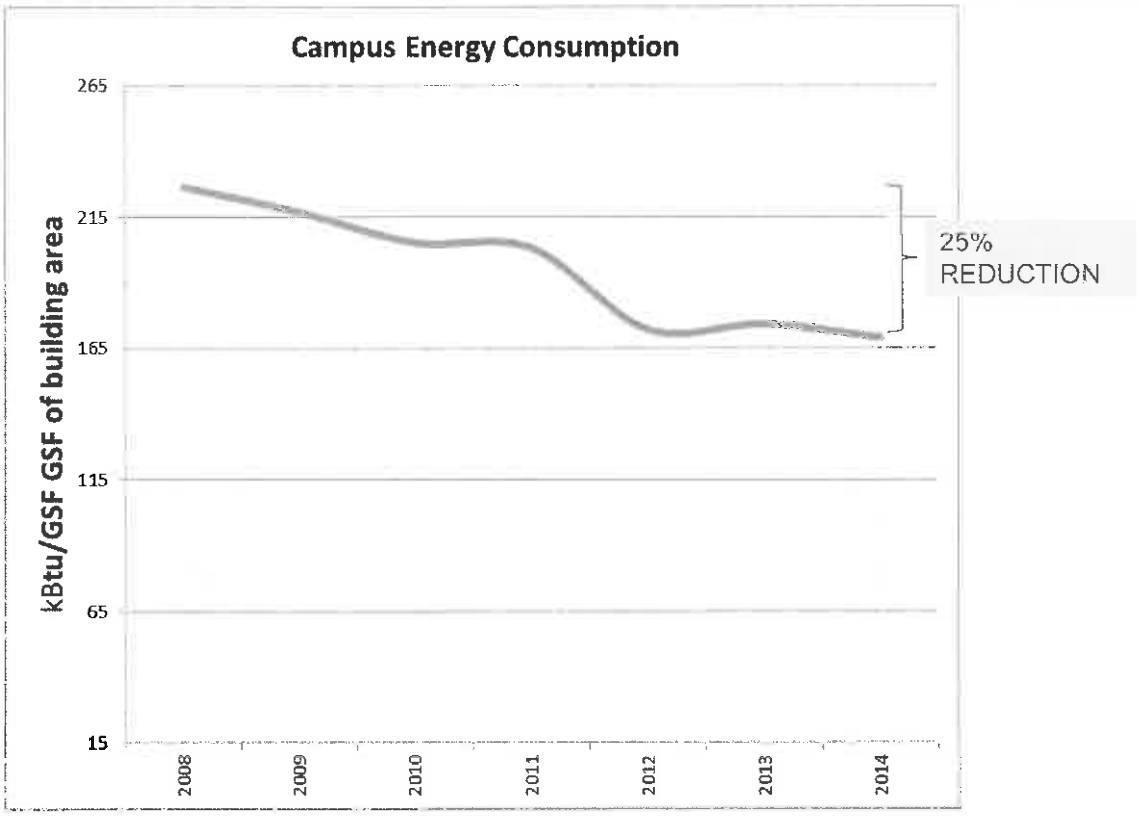
EUI



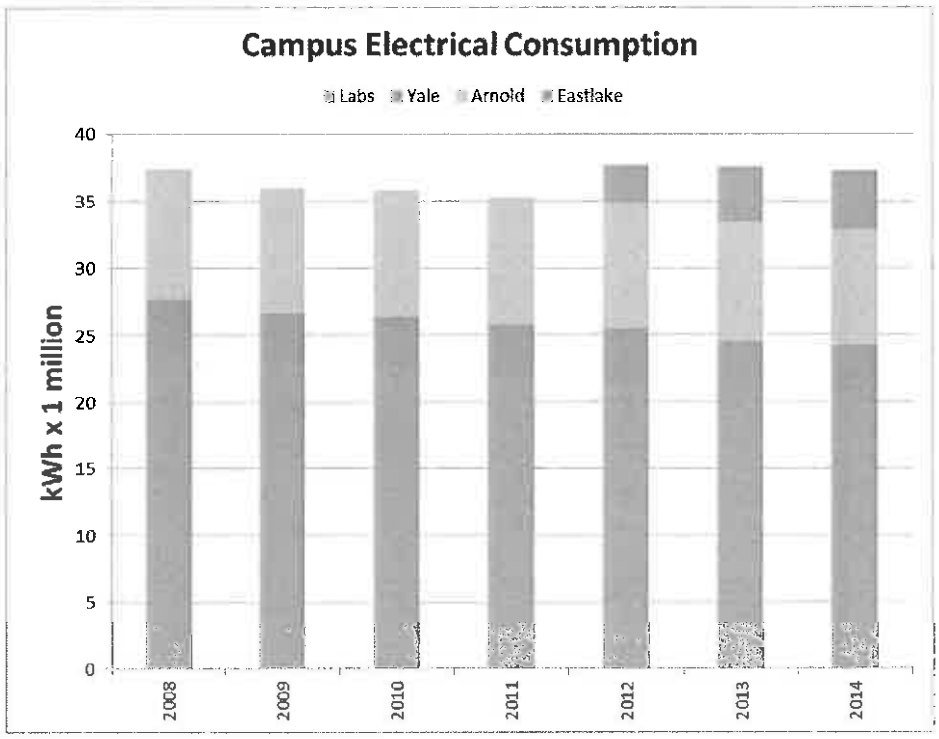
Energy



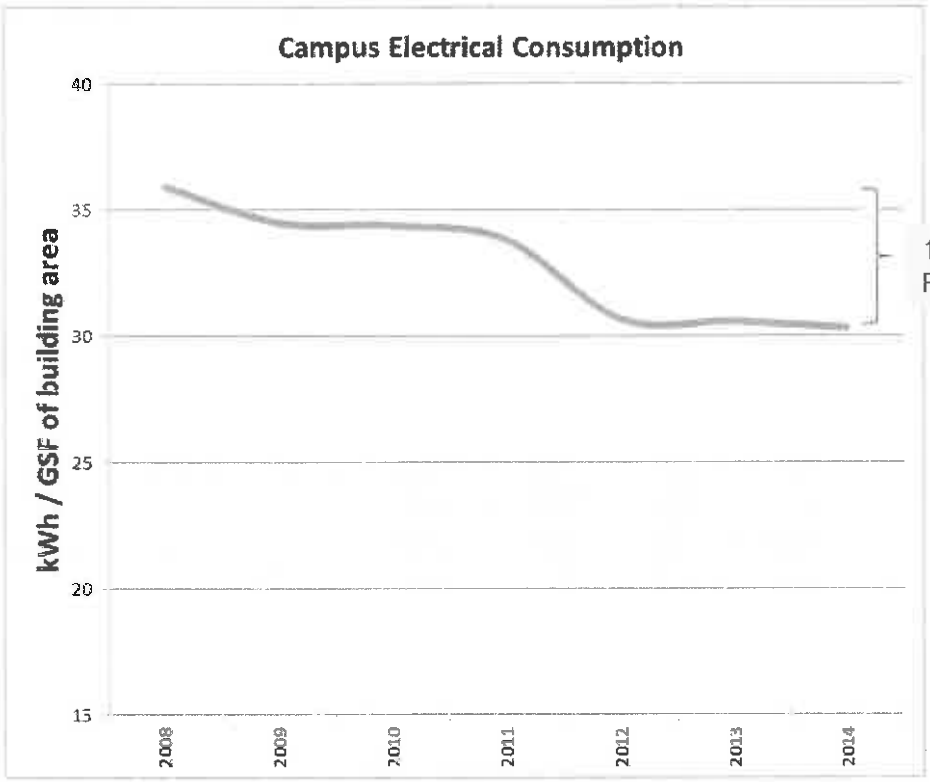
Energy



Electricity

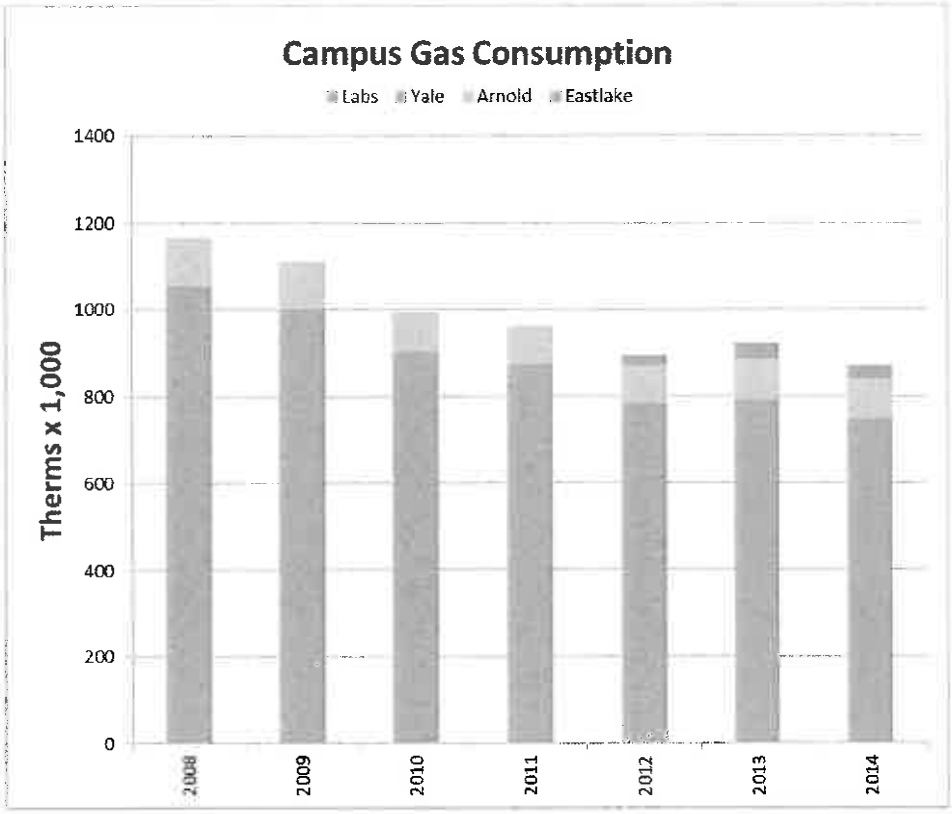


Electricity



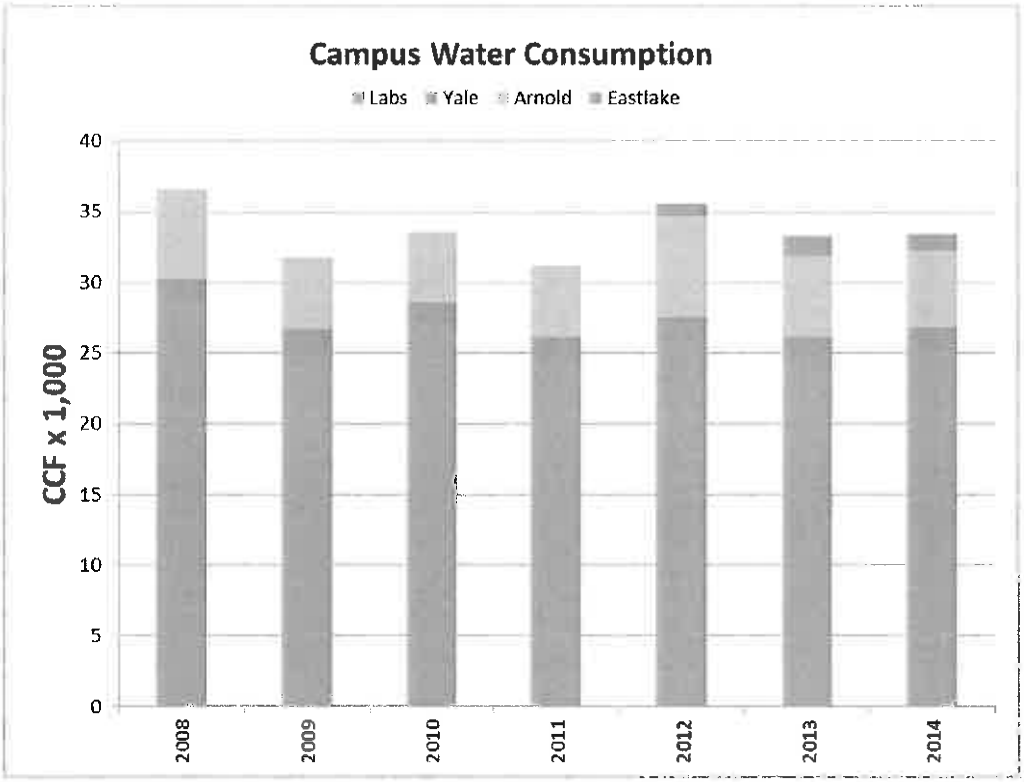
FRED HUTCH

Gas



FRED HUTCH

Water



FRED HUTCH

Fred Hutchinson Cancer Research Center

FRED HUTCH

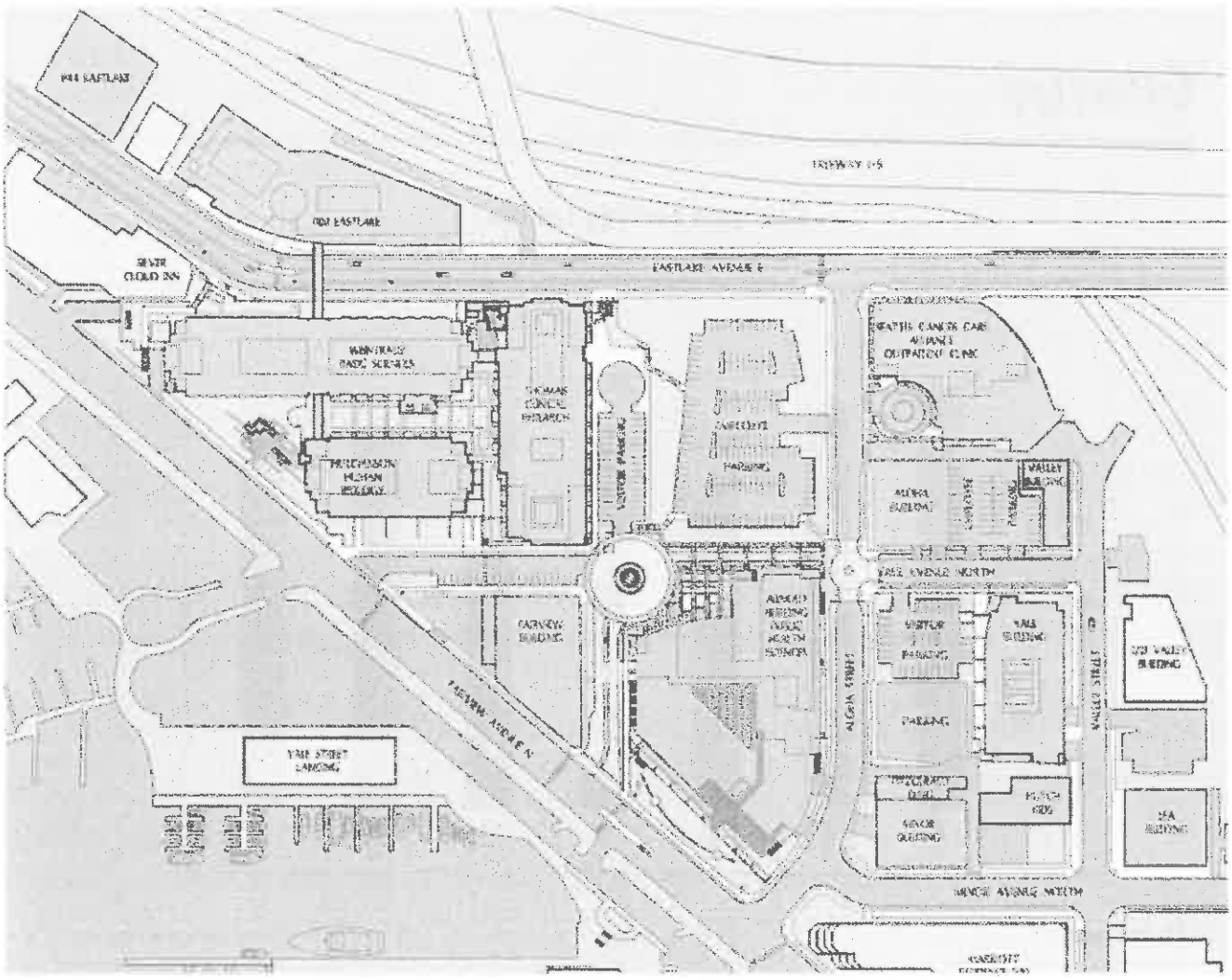
Fred Hutchinson Cancer Research Center

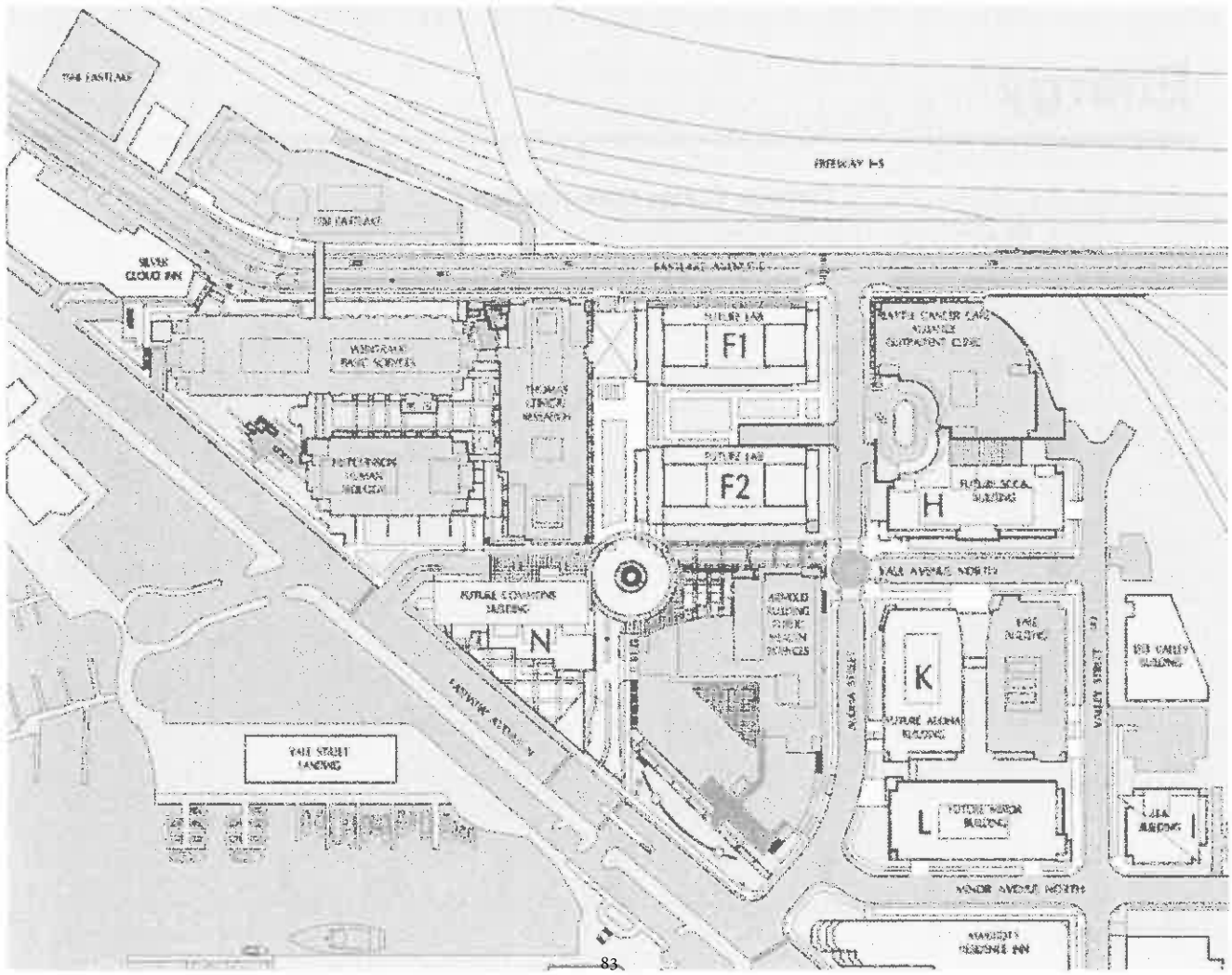
- Established in 1975
- Mission: Elimination of cancer as a cause of human suffering
- 3400 employees
  - 2600 FHCRC
  - 800 SCCA
- Occupy 1.5M GSF of building area
- South Lake Union Campus -14 acres

FRED HUTCH

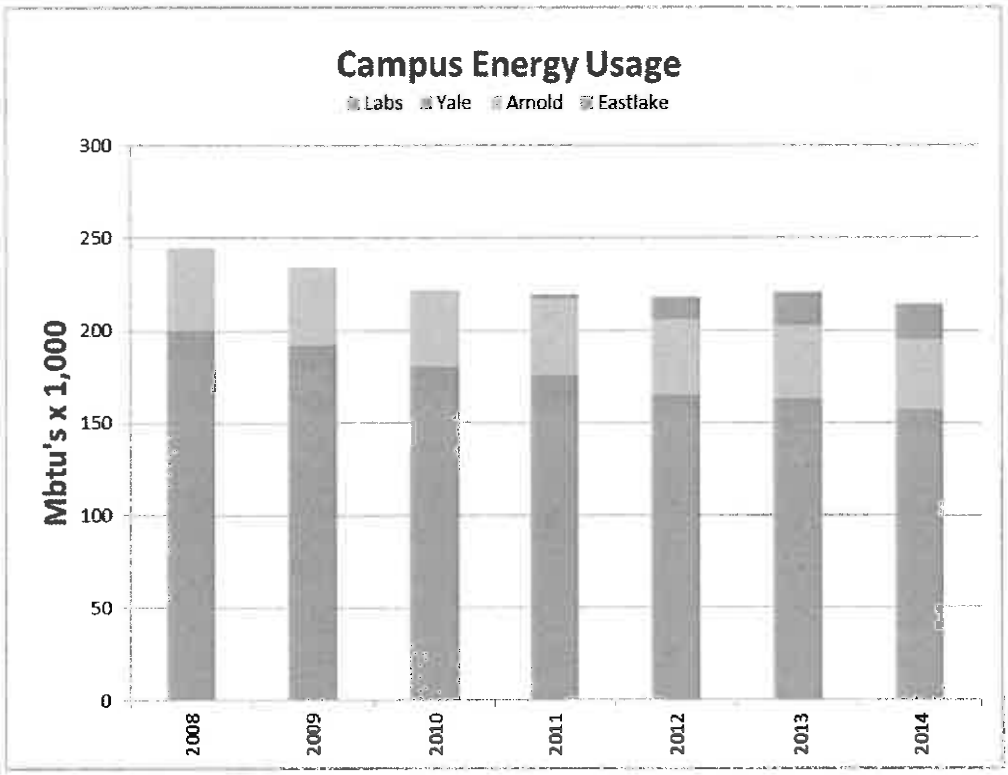
FRED HUTCH

1988


FREEWAY I-5
THE EASTLAKE
SILVER CLOUD INN
EASTLAKE AVENUE E
MINERVA BASIC SCIENCES
THOMAS CENTER RESEARCH
HUTCHINSON HUMAN RESEARCH
PARKING
SEATTLE CANCER CARE ALLIANCE OUTPATIENT CLINIC
ALDER BUILDING
VALLEY BUILDING
FAIRVIEW BUILDING
ARNOLD BUILDING PUBLIC HEALTH SCIENCES
VISITOR PARKING
YALE BUILDING
PARKING
FAIRVIEW AVENUE N
ALDER STREET
YALE STREET LANDING
MINOR BUILDING
MINOR AVENUE NORTH

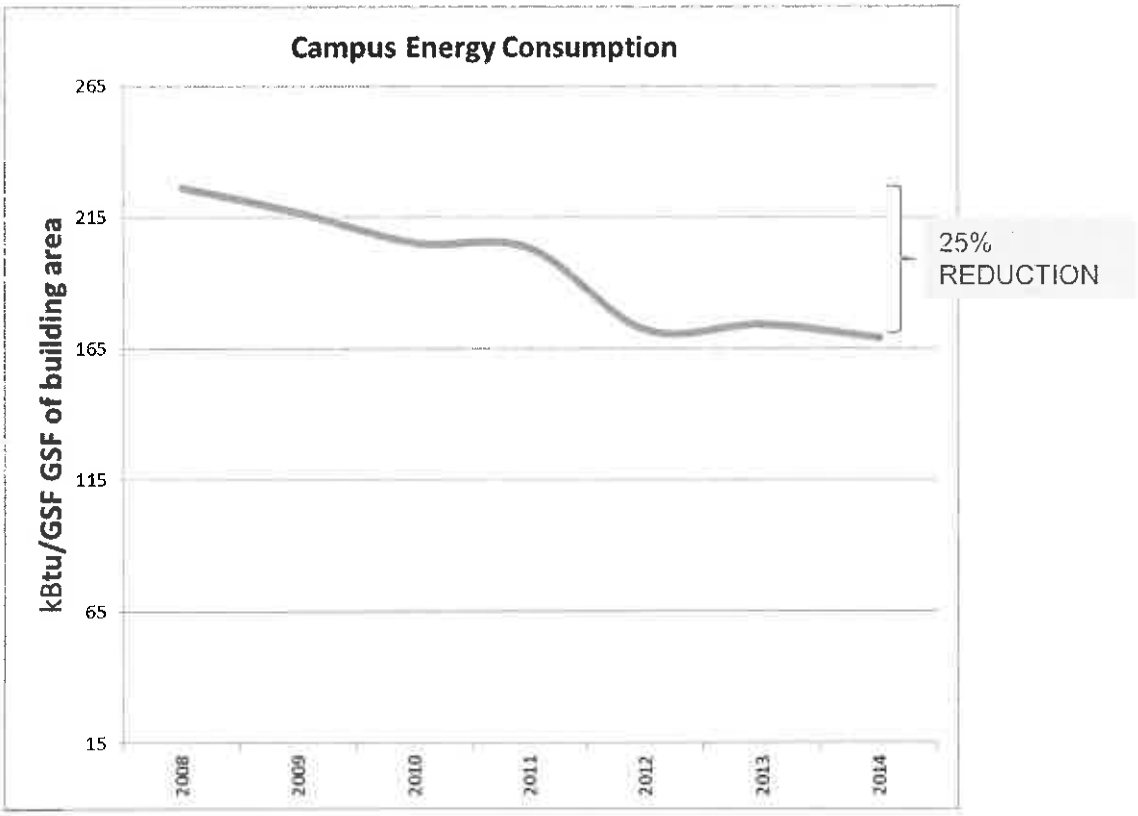

FREEWAY I-5
THE EASTLAKE
SILVER CLOUD INN
EASTLAKE AVENUE E
MINERVA BASIC SCIENCES
THOMAS CENTER RESEARCH
HUTCHINSON HUMAN RESEARCH
SILVER LAB
F1
FUTURE LAB
F2
SEATTLE CANCER CARE ALLIANCE OUTPATIENT CLINIC
H
FUTURE SCCA BUILDING
FUTURE CONDITIONS BUILDING
N
ARNOLD BUILDING PUBLIC HEALTH SCIENCES
VALE AVENUE NORTH
K
YALE BUILDING
VALLEY BUILDING
FUTURE ALDER BUILDING
L
FUTURE MINOR BUILDING
MINOR BUILDING
FAIRVIEW AVENUE N
ALDER STREET
YALE STREET LANDING
MINOR AVENUE NORTH

Energy



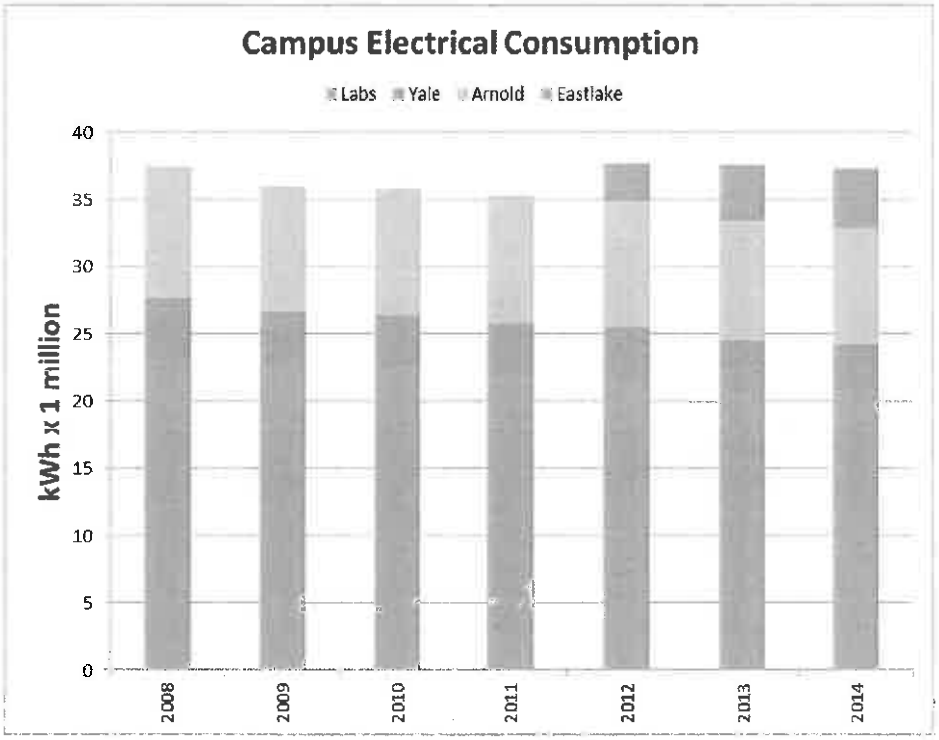
FRED HUTCH

Energy

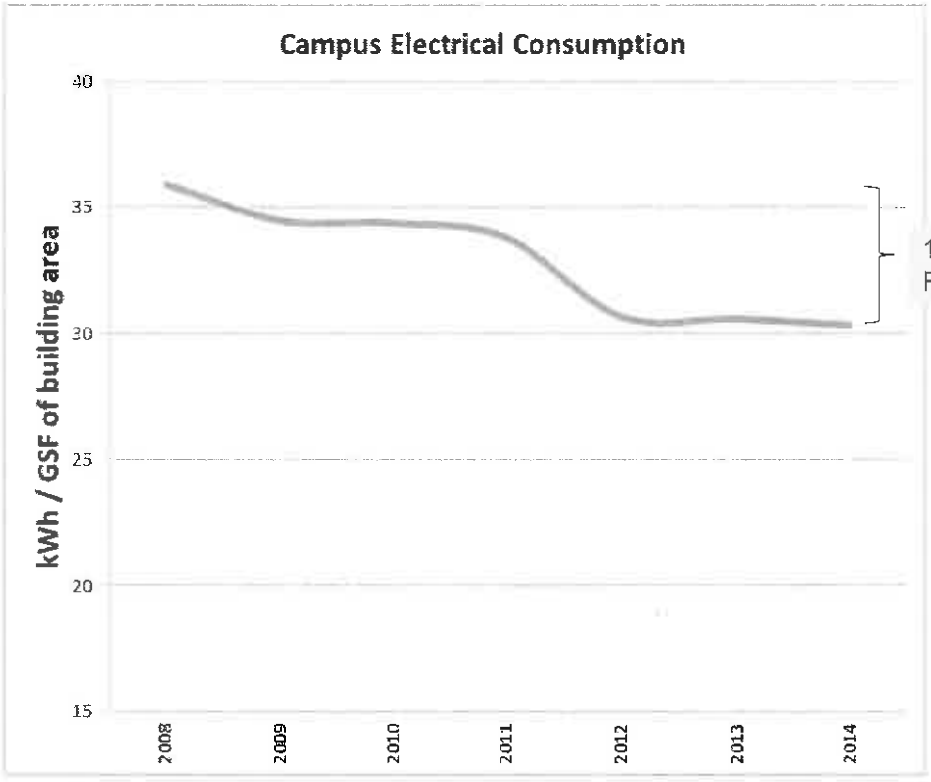


FRED HUTCH

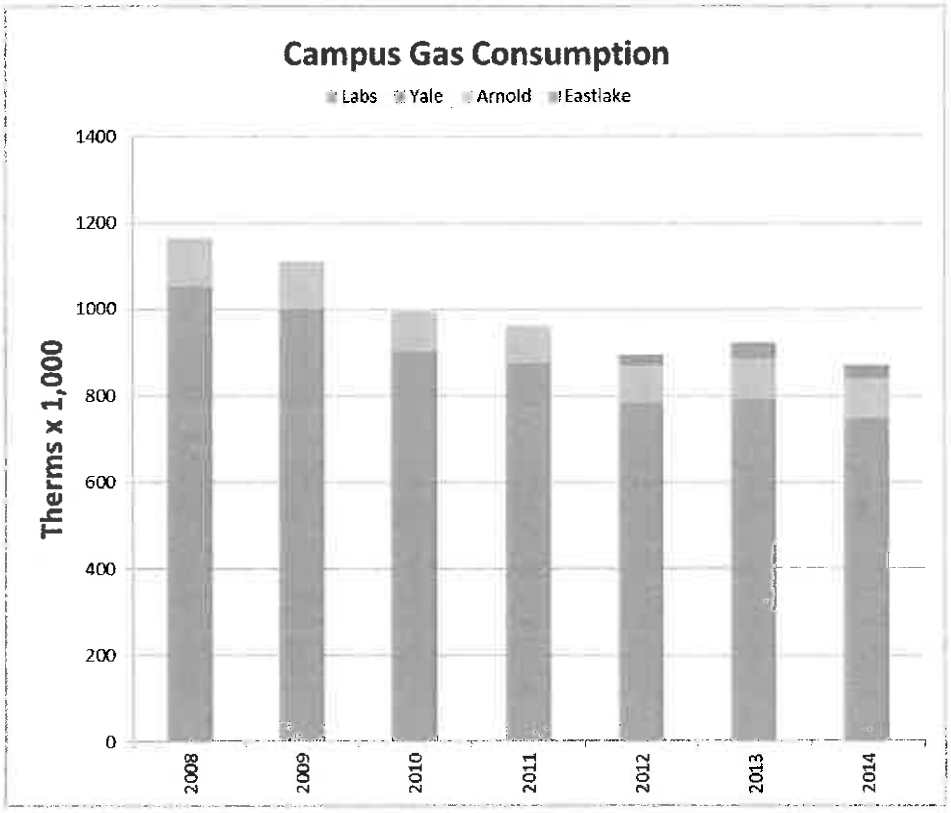
Electricity



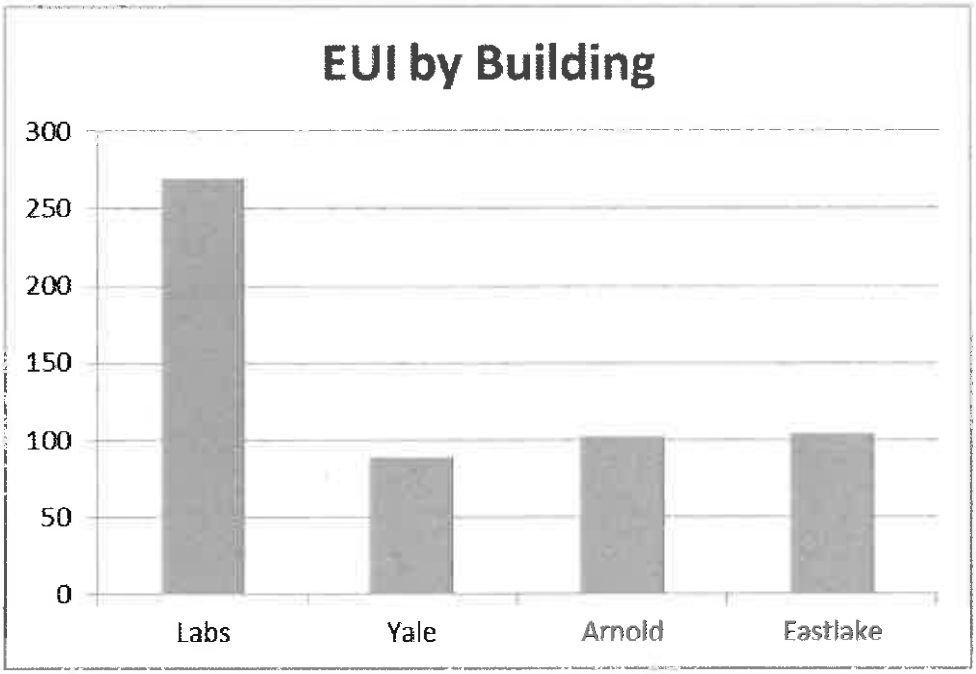
Electricity



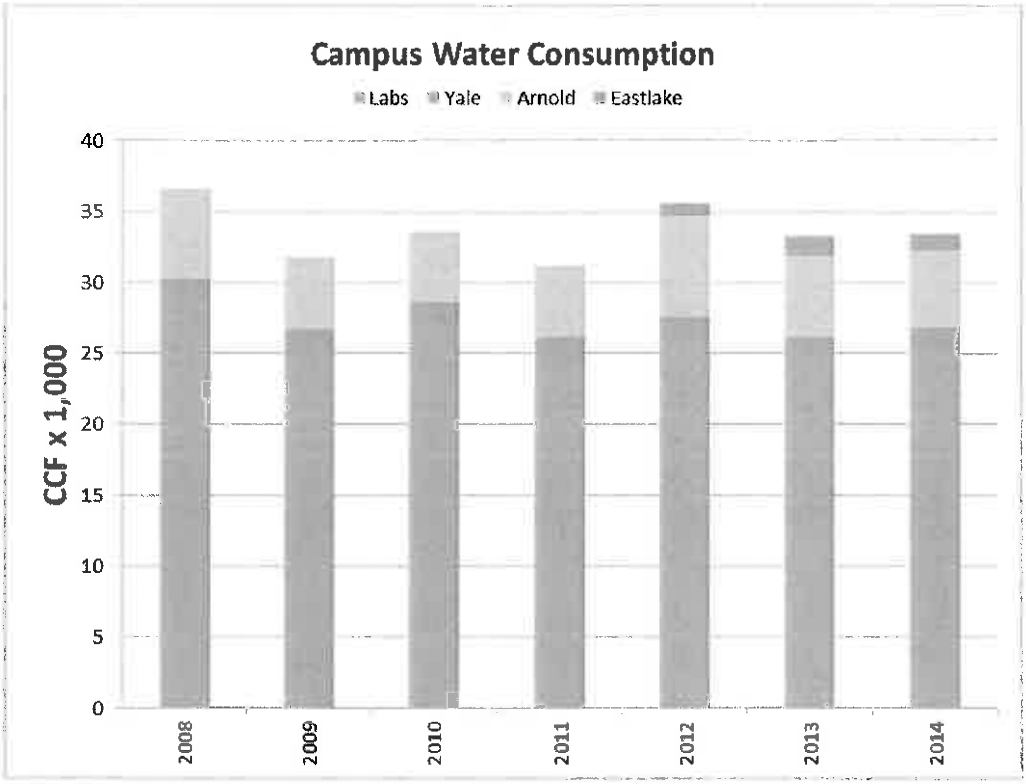
Gas



EUI



Water



FRED HUTCH

Building Size and Cost Summary

Building	Year Completed	Type	Area (gsf)	Cost ($M)*	Cost / GSF
Weintraub & Hutchinson	1993	Lab	305,000	$165	$400
Thomas	1997	Lab	229,000	$127	$441
SCCA	2000	Clinic	217,000	$116	$373
Yale	2001	Office	132,000	$50	$229
Arnold	2003	Office	372,000	$172	$296
Eastlake	2012	Office/ Lab	188,000	$86	$349
Total			1,442,000	$716	$417

FRED HUTCH

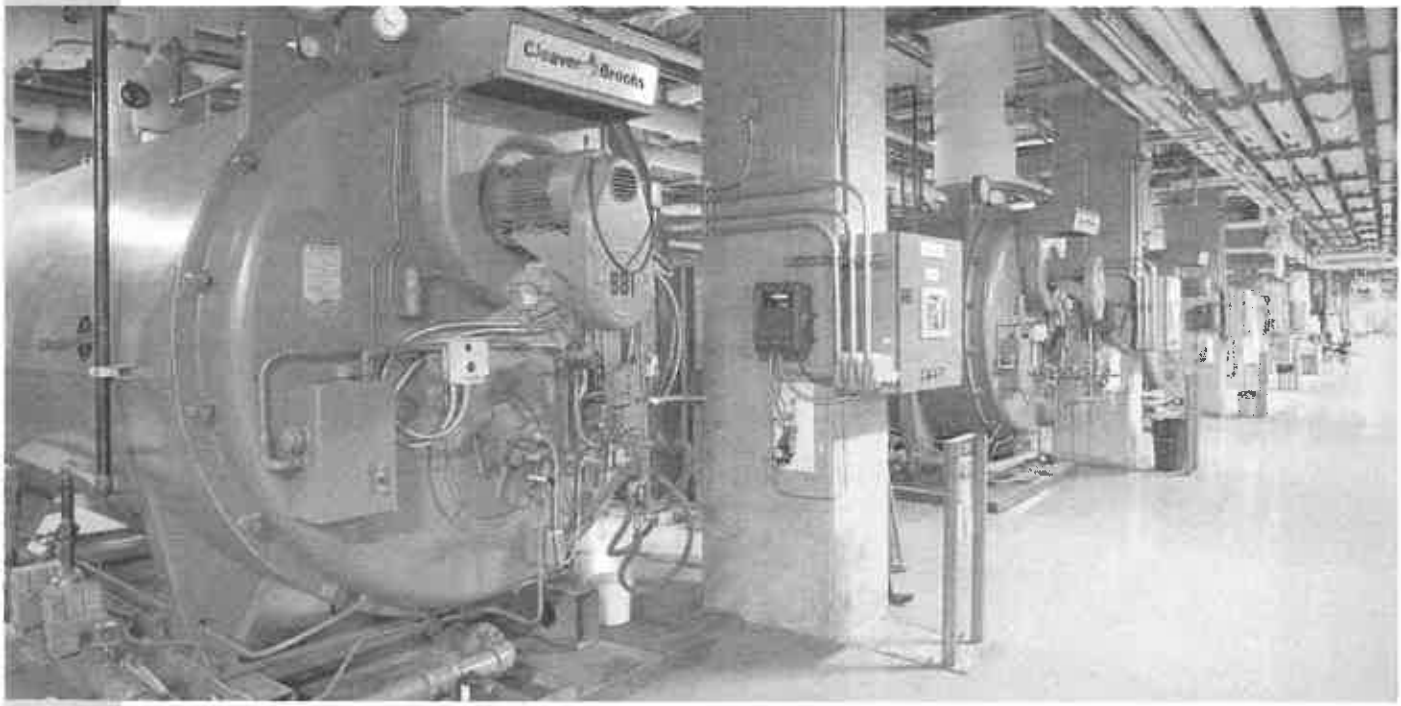
*Costs escalated to Q2 2014

Laboratory Buildings

Energy Heroes, or Energy Hogs ???

Bob Cowan, Facilities Director
Fred Hutchinson Cancer Research Center

Most of us know them as Energy Hogs



But today I'd like to introduce you to an Energy Hero, 1100 Eastlake

Today - 5 Things

- Introduce you to the Fred Hutchinson Cancer Research Center
  - A World Famous Cancer Research Center
- Give you a virtual tour of the Eastlake Building
  - A beautiful facility 45% lab
    - BL2/3 Suite, Mass Spec Tissue Culture, Cold Rooms, Bio Safety Cabinets, Fume Hoods, D.I. Water, Lab Air, Vac, etc.
    - 75+ freezers
  - Has a 750 KW Data Center
    - A CEO of a server hosting site called it "The best Data Center he has ever seen"

Also

- The fascinating story of Eastlake
  - Existing shell
    - Bought (on short sale) prior to foreclosure
      - Pennies on the dollar
    - Immediately adjacent to the Fred Hutch Campus
  - 19 months from Purchase to move in
    - 8 months from start of construction
  - Pretty Reasonable cost (includes land cost)
    - Lab Space $459/sq. ft.

And

- Demonstrate how Energy Efficient it is
  - EUI of 100
  - 39% more energy efficient than the average new NW Lab
    - 25% better than the best
  - Uses less energy than an office building
    - Despite being 30% larger
  - Has a Data Center PUE (Power Utilization Effectiveness) of less than 1.05

And if you are still awake

- We'll tell you how we did it
  - 7 key Strategies
  - Show you how they apply to the Data Center
- Make the Bob Bet
  - If you already have everything I'll show you and then some
    - I'll buy you a beer
  - If you learn something new
    - You buy me a beer

Fred Hutchinson Cancer Research Center

- World Famous Cancer Research Center
- 15 Buildings (1 LEED)
  - 1.6 Million Square feet
  - 4,000 employees
    - 3 Nobel prize winners
- Sunny Shores of South Lake Union


Flexibility, Reliability, Sustainability,
Innovation, Savings

And we use a lot of energy, $ 4.5 million+, last year (@ $.06/kWh)

But We Also Believe in Energy Conservation

- We aren't trying to win the title of the largest energy consumer in Seattle
- Since 1993:
  - 180 Energy Conservation Projects
  - Saving $2.4 million annually
  - Savings to date over $ 25 million dollars
    - Making us the largest donor to the Center

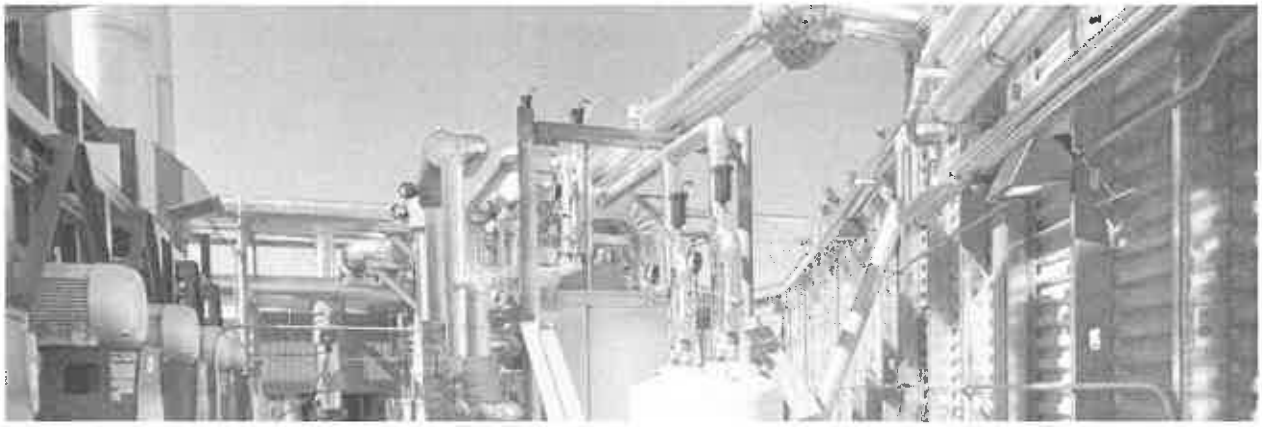
In Fact – Compared to our base year 2007 we've cut consumption (Lab buildings) 21%

Fred Hutchinson Cancer Research Center, Weintraub/Hutchinson/Thomas
Energy Use Report – 01/2014 thru 07/2015

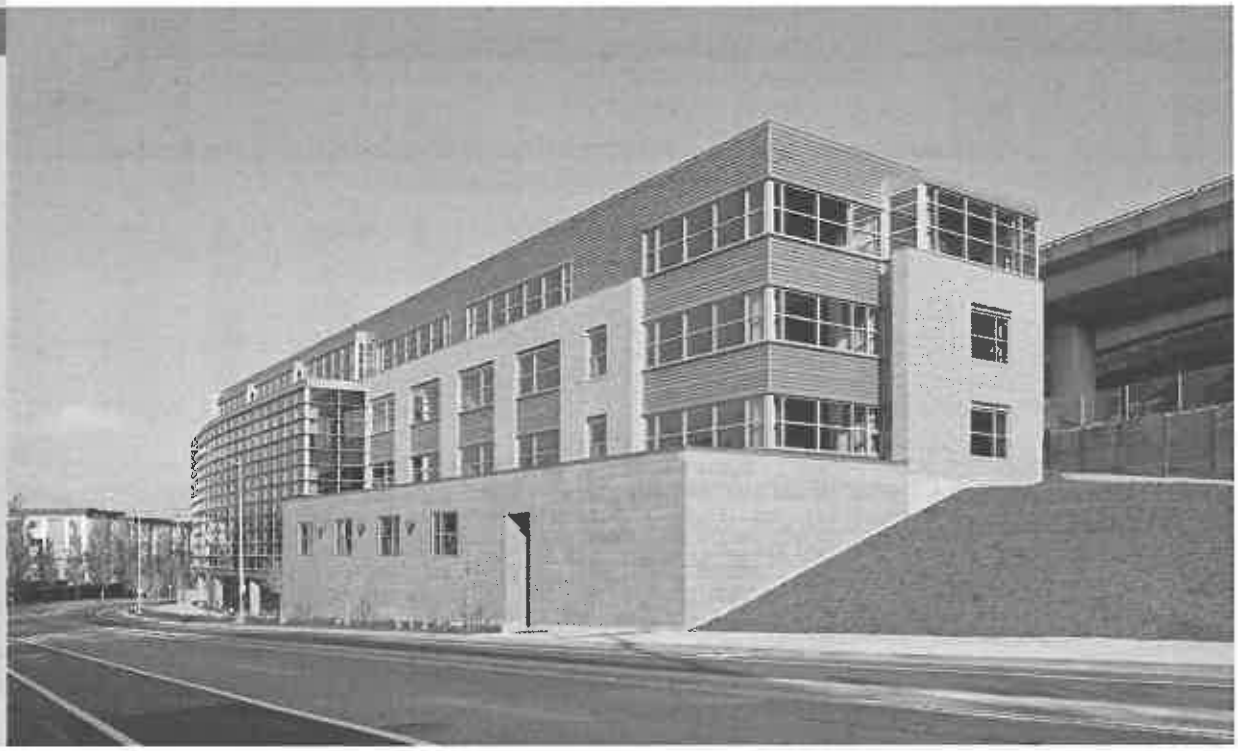
Date	Electricity (kWh)	% Chg	Demand (kW)	% Chg	Natural Gas (Therms)	% Chg	Total Energy (MBtu)	% Chg	Annual Usage Trend	% Chg
01/14	1,641,889	- 10.9	2,899	- 13.9	101,406	- 26.5	15,742.7	- 21.6	12,324.3	- 19.8
02/14	1,505,603	- 14.4	3,228	- 8.5	103,388	- 1.0	15,475.9	- 5.9	12,445.2	- 19.0
03/14	1,668,455	- 11.6	3,228	- 8.5	79,920	- 31.0	13,684.8	- 24.0	12,403.3	- 19.3
04/14	1,674,906	- 9.7	3,746	- 2.5	63,366	- 38.1	12,051.4	- 27.3	12,385.2	- 19.5
05/14	1,814,707	- 9.3	3,746	- 2.7	42,757	- 38.6	10,467.5	- 24.1	12,320.5	- 19.8
06/14	1,800,578	- 9.5	3,780	- 34.4	32,842	- 41.0	9,407.8	- 23.6	12,277.5	- 20.1
07/14	1,975,405	- 9.8	3,941	- 11.1	28,172	- 44.1	9,557.3	- 23.7	12,260.4	- 20.2
08/14	1,998,034	- 8.1	4,006	- 9.7	27,297	- 44.9	9,547.0	- 22.8	12,288.9	- 20.0
09/14	1,831,390	- 8.3	4,006	+ 14.6	35,698	- 25.7	9,819.5	- 15.5	12,304.1	- 19.9
10/14	1,791,003	- 8.5	3,547	- 21.2	44,325	- 42.8	10,543.4	- 26.9	12,210.4	- 20.5
11/14	1,588,522	- 12.4	3,029	- 31.2	83,458	- 1.8	13,759.0	- 6.2	12,231.9	- 20.4
12/14	1,583,960	- 10.6	3,043	- 33.0	92,892	- 40.2	14,693.6	- 31.9	12,062.4	- 21.5
Annual Total	20,872,451	- 10.2	4,006	- 30.5	735,320	- 30.0	144,748.8	21.5		
01/15	1,614,690	- 12.4	3,043	- 9.6	87,737	- 36.4	14,283.0	- 28.9	11,940.8	- 22.3
02/15	1,455,351	- 17.2	2,974	- 15.7	63,092	- 39.6	11,274.8	- 31.4	11,590.7	- 24.6
03/15	1,626,953	- 13.8	3,144	- 10.8	66,449	- 43.5	12,096.1	- 32.9	11,458.3	- 25.4
04/15	1,569,503	- 15.4	3,163	- 17.7	64,089	- 37.4	11,764.1	- 29.0	11,434.3	- 25.6
05/15	1,732,841	- 13.4	3,703	- 3.8	39,200	- 43.7	9,832.5	- 28.7	11,381.4	- 25.9
06/15	1,657,097	- 8.6	3,965	- 31.2	31,454	- 43.1	9,461.8	- 23.0	11,387.6	- 25.9
07/15	1,951,407	- 10.9	3,965	- 10.6	29,373	- 41.7	9,695.5	- 23.3	11,390.6	- 25.9
YTD Total	11,807,842	- 12.7	3,965	- 31.2	380,395	- 40.2	78,327.9	28.6		

We've learned a lot of lessons along the way

- And we applied (some of) them to Eastlake



Beautiful Facility

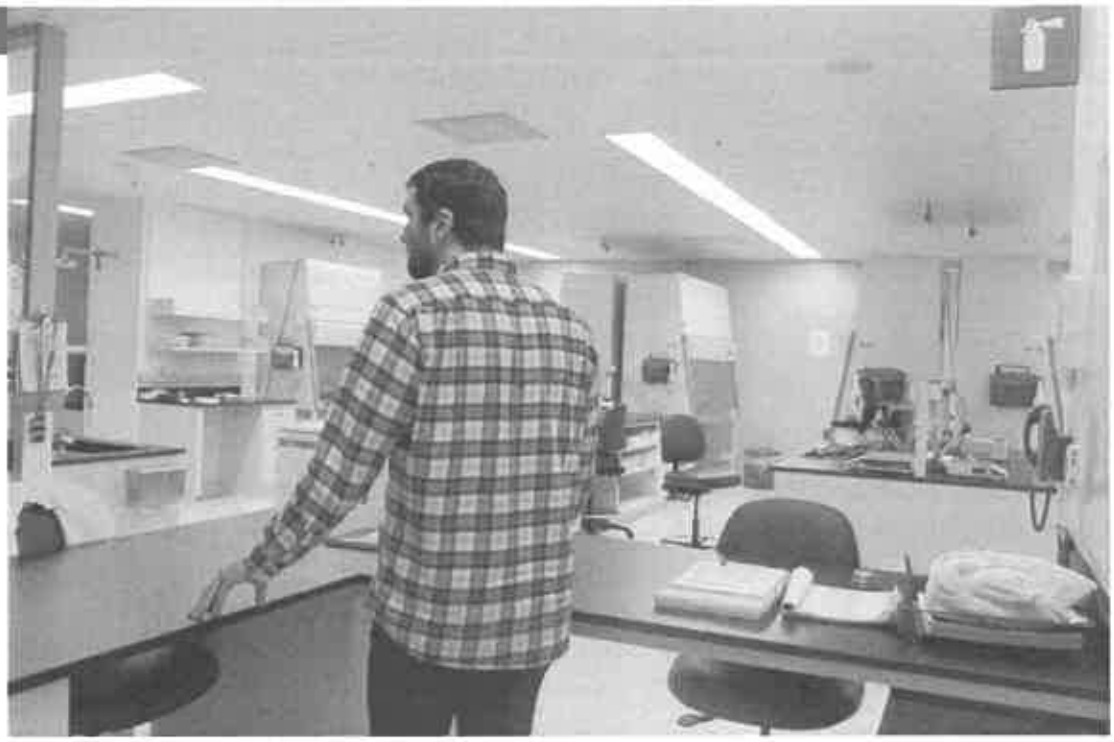


Lots of great labs

Huge Labs, Multiple PI's

Post Doc's and Tech's outside of Lab

Validated Labs



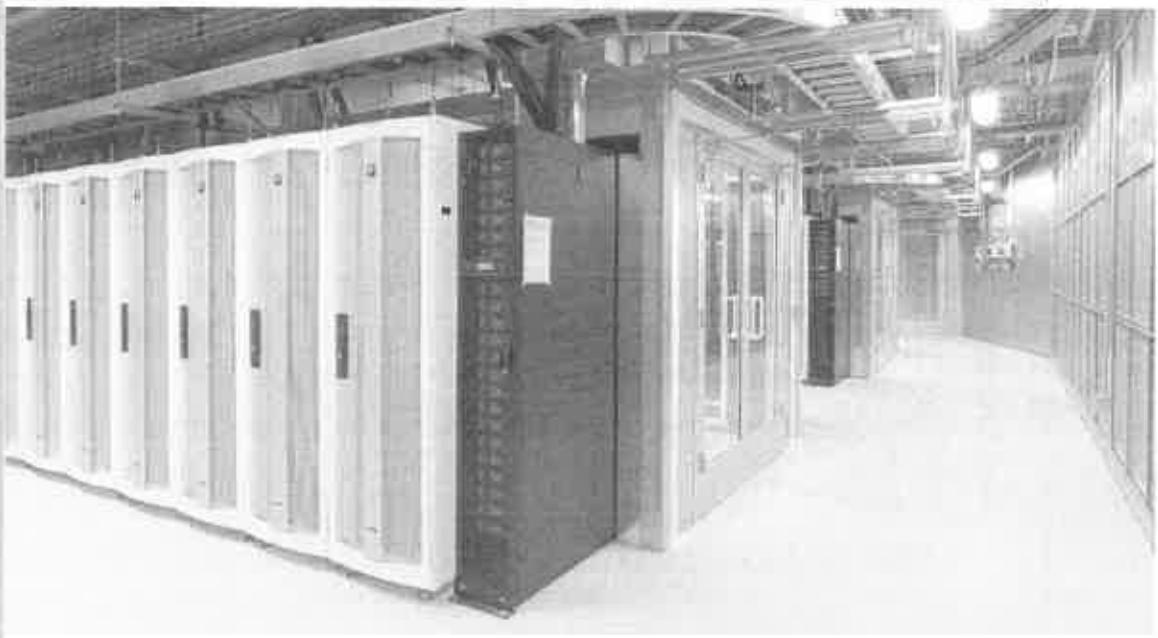
Mass Spec

BL2/3 Suite

Freezers everywhere (100+)

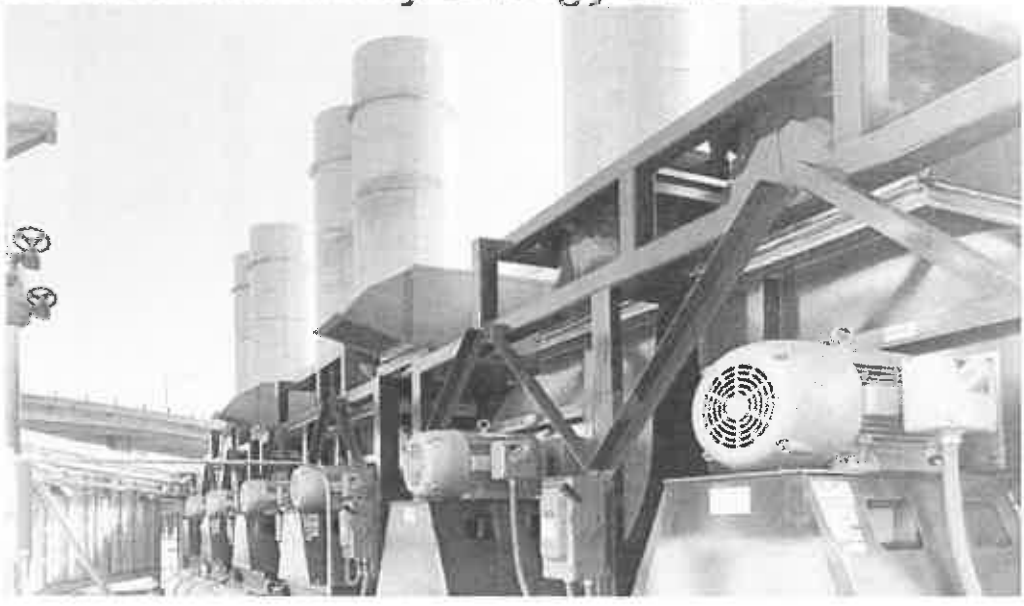
Not Just Labs - Fantastic Offices, Cubes and Collaboration spaces

It also has a World Class Data Center



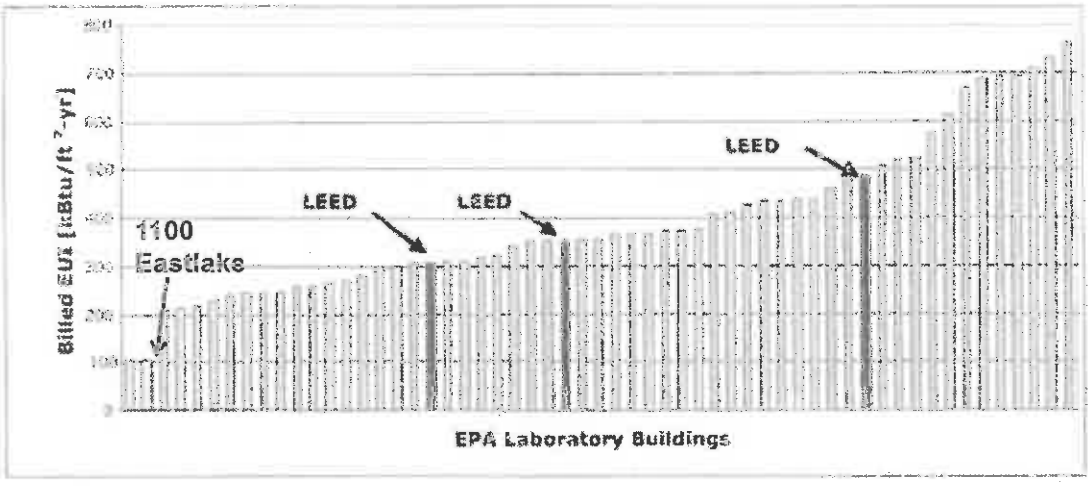
It's not just Beautiful and Functional

It's also extremely Energy Efficient

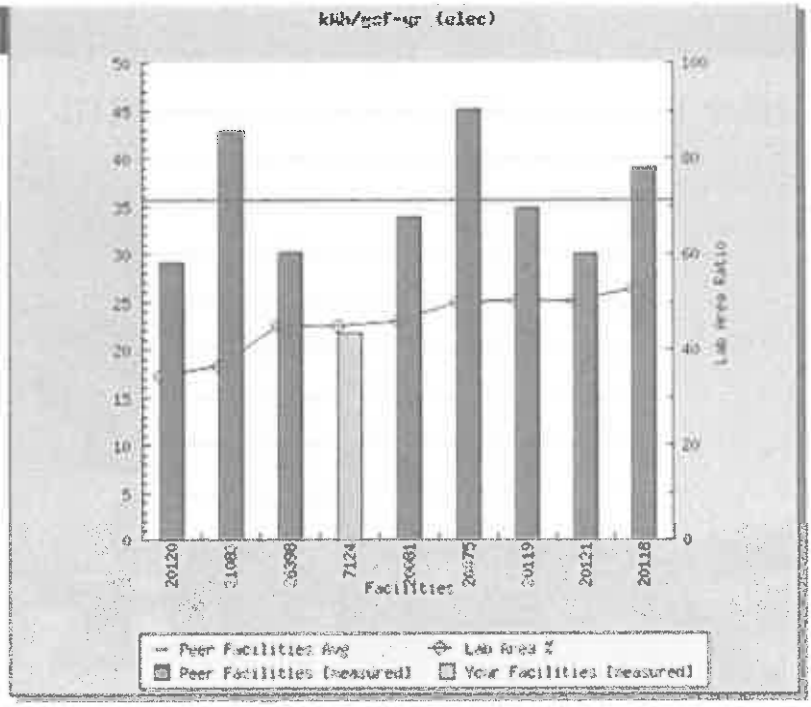


One of the most Energy Efficient Laboratory buildings in the World

Billed Energy Intensity (EUI) for 57 EPA Laboratory Buildings, Showing the Three LEED Laboratories

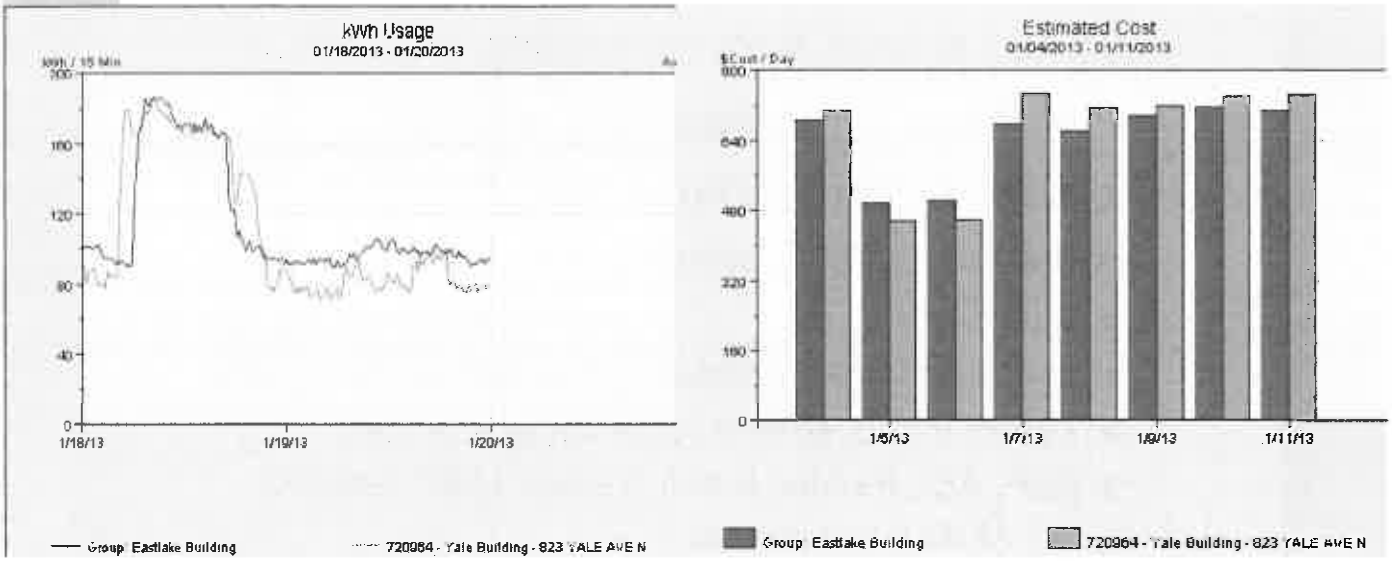


Compared to other labs in the NW: 39% better than avg, 25% < best



Uses less Energy than an (energy star) office building (Yet 45% Lab)

- And its 30% bigger than the office building



A Facility that has a Data Center with a PUE of less than 1.05

Fred Hutchinson Cancer Research Center

PUE
1.04

It's a pretty amazing building (but it's got a boring name)

- The building was purchased just prior to Foreclosure
  - We had to work from an existing footprint
- Construction time was 8/9 months
  - Total time from purchase date 20 months
  - 3 design teams, 3 construction contracts
    - Data Center
    - Shell and Core upgrades (made building lab ready)
    - Tenant improvements (built out labs/offices
    - ZGF, AEI, Perkins & Will, Turner, UMC, SASCO
      - All did a fantastic job

Cost - Pretty Reasonable

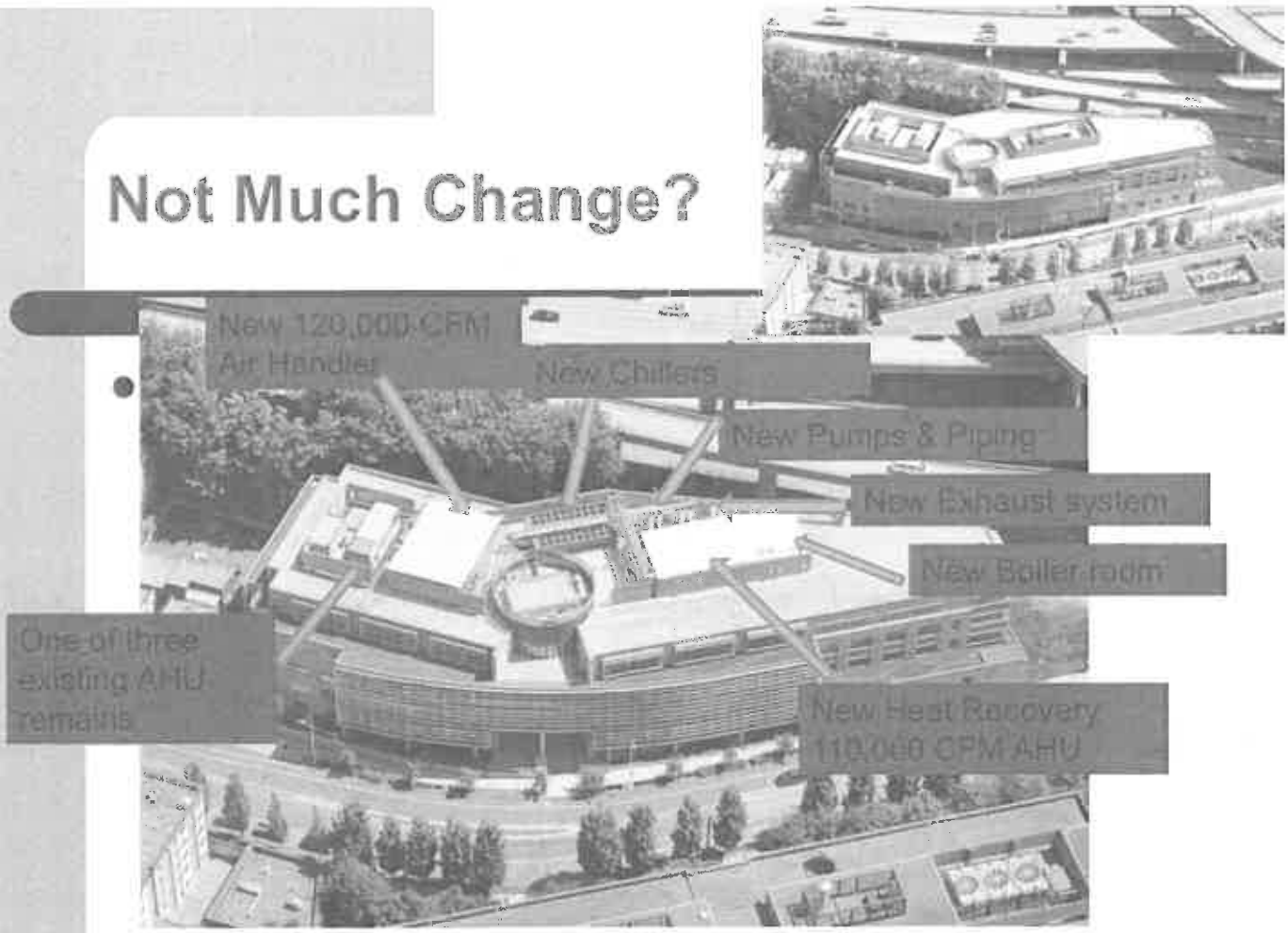
- $459/sq. ft.. for Lab (including land)
  - $ 203/sq. ft. Building (included land)
  - $ 69 / sq... ft. (Shell and Core Upgrades)
  - $ 91/ sq... ft. Office (Tennant Improvements)
  - $ 187 sq... ft. Labs (Tennant Improvements)
  - $ 928/ sq... ft. Data Center

But the Construction time was amazing, 8 months from start -

To first Lab move in

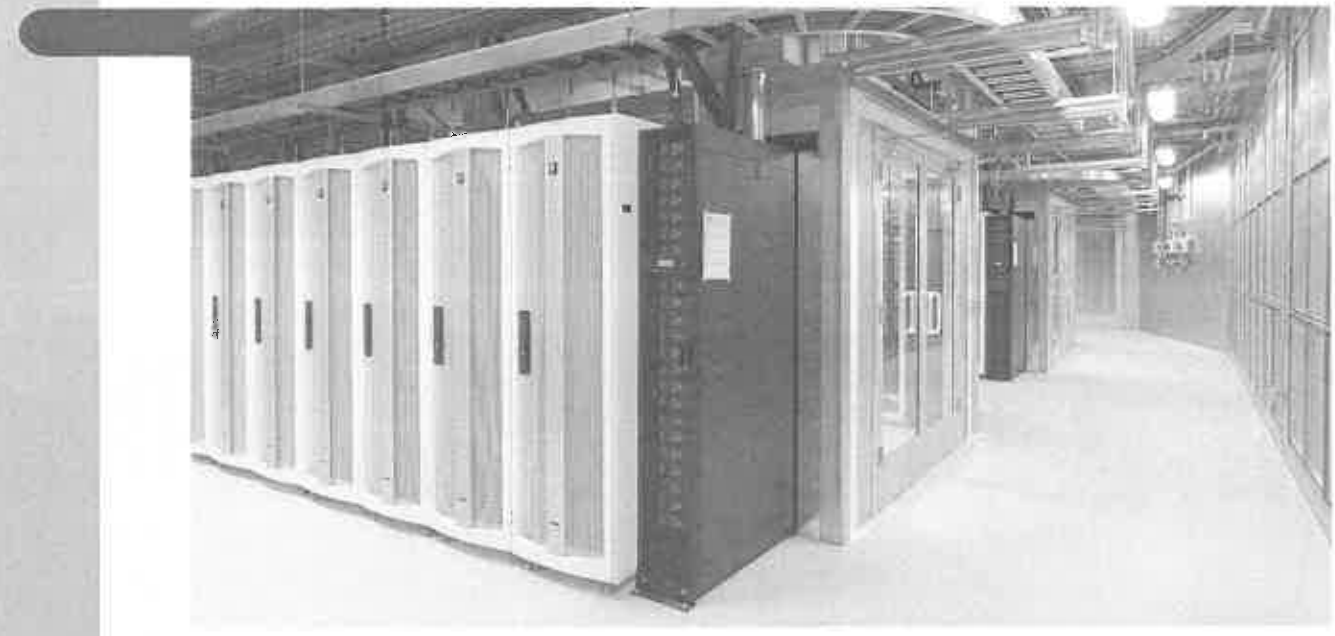
Shell and Core Upgrades, 8 months

Not Much Change?



Simultaneously, we were building a Data Center

In 8 Months -- We went from an empty shell to a World Class Data Center (750 KW)



Tenant Improvements going on at the same time - (8 to 9 months)

The Occupants love it (and that could have been our Happy Ending)

But That wasn't our Happy Ending

- The end of the Construction Cycle is really just the start of the Story
  - We can all build world class labs in 8 months for under 500 dollars per sq. ft.
- Our Happy Ending is the Super Energy Efficiency of the Facility
  - Because that's the story that keeps on going
    - The fact that Bob is paying $25 K per month for all utilities for the entire 177,000 sq./ft. building ($1.70/sq ft/yr)
      - Less than we were paying to lease server space off-site for some of the servers in the Data Center

7 Key Strategies

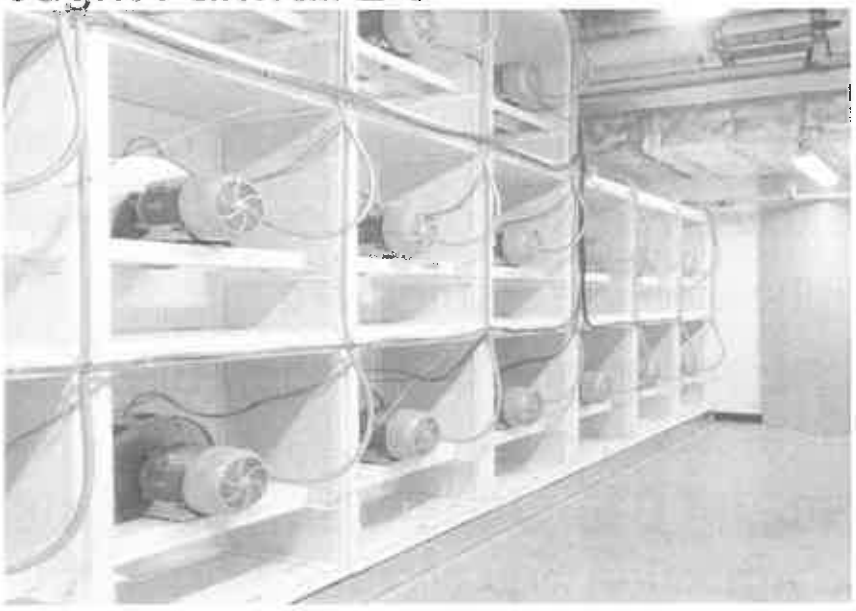
- Deliver the Energy as efficiently as possible
- Deliver the Energy just in time
- Deliver just the right amount of Energy
- Take Advantage of Excess Energy
- Right-size the Equipment
- Take advantage of Temperate Climate in Puget Sound
- Educate Users/Operators, Constantly Commission and Monitor

Deliver the Energy As efficiently as possible

- 80 plus VFD's
- Dampers bypass unneeded coils to reduce static pressure
- Modular Chillers
- Energy Efficient UPS
- Pulse Purge heated compressed air dryer
- LED task lighting - 10 W per task light
- But my favorite and the wave of the future is:

Optimization Programs

- We bought Fanwall 2.0



Deliver the Energy Just in Time

- Emergency Lights come on only in Emergency
  - Don't have 25% of lights on all the time
- Occupancy Sensors in all common areas
  - Conference rooms, break rooms, copy rooms
- Two level Vacancy Sensors in all offices
- Two level lighting in Cube area
- Air Exchange Rate tied to when the lights are on
- Zone overrides for after hour operation

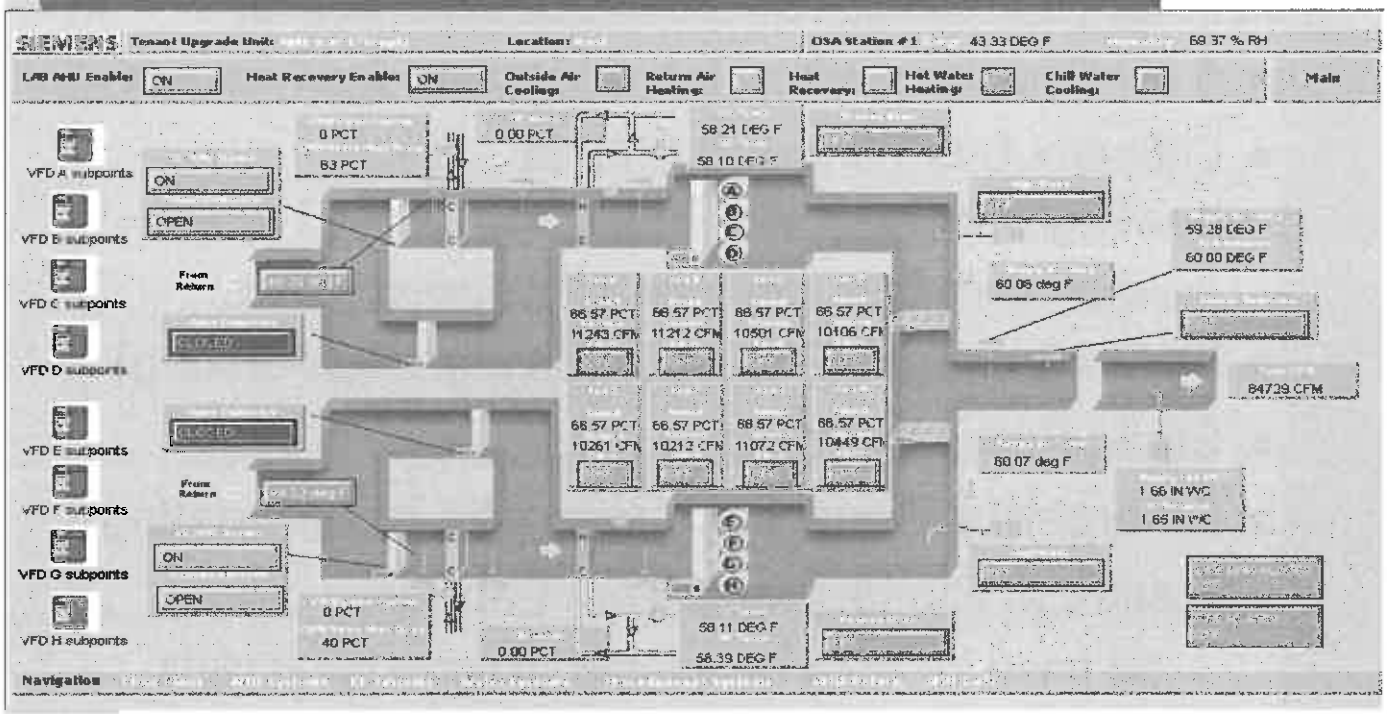
Deliver Just the Right Amount

- 6 Air Changes when lab occupied, 2 when not
- Office/cubes zoned (5,000 sq... ft.) heating/cooling
  - After hours only space needing energy gets it
- Lighting intensity sensors (daylight harvesting)
- Static Pressure reset
- Emergency Generators minimize block heating
- Electrical Closets feed from Lab Air
  - No need for office air handler to come on at night

Take advantage of Excess Energy

- Excess heat from electrical rooms and office return air to preheat lab air supply (huge)
- Heat recovery from lab and fume exhaust system (huge - it can be 40 degrees outside and bypass heating valves are closed)
- Heat from Data Center to preheat Data Center Air (huge and no heating coil for less static pressure)

84,000 CFM, 43 degree outside air, Heating valves closed????

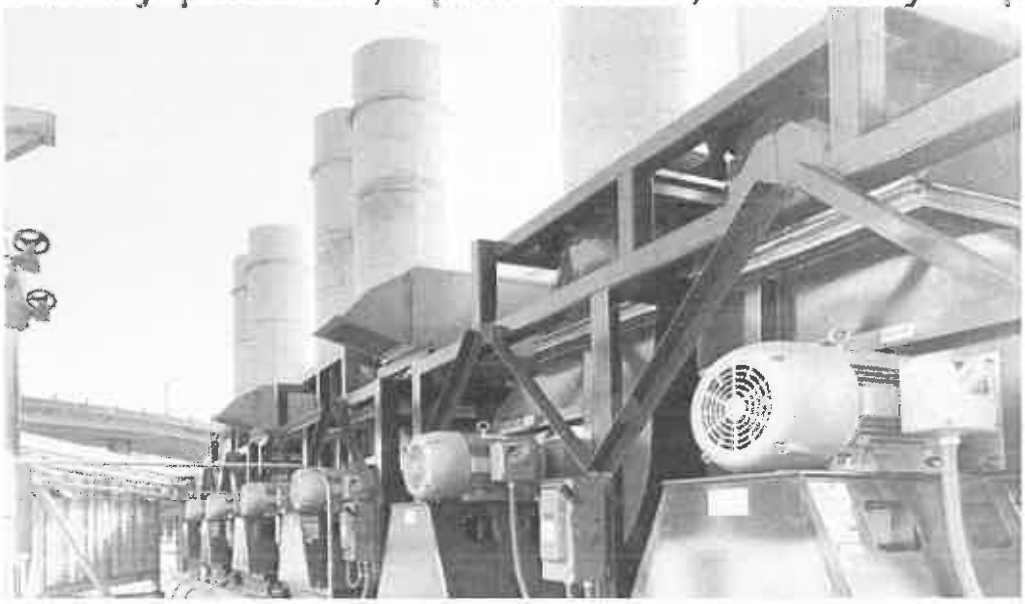


Right Size the Equipment

- Combined Fume Exhaust/Lab Exhaust
- Multiple fans for Exhaust system
- Fan Array Walls for Supply and Exhaust
  - In Data Center
- Modular Condensing Boilers
  - With room for future expansion
- Small Hot Water Boilers (lab and domestic)
  - With room for future expansion
- Point of Use hot water system

6 small exhaust fans vs. 2 large, no oversizing

- No by-pass air, optimization, reliability improves



Take Advantage of the Temperate Climate in the Puget sound

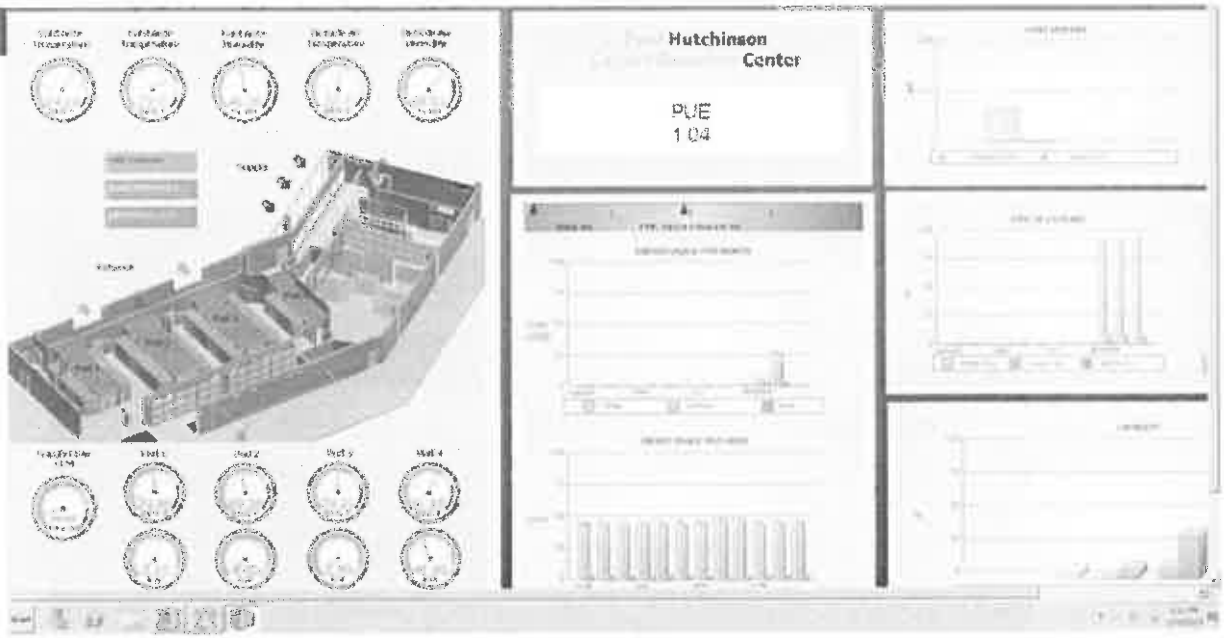
- Data Center uses 90% "free" outside air cooling
  - 8% Evaporative cooling, 2% Mech cooling
- Oversize coils for free cooling of CRAC units in UPS room
- Design Day in Puget Sound is Different
  - Reduced heating/cooling requirement for 100% outside air lab system allows downsizing of everything
  - Chillers to Ducts to Transformers
  - Savings cascade at multiple levels

Education, Commissioning, Monitoring

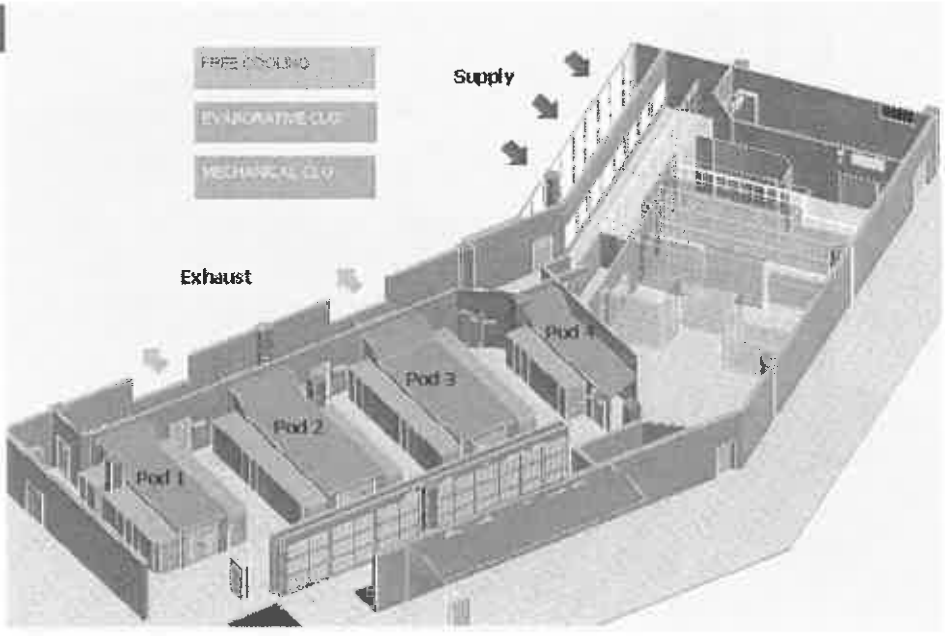
- Classes for Operators and Occupants
  - 600 hours of Operator training
  - 4 Classes for occupants
- Building User Guide
- Commissioning
  - 13 After hours walk throughs
    - Making sure systems were truly off at night

Our Commissioning Concept includes the In-house team

These strategies come together in the Data Center



Started with Free Cooling 90%

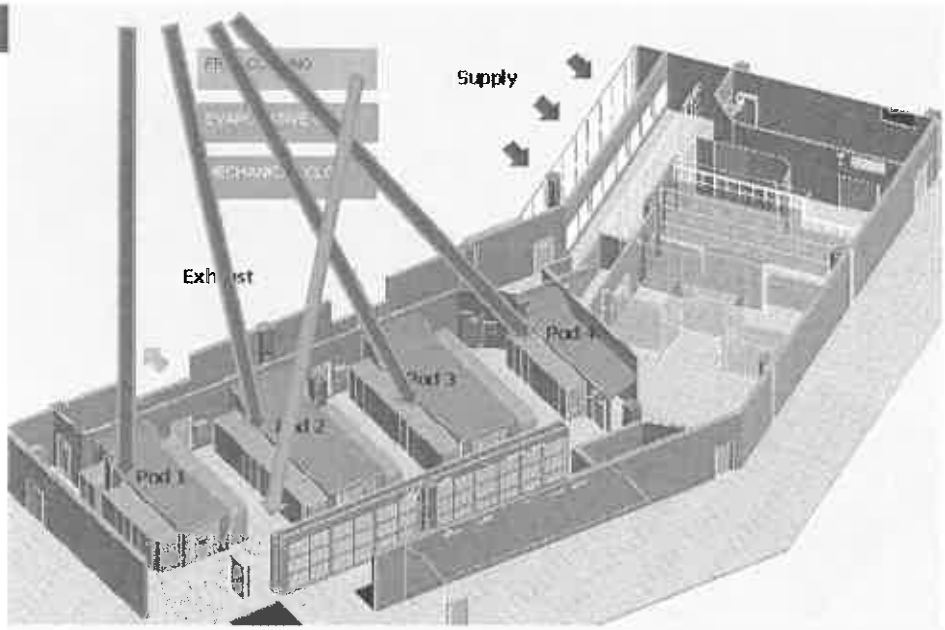


And a Shaft that was in the Shade zone of the Freeway

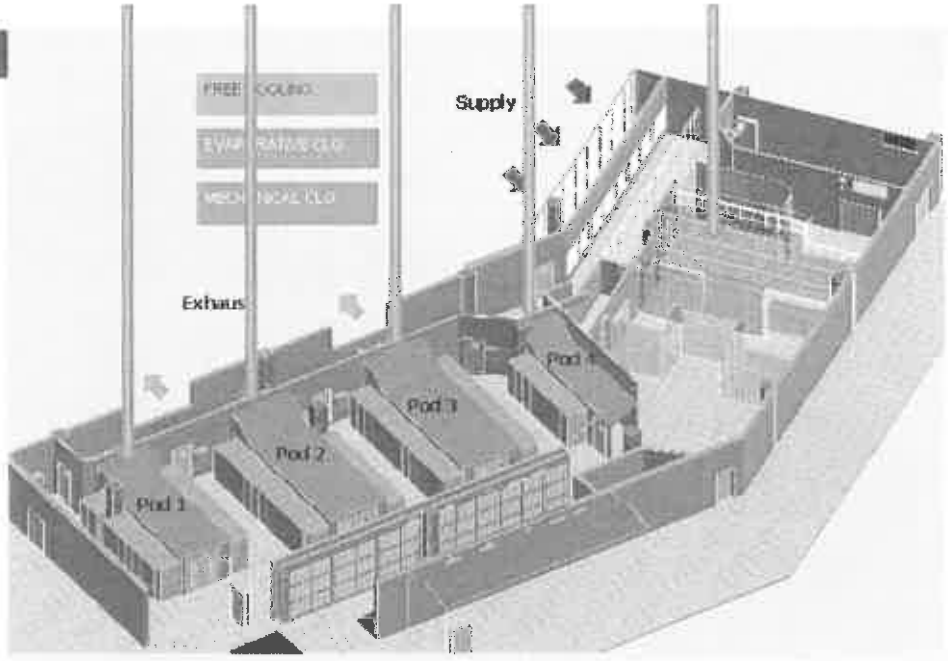
5 degrees cooler than roof or front

- The proverbial place where the sun never shines

Hot Aisle Cold Aisle Concept



Fan Wall 2.0



Optimization is Huge

- Brings Scalability

SIEMENS Unit: OSA Station #1 48.1 DEG F 43.51 DEG F

SUPPLY FAN WALL

Datacenter Main

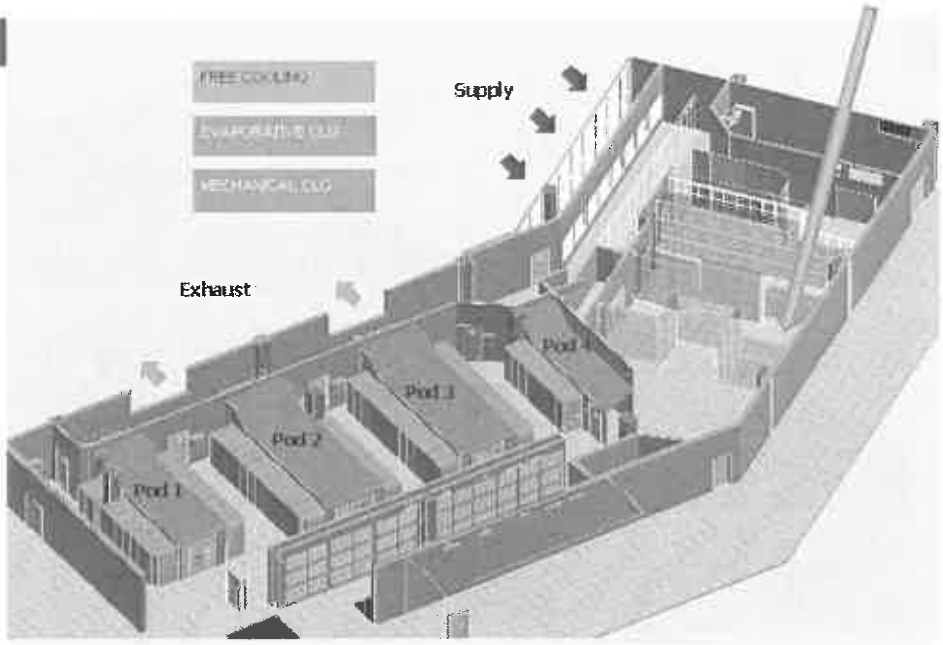
	Running	Current	Alarm	Ready	Fanwall CFM
Fan 1	On	4.46 A	Off	On	2141.56 ft3/m
Fan 2	Off	0.00 A	Off	On	0.00 ft3/m
Fan 3	Off	0.00 A	Off	On	0.00 ft3/m
Fan 4	Off	0.00 A	Off	On	0.00 ft3/m
Fan 5	On	4.61 A	Off	On	2095.44 ft3/m
Fan 6	Off	0.00 A	Off	On	0.00 ft3/m
Fan 7	Off	0.00 A	Off	On	0.00 ft3/m
Fan 8	Off	0.00 A	Off	On	0.00 ft3/m
Fan 9	Off	0.00 A	Off	On	0.00 ft3/m
Fan 10	Off	0.00 A	Off	On	0.00 ft3/m
Fan 11	Off	0.00 A	Off	On	0.00 ft3/m
Fan 12	Off	0.00 A	Off	On	0.00 ft3/m
Fan 13	Off	0.00 A	Off	On	0.00 ft3/m
Fan 14	Off	0.00 A	Off	On	0.00 ft3/m
Fan 15	Off	0.00 A	Off	On	0.00 ft3/m
Fan 16	Off	0.00 A	Off	On	0.00 ft3/m
Fan 17	On	4.71 A	Off	On	2023.55 ft3/m
Fan 18	Off	0.00 A	Off	On	0.00 ft3/m
Fan 19	Off	0.00 A	Off	On	0.00 ft3/m
Fan 20	Off	0.00 A	Off	On	0.00 ft3/m
Fan 21	Off	0.00 A	Off	On	0.00 ft3/m
Fan 22	Off	0.00 A	Off	On	0.00 ft3/m
Fan 23	On	4.48 A	Off	On	2060.87 ft3/m
Fan 24	Off	0.00 A	Off	On	0.00 ft3/m
Fan 25					

SUPPLY FAN WALL

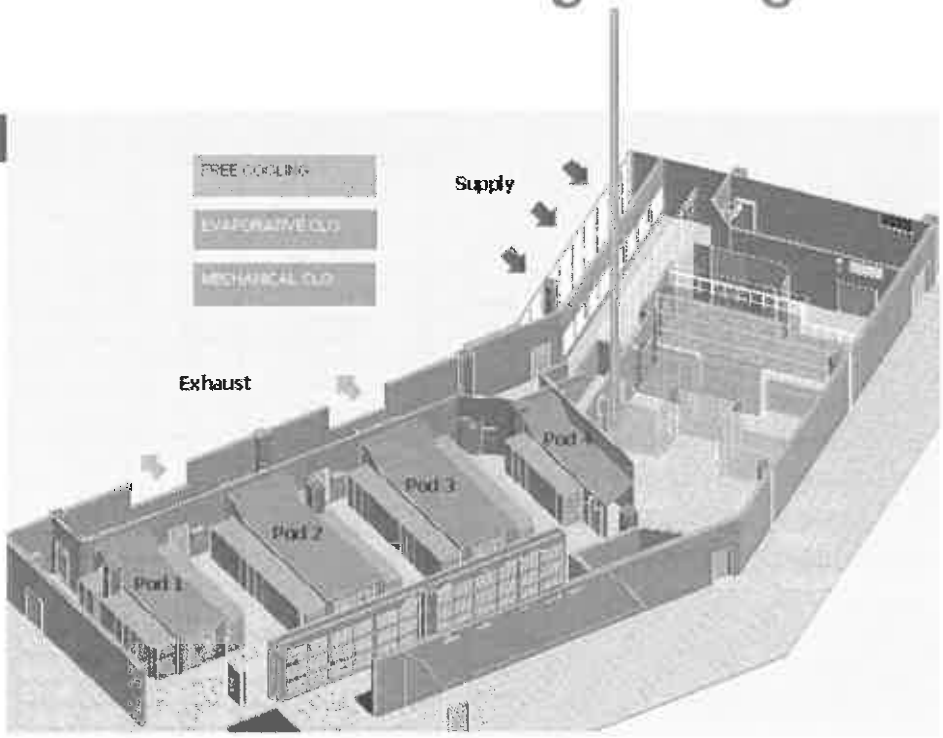
Start/Stop	Alarm
	OFF
CFM Setpoint	CFM Actual
9295.7 CFM	8630.16 CFM
Ret Fans Tot CFM	CFM Compensation
9971 CFM	-810 CFM
Supply Plenm Press	Total FanWall Kw
-0.03 IWC	0.80 kW
DC Room Static PRS	EXT Plen Static PRS
-0.02 IWC	0.07 IWC
POD 1 Static PRS	POD 2 Static PRS
0.01 IWC	-0.01 IWC
POD 3 Static PRS	POD 4 Static PRS
-0.00 IWC	-0.06 IWC
Enable Auto Optimiz	Total Stat PRS
On	0.00

Navigation

Evaporative Cooling when needed

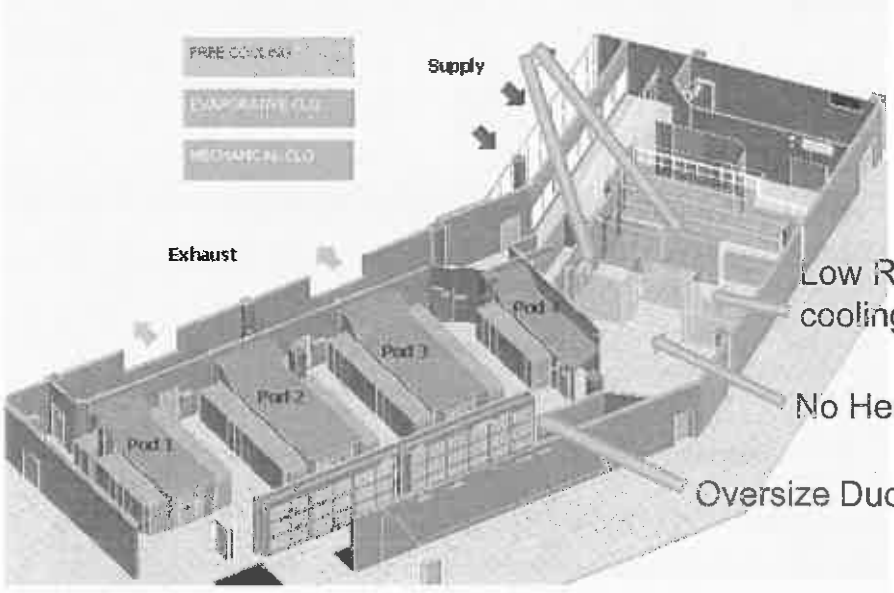


Mechanical Cooling Emergencies

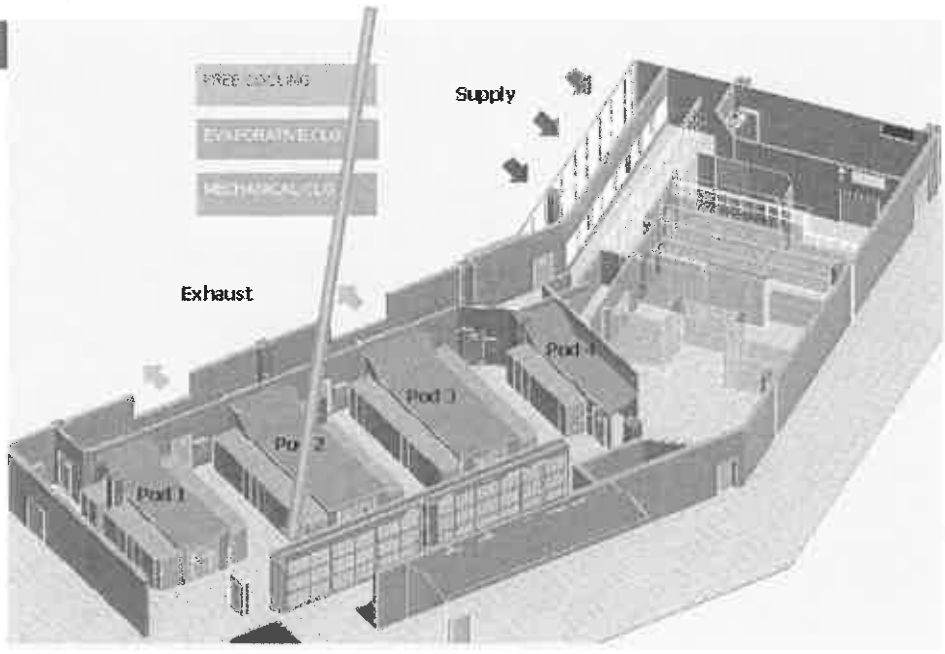


Minimize Static Pressure

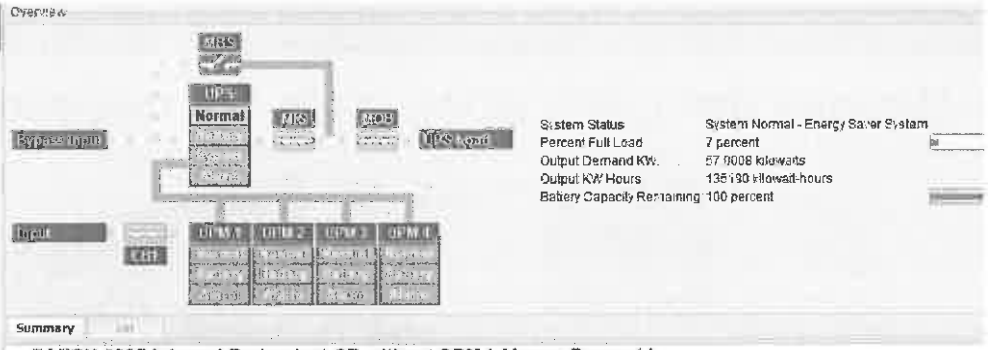
- Bypass dampers when coils not needed



Energy/Space Efficient PDU's



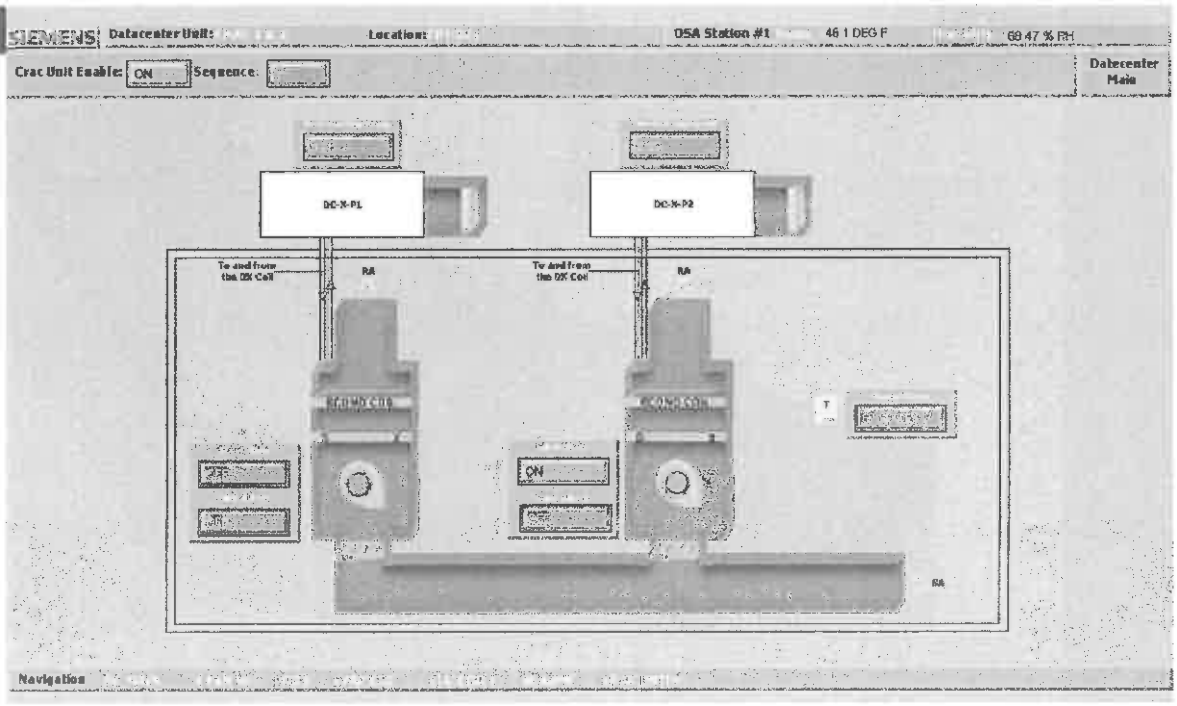
UPS's That Coast



EATON 9395 Internal Redundant CB without SBM (Alarms Present)

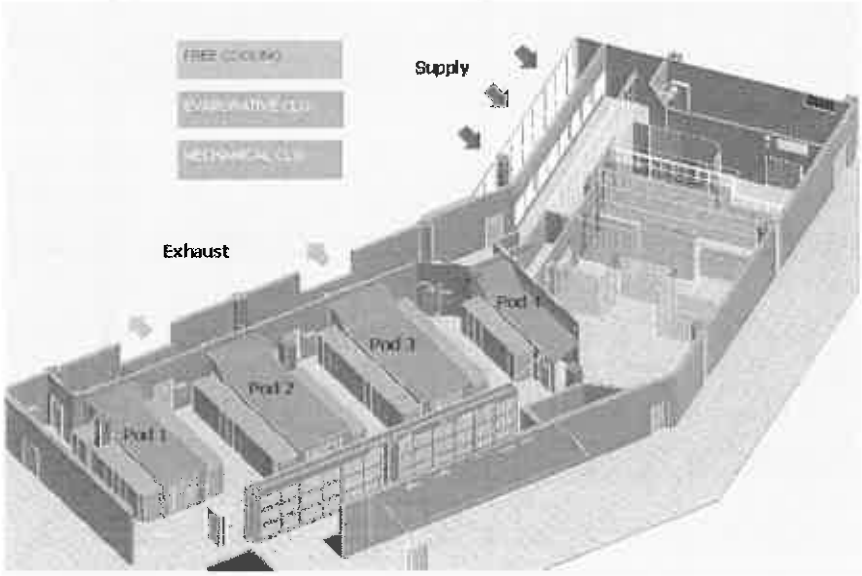
- Energy	
Input Demand KW:	57.0529 kilowatts
Input KW Hours:	68931.6 kilowatt-hours
Output Demand KW:	57.0008 kilowatts
Output KW Hours:	135190 kilowatt-hours
- Identification	
Display Name:	EATON 9395 Internal Redundant CB without SBM
Model Name:	9395 Internal Redundant CB without SBM
Serial Number:	EE512SAA03
- Identification-General Information	
Output VA Rating:	825000 volt-amperes
Output Watts Rating:	750700 watts
- Measure/Alarm/Input	
Utility Not Present:	false
- Measure/Battery	

And Uses Free Cooling from Garage

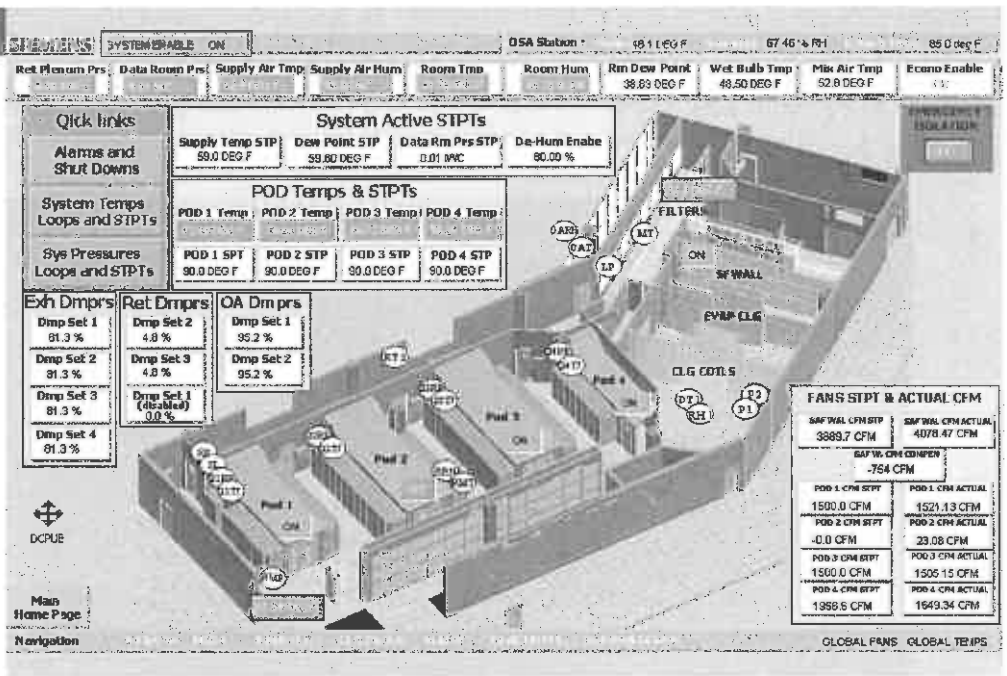


Operational Efficiencies

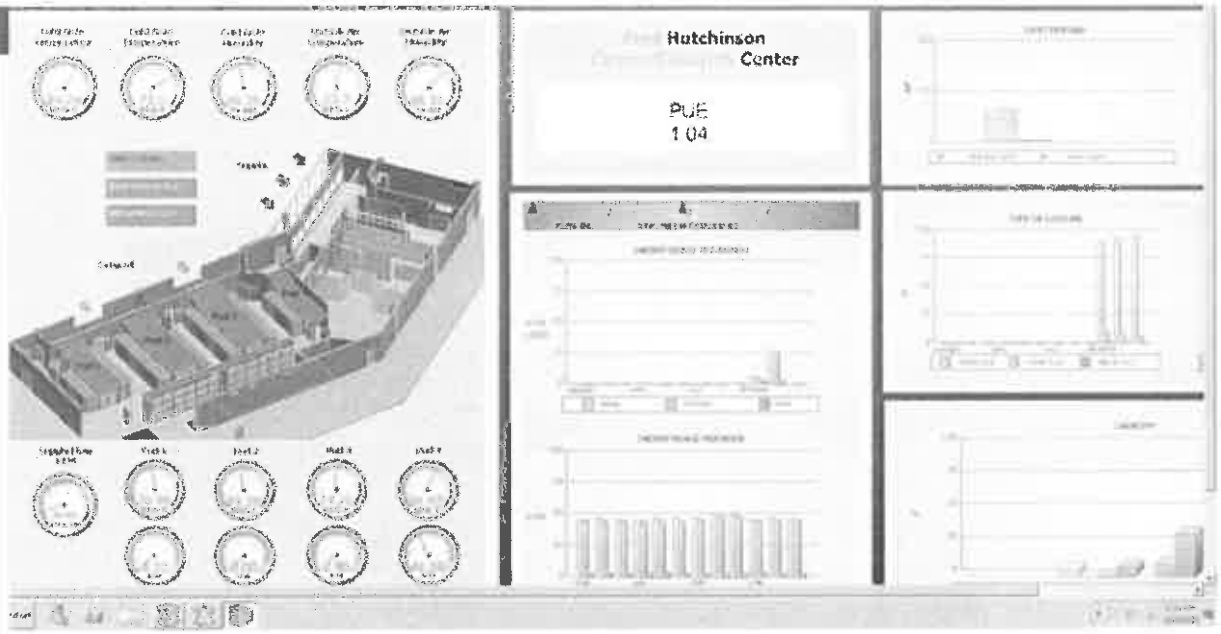
- Not using all Pods, Temp at 62 (when free)



Great Controls



Fantastic Dashboard



Just When you Thought you saw it all

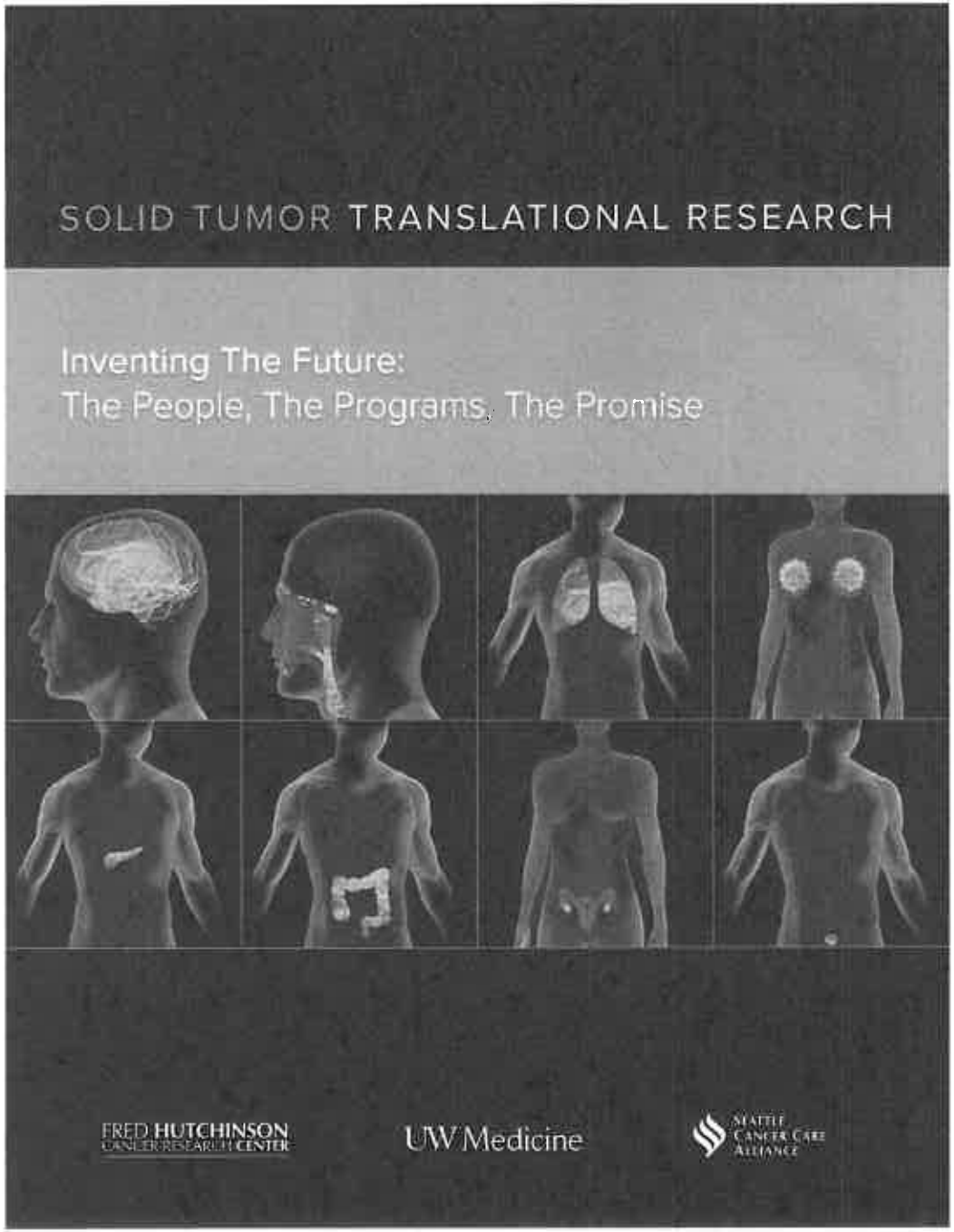
Generators that use 1/10 the usual energy to keep their blocks heated

3 Takeaways

- Lab Buildings can be Energy Heroes
- You need coherent strategies
  - You need to work with your design team on them
  - You can borrow from Bob
- Optimization and small multiple units

Extremely Interesting Building, Fairly Boring Name (1100 Eastlake)

- For a nominal donation ($20 million) the name can be improved upon


SOLID TUMOR TRANSLATIONAL RESEARCH
Inventing The Future:
The People, The Programs, The Promise
FRED HUTCHINSON CANCER RESEARCH CENTER
UW Medicine
SEATTLE CANCER CARE ALLIANCE

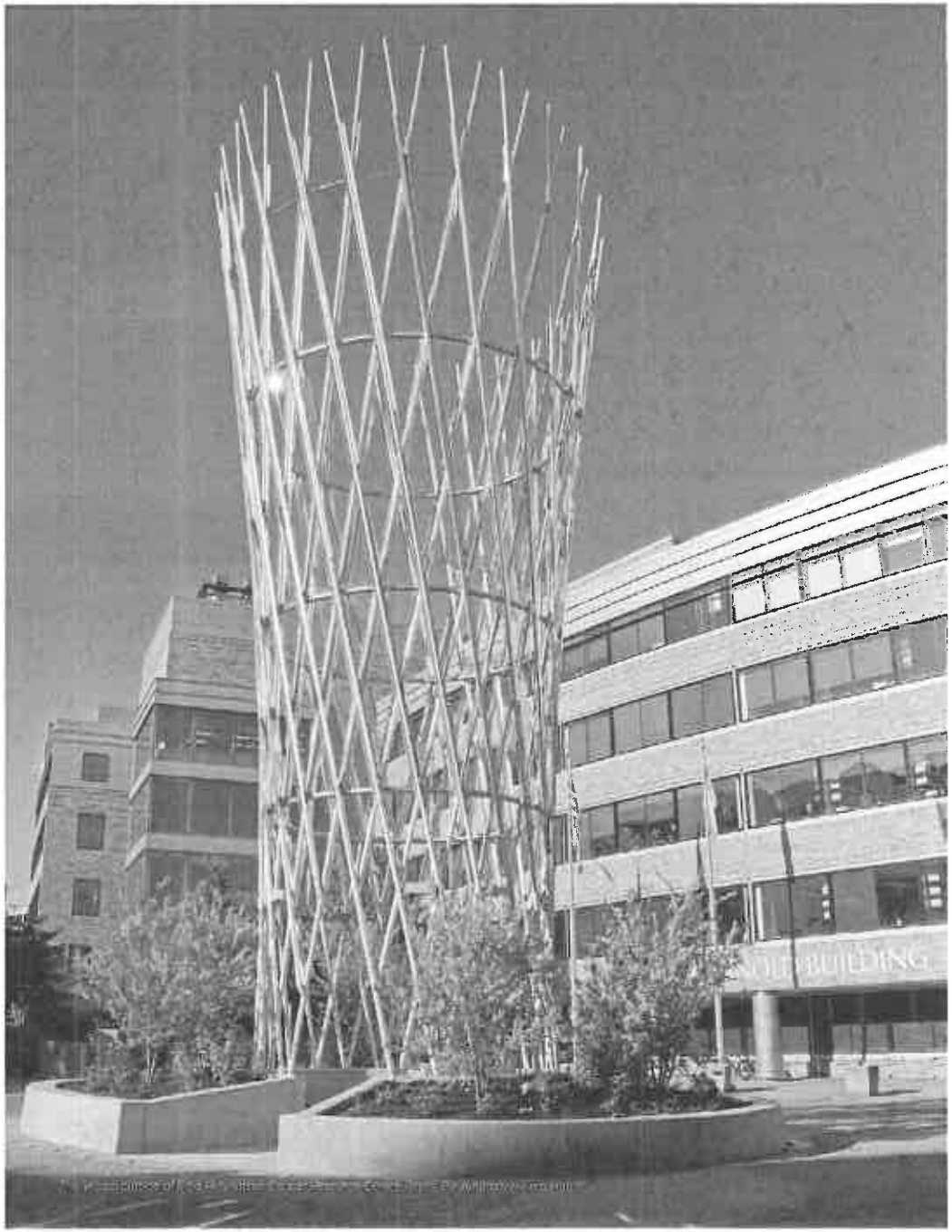


Table of contents

Together, Fred Hutchinson Cancer Research Center, UW Medicine, Seattle Cancer Care Alliance and Seattle Children's form the Pacific Northwest's only NCI-designated Comprehensive Cancer Center.

Map of the United States marking all NCI-designated Comprehensive Cancer Centers. Alaska and Hawaii are not shown.

STTR's Revolutionary Effort

Eric C. Holland,
STTR Director

Fred Hutchinson Cancer Research Center in Seattle has been long known as a stronghold for research and clinical care of liquid tumors via bone marrow transplants. Solid Tumor Translational Research (STTR) leadership was recruited from New York less than one year ago to enhance translational research in solid tumors. We originally chose eight organ sites to focus our efforts, including brain, breast, colon, head and neck, lung, ovary, pancreas, and prostate. We identified over 400 investigators and clinicians who focus on tumors that arise from these organ sites across University of Washington, UW Medicine, Seattle Cancer Care Alliance (SCCA), and Fred Hutch. We have begun to create interactive communities of investigators centered on diseases from these organ sites. Moving forward, our goal is to enhance collaborative projects, publications and grants leading to clinical impact that will change the standard of care for those solid tumors. From this extensive list of dedicated people we highlight a few examples of translational research projects, many led by physician-scientists partnering with clinicians that take them into clinical trials for our patients.

Sincerely,

Eric C. Holland, STTR Director

Desert Horse-Grant,
Director, Strategy &
Operations

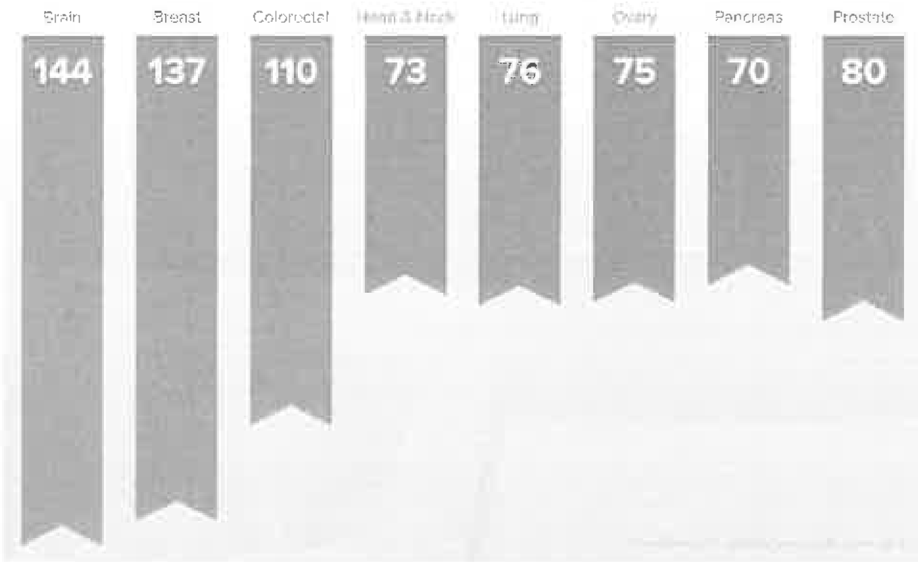
We cannot thank the community enough for its warm welcome, guidance and enthusiasm surrounding the formation of STTR. STTR is a transformative movement that is creating a strong sense of community among Seattle's cancer investigators, with the ultimate goal of accelerating scientific discovery and translating it into cancer cures for patients both regionally and globally. With the support from our philanthropic partners, we are poised to make major research advances that will significantly improve patient quality of life and survival. Our team includes experts in mathematical modeling, computer simulation, visualization, bioengineering, big data mining, cancer biology, precision oncology, population science and the best clinicians in the field. The SCCA, along with UW Med Clinic, has demonstrated the highest five-year survival rates in the nation for several cancer types; moreover, it offers a litany of patient support groups and services. Philanthropy plays a large role in supporting innovative and transformative research, leading to better quality of life and survival for our patients. We genuinely thank each foundation and some for their collaboration in our revolutionary research efforts and look forward to future engagement.

Regards,

Desert Horse-Grant, Director, Strategy & Operations

STTR contact: 206.667.6661

Total STTR Faculty by Organ Site



The Fred Hutchinson/University of Washington Cancer Consortium brings together more than 450 investigators with cancer expertise in clinical, basic and public health sciences. As the only NCI-designated comprehensive cancer center in a five-state region, the goal of the Cancer Consortium is the elimination of cancer through more effective prevention, diagnostics and treatment. A major area of emphasis during the next five-year period is to further develop solid tumor translational research to position the Cancer Consortium as a leader in this field.

STTR is the [illegible] Consortium's renewed emphasis [illegible] STTR leverages a multidisciplinary [illegible] scientists from Fred Hutchinson [illegible] UW Medicine, Seattle Cancer Care Alliance, and Seattle Children's to accomplish [illegible] cutting edge research into [illegible] improved quality of life and [illegible]

To accomplish its goal, STTR [illegible] 1) the development of tailor[illegible] oncology; 2) the funding of peer-reviewed grants to test pioneering approaches to eliminate cancer; 3) priming our research environment with the most robust faculty research teams across our cancer organ sites (brain, breast, colorectal, head and neck, lung, ovary, pancreas, and prostate); and 4) the gathering of metrics that will inform our [illegible]

The Age of Personalized Medicine: Our Contributions

[illegible]hest priority is to create research and infrastructure that provides a foundation for personalized precision diagnostics and tailored therapies for cancer patients. 'Precision oncology' is a deceptively simple idea: identifying genes that [illegible] particular cancer to facilitate the design of precise targeted therapies for [illegible]tient—ultimately reducing tumor burden or eradicating disease altogether. [illegible]quires a precision oncology pipeline to identify and collect tumors, [illegible]arly test those tumors and screen for targets against the disease.

The Precision Oncology Pipeline:

Building Cancer Biospecimen Banks:

[illegible] tissue from surgical [illegible] is fundamental to improving [illegible]gical understanding of each [illegible] and its respective cure.

Molecular Testing of Patient Tumors:

It is critical to secure private donations so we may genetically characterize tumor cells from cancer patients and subsequently tailor targeted therapies.

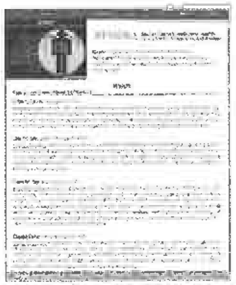
Biotool Development/ Informatics:

[illegible] time, for researchers and/or clinicians [illegible] in a new and meaningful way.

Biotool Development

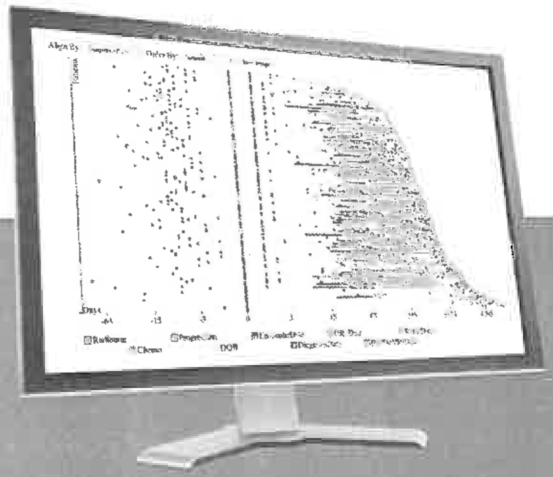
HIDRA

A patient-centric database tool unifying UW Medicine, Seattle Cancer Care Alliance, and Fred Hutch that integrates data, enabling searches across cancer patients, specimens, studies and molecular assays for broad, rapid research into molecular diagnostics and precision oncology. HIDRA implements natural language processing, eliminates redundancy, and takes advantage of electronic feeds to speed progress.



ATHENA

An Internet based tool to rapidly identify collaborators that searches over 400 STTR faculty and over 600 Seattle-based experts in the "omics" fields of experimental design, analysis and data interpretation.



ONCOSCAPE

A tool developed by STTR that enables interactive in-browser data [illegible]

Uncovering Trends in Therapeutic Response and Genetics to Increase Survival

STTR investigators have created Oncoscape, a [illegible]

Pioneering Approaches to Eliminate Cancer: Our Novel Research

New funding at critical stages of a research program is key to developing new ideas that allow researchers to explore high-risk, high-reward ideas on a small scale.

Seed Funding for Peer-Reviewed Grants: Nine of the following research projects have been funded by STTR ranging from $45K-$100K, while the rest are seeking opportunities for external funding.

Translational Research Proposals

Brain

Deconstructing Glioma Heterogeneity through Single Cell Genomic Analysis* FUNDED

Investigators: Drs. Robert Rostomily, Patrick Paddison, Jay Shendure and Andrei Mikheev

Genomic Profiling of Aggressive Meningiomas with Defined Phospho-Proteomes and Correlation with Long-Term Clinical Outcomes*

Investigators: Drs. Manuel Ferreira, James Olson, Jing Zhang, and Michael Dorschner

Metabolic Diversity Among Glioblastomas*

[illegible]

[illegible]

Breast

In Vivo* Gene Engineering of Hematopoietic Stem Cells for Breast Cancer Therapy

[illegible]

Innovations in Tissue Sampling and Imaging of Bone Dominant Metastatic Breast Cancer* FUNDED

Investigators: Drs. Hannah Linden, Peggy Porter, Stephen Schmechel, Jean Lee, Paul Kinahan, Kenneth Krohn, Jennifer Specht, and Evan Yu

MRI and Tissue Biomarkers of Ductal Carcinoma in situ Risk*

[illegible]

Relationship of Molecular Alterations in Breast Cancer Cells and Exposure to Protracted, Low Dose Ionizing Radiation*

[illegible]

Colorectal

[illegible]

Investigators: Drs. Colin Pritchard and William Grady, Melissa Upton and Stacey Shiovitz

Discovery and Verification of Novel Biomarkers of Colorectal Cancer Recurrence* FUNDED

Investigators: Drs. Christopher Li and Paul Lampe, William Grady, Margaret Pepe, and Mario Westerhoff

Microbial Signatures Associated with the Molecular Pathogenesis of Colon Cancer*

Investigators: Drs. Meredith Hullar and William Grady

Mitochondrial Dysfunction: A Novel Transformation Mechanism and Target in Colorectal Cancers with Fbw7 Mutations*

Investigators: Drs. Bruce Clurman and David Hockenbery

Head and Neck

A Human/Mouse Co-Clinical Trial to Study Response to Small Molecule Inhibitors of G2/M Cell Cycle Regulation in p53-Mutant Head and Neck Cancer* FUNDED

[illegible]

Genomic Tumor Profiling of Non-Adenoid Cystic Malignant Salivary Gland Tumors*

[illegible]

Novel Imaging of Tumor Hypoxia: Metabolic-Vascular Uncoupling of Head and Neck Cancer

Investigators: Drs. [illegible] and Julie [illegible]

Lung

Developing Tumor-Infiltrating Lymphocyte (TIL) Therapy for Non-Small Cell Lung Cancer* FUNDED

Investigators: Drs. Sylvia [illegible] McGarry Houghton, Stanley [illegible] McIntosh, Laura Chow and [illegible]

RADVAX: Optimizing Immune Modulation Using Radiation and TLR-7 Ligation to Achieve Anti-Tumor Immunity*

Investigators: Drs. Ramesh [illegible] Lu and Amanda Paulovich

Ovary

Big Data Approach to Identify Molecular Basis for Clinical Phenotypes in Ovarian Cancer* FUNDED

[illegible]

Sensitizing Ovarian Cancer Cells to Chemotherapy by Interfering with Cancer Stem Cell Formation*

[illegible]

Pancreas

Developing an Implantable Polymeric T-cell Delivery Device to Treat Unresectable or Non-Resected Pancreatic Cancer* FUNDED

[illegible]

Magnetic Resonance Elastography to Predict Pancreatic Ductal Adenocarcinoma Tumoral Stromal Content*

[illegible]

Noninvasive MRI Assessment of Tumor Stroma for Pancreatic Cancer*

[illegible]

Early Phase Clinical Research Support Grants

A Pilot Study to Determine the Safety of GLA-SE in Patients with Metastatic Sarcoma Requiring Radiation for Superficial Primary Tumors* FUNDED

Investigators: Drs. [illegible] Pollack

Deconstructing Triple Negative Breast Cancer

Investigator: Dr. C. Anthony Blau

Phase 1 Study of Somatostatin Analog SOM230 with BKM120, a Pan-Class I PI3K Inhibitor in Advanced and Refractory Carcinoid Tumors FUNDED

Investigators: Drs. Gabriela Chiorean, Colin Pritchard, Raymond Yeung and Jeannine McCune

Pilot Study of Functional Liver Imaging for Individual Radiation Therapy of Primary Hepatic Malignancies: Towards Functional Avoidance Planning

Investigators: Drs. Smith Apisarnthanarax, Hubert Vesselle, Stephen Bowen, Matthew Nyflot, and Robin Mayorka

[illegible]

Select NIH Awards

The National Institutes of Health (NIH) budget has not been increased in a number of years, yet our faculty continue to successfully secure competitively awarded research grants. STTR faculty have a multi-million dollar portfolio each year through highly competitive NIH funding mechanisms. Below are select programmatic and individual grants per organ site, [illegible]

Brain

P01 CA042045: Molecular Imaging of Cancer and Its Response to Therapy

[illegible]

U54 CA163167: Role of the Perivascular Microenvironment in Primary and Metastatic Brain Tumors

[illegible]

Breast

P50 CA138293: Seattle Cancer Consortium Breast SPORE

[illegible]

P50 CA148143: Understanding and Preventing Breast Cancer Disparities in Latinas

[illegible] Thompson

$1,846,612

Colorectal

R21 CA164548: Mitochondria Proteome of Ulcerative Colitis Associated Dysplasia

[illegible]

R01 CA162332: A Cohort Study of Sessile Serrated Polyps and Subsequent Colorectal Neoplasia

[illegible]

$660,122

Head and Neck

U01 CA176303: An Integrated Computational and Functional Genomics Discovery Engine for Preclinically Validated Cancer Drug Targets

[illegible]

$1,088,820

R01 CA068328: Lymph Node Alterations in Cancer

[illegible]

Lung

U48 DP001911: Health Promotion Research Center

[illegible]

R01 CA170386: Novel Pathogen Associated Cancers (PO12)

[illegible]

$736,412

Ovary

P50 CA083636: Pacific Ovarian Cancer Research Consortium

[illegible]

$2,150,499

R01 CA144057: Evaluation of Vectors Based on Group B Adenoviruses

[illegible]

Pancreas

R01 CA033084: Mechanisms of Murine Tumor Eradication by Immunotherapy

[illegible]

R01 CA161112: Overcoming Stromal Barriers to Therapeutics in Pancreas Cancer

[illegible]

Prostate

P50 CA097186: The Pacific Northwest Prostate Cancer SPORE

[illegible]

U01 CA157224: Modeling Prostate Cancer Control: Prevention, Screening, Treatment, Follow-up Care

[illegible]

$1,022,733

P01 AG037603A: Dose-Response Relationships Between Circulating and Intraprostatic Androgens in Men

[illegible]

[illegible]

NIH awardees as highlighted on the previous page.



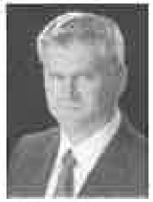















Select Foundation Awards

Brain

American Brain Tumor Association

[illegible] of Ape1 Activity in Pediatric Brain Tumor Cells Using Nanoparticles Enhances Their Sensitivity to Radiation Therapy

Dr. [illegible] Kievit

Breast

Susan G. Komen for the Cure

[illegible]

Dr. [illegible] Anderson

GE Foundation

[illegible] Breast Ultrasound and Digital [illegible] Tomosynthesis Screening Compared to Full Field Digital Mammography in Women with Dense Breasts

[illegible]

Breast Cancer Research Foundation

[illegible]

Dr. [illegible]

Colorectal

Burroughs Wellcome Fund

Novel Biomarkers for the Prevention and Treatment of Colon Cancer

Dr. [illegible] Grady

ASCO Conquer Cancer Foundation

[illegible]

ASCO Conquer Cancer Foundation

Young Investigator Award

Dr. Stacey Sch[illegible]

Head And Neck

American Cancer Society

Integrative Genomics Approach Therapeutic Target Selection in Oral Cancer Metastasis

Dr. Eduardo Mendez

American Cancer Society

[illegible]

Dr. Chris Miller

Lung

LIVESTRONG

[illegible]

[illegible]

Ovary

V Foundation

[illegible]

[illegible]

Marsha Rivkin Center for Ovarian Cancer Research

TOR Specimen Repository for Early Detection Research

Dr. Nicole Urban

Pancreas

Giles W. and Elise G. Mead Foundation

A New Platform for Translational Oncology in Pancreas Cancer

Dr. [illegible]

Focused Ultrasound Surgery Foundation

[illegible]

Dr. [illegible]

Prostate

Prostate Cancer Foundation

[illegible]

Dr. [illegible]

Listwin Family Foundation

The Androgen Receptor as a Novel Driver and Therapeutic Target in Mantle Cell Lymphoma

Dr. [illegible]

Prostate Cancer Foundation

[illegible] Therapeutic Approaches to Target AR Pathway Independent Prostate Cancer (APIPC)

Dr. Colin Pritchard

Our faculty are very grateful to foundations who fund scientific research through competitive award programs.

Accelerate Brain Cancer Cure
Alex's Lemonade Stand Foundation
American Brain Tumor Association/Emily Dorfman Foundation
American Cancer Society
American College of Radiology Imaging Network
American College of Surgeons
Avon Foundation
Burroughs Wellcome Fund
[illegible]
CARIS Molecular Profiling Institute
CRP-Sante (Luxembourg)
Crohn's & Colitis Foundation of America
Cures Within Reach
Damon Runyon Cancer Research Foundation
David Jones and Maryanne Jones Fund
[illegible]
[illegible]
Fogharty International Center FIC
[illegible]
[illegible]
[illegible]
Giles W. and Elise G. Mead Foundation
[illegible]
Lotte & John Hecht Memorial Foundation
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
Lotte and John Hecht Memorial Foundation
Lung Cancer Research Foundation
[illegible]
Marsha Rivkin Center for Ovarian Cancer Research
Matthias Lackas Foundation
National Center for Complementary and Alternative Medicine
National Comprehensive Cancer Network
National Pancreas Foundation
Pancreatic Cancer Action Network
Prevent Cancer Foundation
Prostate Cancer Foundation
Safeway Foundation
St. Baldrick's Foundation
Susan G. Komen Foundation
Swim Across America
The Howard Hughes Medical Institute
The Mary Kay Foundation
The V Foundation for Cancer Research
Wallace H. Coulter Foundation
Washington Global Health Alliance
Washington Research Foundation


[illegible]


[illegible]


Colorectal Cancer


[illegible]

[illegible]


[illegible]


[illegible]


Prostate Cancer

Recruiting and Retaining the World's Top Researchers: Our Program Highlights

Brilliant researchers are the cornerstone of our work and achievements in developing successful treatments. STTR must offer competitive start-up packages to draw the talent needed to advance our work and increase the hope of finding cures. Philanthropy is vital to both the recruitment and retention of leaders in the field as well as funding their research—especially the development of less invasive, more sensitive early diagnostic testing so that interventions can stop cancer before it starts.

STTR has recruited over 400 faculty spanning eight initial organ sites. The following pages highlight our members and the work being done within those tumor sites.

To learn more about our programs and members, visit our expertise and research pages at www.STTRCancer.org.

STTR Faculty

M. Robyn Andersen, PhD, MPH
Benjamin Anderson, MD
Garnet Anderson, PhD
Jalal Andre, MD
[illegible]
[illegible]
Shirley Beresford, PhD, MSc, MA
Daniel Berg, MD
Slobodan Beronja, PhD
[illegible] Bhatti, PhD
[illegible]
Jason Bielas, PhD
C. Anthony (Tony) Blau, MD
Jesse Bloom, PhD
Farid Boloori, PhD
Mark Bothwell, PhD
Denise Boudreau, PhD, RS
[illegible]
Robin Bradley, PhD
William Bremner, MD, PhD
[illegible] Broadwell, MD
David Breiger, PhD
James (Jim) Brinkley, MD, PhD
Samuel Robert Browd, MD, PhD
Peter Brzeski, PhD
Diana Buist, PhD, MPH
David Byrd, MD
Kristine Calhoun, MD
Christopher Carlson, PhD
[illegible]
Marc Chesnut, MD
Chu Chen, PhD, NRCC, DABCC
Ru Chen, PhD
[illegible] Cheng, MD
[illegible] Chiang, MD, PhD
[illegible] Chevalier, PhD
[illegible]
Marc Colbert, MD
Jonathan Cooper, PhD
Eva Corey, PhD
Colin Conrad, PhD
Andrew Coveler, MD
Courtney Collins, PhD
Ian Nicholas (Nick) Crispe, MBBS, PhD
Kristina Crothers, MD
[illegible]
Mary (Nora) Disis, MD
Jason Dominitz, MD, MHS
Michael Dorschner, PhD
Charles Drescher, MD
Larry Duckert, MD, PhD
Catherine Dugger, PhD
Tanya Eadie, PhD, CCC-SLP
Keith Eaton, MD, PhD
Robert Eisenman, PhD
Richard Ellenbogen, MD, FACS
William Ellis, MD
[illegible]
Stuart Julian Forbes, MD
Farhood Farjah, MD, MPH
Manuel Ferreira, MD, PhD
[illegible]
James Fink, MD
Albert Folch, PhD
Eric Ford, PhD
[illegible]
Louis Garrison, PhD
Jeffrey Russell Gever, MD
Cyrus Ghajar, PhD
Basavaraj Ghodke, MS
Barbara Goff, MD
Myron Goldberg, MD
Luis Gonzalez-Cuyar, MD, PhD
Gary Goodman, MD, MS
John Gore, MD, MS
Bernardo Goulart, MD, MS
William Grady, MD
[illegible]
Veronika Groh-Spies, MD
Justin Guinney, PhD
Liz Haleas, MD
[illegible]

David Hockenbery, MD
[illegible], MD, PhD
[illegible]
[illegible]
[illegible]
Karen Horvath, MD
Marshall Horwitz, MD, PhD
A. McGarry Houghton, MD
Li Hsu, PhD
Meredith Hullar, PhD
[illegible], PhD
John Inadomi, MD
Brian Iritani, DVM, PhD
[illegible], MD
[illegible], MD
Mike Jensen, MD
Robin Jones, MD
[illegible]
Andrew Kaz, MD
Christopher (Dirk) Keene, MD, PhD
Edward Kelly, PhD
John Kelly, PhD
Christopher Kemp, PhD
[illegible], ScD
Hans-Peter Kiem, MD, PhD
Forrest Kievit, PhD
[illegible]
Edward Kim, MD
[illegible], MD
Paul Kinahan, PhD
Rachel Klevit, PhD
Sue Knoblaugh, DVM, Diplomate, ACVP
Cynthia Ko, MD
Wui-Jin Koh, MD
Mario Kratz, PhD
Kenneth Krohn, PhD
[illegible], PhD
[illegible]
[illegible], MD
[illegible], PhD
Johanna Lampe, PhD
Paul Lampe, PhD
Paul Lange, MD
George Laramore, PhD, MD
[illegible], MD, MPH
[illegible], MD, MS
[illegible], MD
Christoph Lee, MD, MSHS
Donghoon Lee, PhD
[illegible], MD, MSc
[illegible]
Su-In Lee, PhD
[illegible], MD
Constance Lehman, MD, PhD, FACR
Christopher Li, MD, PhD
[illegible], MD
[illegible], MD, PhD
Andre Lieber, MD, PhD
[illegible], DVM, PhD
Daniel Lin, MD
Edward Lin, MD
Hannah Linden, MD
[illegible], PhD

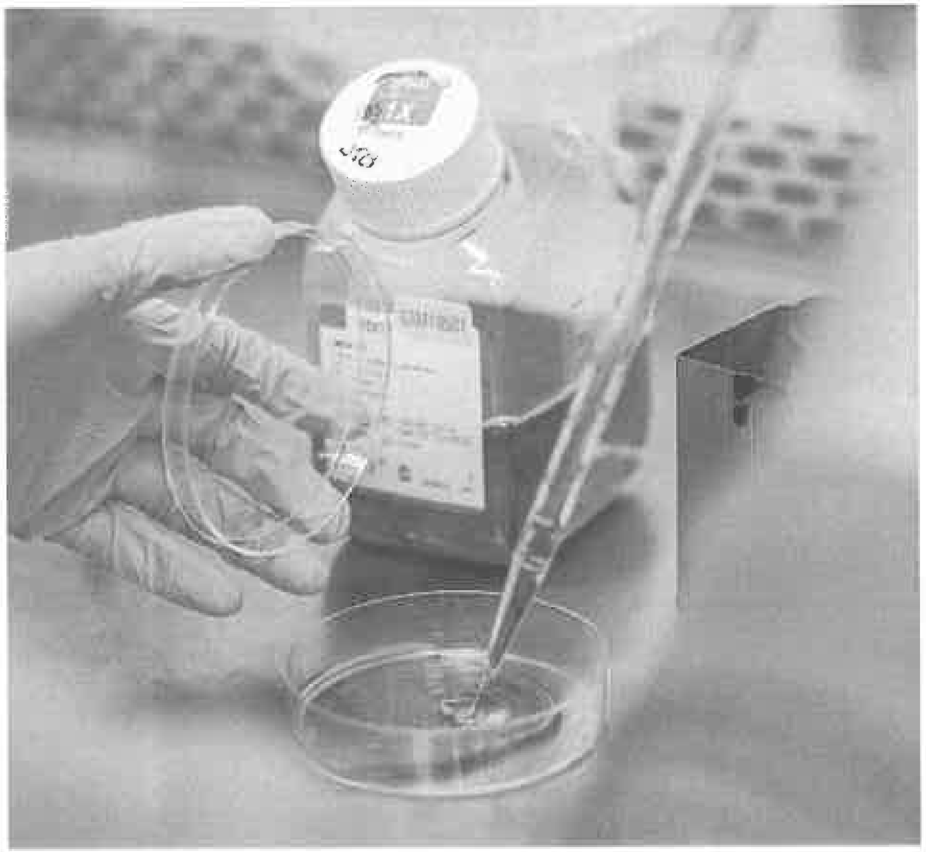
Alan Liu, PhD
[illegible]

Mark Phillips, PhD
Amanda Phipps, PhD
Catherine Pihoker, MD
Venu Pillarisetty, MD
Sudhakar Pipavath, MD
Stephen Plymate, MD
Seth Pollack, MD
Michael Porter, MD, MS
Peggy Porter, MD
John Potter, MD, PhD
[illegible], PhD
Ross Prentice, PhD
Oliver Press, MD, PhD
Colin Pritchard, MD, PhD
Suzie Pun, PhD
Tony Quang, MD
Peter Rabinovitch, MD, PhD
Daniel Raftery, PhD
[illegible]
Joseph Rajendran, MD
[illegible], PhD
Scott Ramsey, MD, PhD
Julie Randolph-Habecker, PhD
Bruce Ransom, MD, PhD
[illegible], PhD
Kerryn Reding, PhD, MPH
Mary Redman, PhD
[illegible], MD, PhD
Ramesh Rengan, MD, PhD
Stanley Riddell, MD
Rosana Risques, PhD
Harlan Robins, PhD
Jason Rockhill, MD, PhD
Tina Rodriguez, MD
Mary Anne Rossing, PhD
Robert Rostomily, MD
Christian Roth, MD
Alanna Ruddell, PhD
[illegible]
Kenneth Russell, MD
[illegible], MD
Daniel Sabath, MD, PhD
Lupe Salazar, MD
Michael Saunders, MD
John Scheel, MD, PhD
Andrea Schietinger, PhD
Stephen Schmechel, MD, PhD
Rodney Schmidt, MD, PhD
Mark Schubert, DDS, MSD
[illegible]
Stephen Schwartz, PhD
Eric Seibel, PhD
Laligam Sekhar, MD
William Shain, PhD
[illegible], MD
Dennis Shaw, MD
Jay Shendure, MD, PhD
Dean Shibata, MD
[illegible], MD
[illegible], MD, PhD
[illegible], PhD
Daniel Silbergeld, MD, FAANS, FACS
Julian Simon, PhD
[illegible], MD, PhD

Narendra Singh, MS, MBBS
Jennifer Specht, MD
Thomas Spies, PhD
[illegible] Stanford, PhD
Patrick Stayton, PhD
Gideon Steinbach, MD, PhD
Nephi Stella, PhD
Matthias Stephan, MD, PhD
Paul Swanson, MD
Elizabeth Swisher, MD
Karen Syrjala, PhD
Jonathan Tait, MD, PhD
Hisham Tamimi, MD
Catherine Tangen, DrPH
Toshiyasu Taniguchi, MD, PhD
Stephen Tapscott, MD, PhD
[illegible] Thome, PsyD
[illegible] Thompson, PhD
Maria Tretiakova, MD, PhD
Lawrence True, MD
Karen Tsuchiya, MD
Cornelia Ulrich, PhD
Jashvant Unadkat, PhD
Melissa Upton, MD
Nicole Urban, MS, ScD
Renata Urban, MD
Rajesh Uthamanthil, DVM, PhD, DACLAM
Funda Vakar-Lopez, MD
[illegible], MD
Thomas Varghese Jr., MD
Valeri Vasioukhin, PhD
Thomas Vaughan, MD, MPH
David Veenstra, PharmD, PhD
[illegible], PhD
Robert Vessella, PhD
Hubert Vesselle, MD, PhD
[illegible]
Ruikang Wang, MD
Edus (Hootie) Warren, MD, PhD
Avery Weiss, MD
Noel Weiss, MD, DrPH
[illegible] Westerhoff, MD
Emily White, PhD
Alejandro Wolf-Yadlin, PhD
[illegible], MBA, PhD
Douglas Wood, MD
Jonathan Wright, MD, MS, FACS
David Wu, MD, PhD
Peter Wu, MD
Matthew Yeh, MD, PhD
Meliha Yetisgen, PhD, MSc
Raymond Yeung, MD
Kathryn Yorkston, PhD
Evan Yu, MD
William Yuh, MD
[illegible] Zeliadt, PhD, MPH
Jing Zeng, MD
Jing Zhang, MD, PhD
Miqin Zhang, PhD
[illegible] Zhao, PhD
Ning Zheng, PhD
Ying Zheng, PhD

Brain Cancer Program

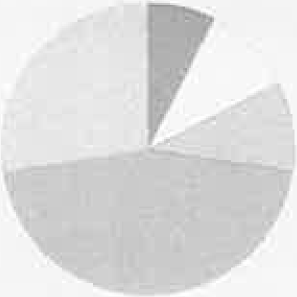
More than 140 researchers and clinicians from Fred Hutch, UW Medicine, Seattle Children's and SCCA make up the Alvord Brain Tumor Center. Together these investigators are focused on accelerating the exchange of knowledge about brain tumors among 35 departments, divisions and programs. They have the largest NIH grant funding base in the nation for brain tumor related research.

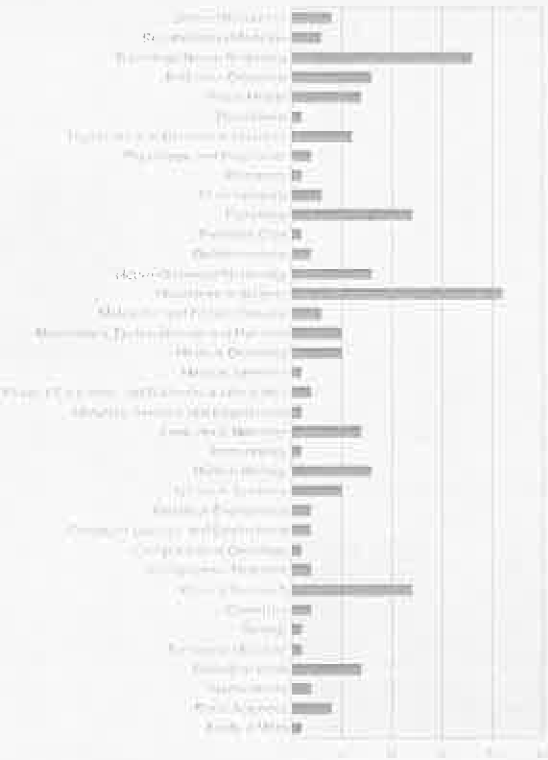


There will be an estimated 23,380 new cases of brain cancer in 2014 in the United States.

Source: SEER Fact Sheets

BRAIN CANCER TRANSLATIONAL RESEARCH METRICS





TOP FEATURES

- Expert neurosurgeons and neuro-oncologists
- Specialized nurses
- Support services
- Large number of clinical trials
- Gamma knife radiation
- Proton therapy
- Molecular testing
- Glioblastoma and metastases seen within 24 to 48 hours

EXCITING NEXT STEPS

Our new multidisciplinary clinic space will open in January 2015. Brain tumor patients will be able to see their team of doctors, including their medical oncologist and surgeon, in a single visit. Multidisciplinary clinics reduce the number of clinic visits, expedite patient care delivery, and decrease patient and family anxiety.

Adult Patient Appointments
877-520-5000

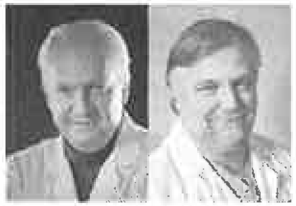
Pediatric Patient Appointments
205-937-2079

BRAIN CANCER TRANSLATIONAL RESEARCH SPOTLIGHT

Brain cancer is one of the most malignant cancers in the world, afflicting more than 200,000 people in the U.S. There is no known cause, and an effective cure remains elusive. Our program includes experts in oncologic brain and spine surgery who perform more than 500 cancer operations a year. Over 3,000 patients see our doctors in the Neuro-Oncology Program each year. Each patient who meets eligibility criteria has the option for treatment within a clinical trial or treatments using the most recent scientific evidence. Our NIH-funded investigators are joining disciplines, working on developing new drugs through molecular profiling of tumors, implementing immunotherapy in clinical trials, and incorporating proton therapy in the clinical setting to lessen treatment side effects.

MATHEMATICAL MODELING TO IMPROVE THERAPEUTIC EFFICACY

Over the past 30 years, treating glioblastoma has largely involved patients receiving radiation therapy [illegible] per week. Patients receive [illegible] dose they can tolerate [illegible] side effects or harming surrounding normal [illegible] and neurosurgeon, and his team are studying glioblastoma using mathematical models to better understand what equips cancer cells to become resistant to radiation therapy. The results of this work, currently being tested in cancer models, will ultimately shape novel radiation therapy doses and regimens [illegible]



Dr. Robert Rostomily

GLIOMA INVASION AND TARGETED THERAPY

[illegible] how glioma tumor cells metastasize [illegible] activity, often referred to as epithelial [illegible] key to better patient outcomes, and our [illegible]

NEW HOPE FOR PEDIATRIC CANCER

[illegible]

IDENTIFICATION OF DRUG TARGETS

[illegible]

A PROMISING CLINICAL TRIAL IN GLIOBLASTOMA

[illegible] a highly aggressive type of [illegible] called glioblastoma multi[illegible] [illegible] drug [illegible] an experimental [illegible] brain tumor cells. More [illegible] drug will "train" the body's [illegible] to seek out a target on th[illegible] [illegible] chemotherapy regimens.

REVOLUTIONARY TREATMENT OPTIONS

Proton therapy is now, for the first time, available to brain cancer [illegible] radiation exposure to surrounding healthy tissue. In addition to dramatic success in reducing tumor burden, it promises to cause fewer short- and long-term side effects. UW Medicine's brain mapping program, which maps motor, speech, and cognitive areas of the brain, is the largest and busiest program in the Pacific Northwest. Our neurological surgeons use functional brain mapping to help them identify areas that control movement, sensation, talking and understanding speech. This data is used to help find a balance between removing diseased tissue and preserving crucial brain functions.

Radiation Proton Therapy Appointment:
Dr. Lia Halasz or Jason Rockhill
Call (206) 306-2800

"As a cancer doctor, I think of myself as a patient advocate, and as such, try to provide patients and families with a sense of autonomy and control over their cancer."

Dr. Marc Chamberlain, Neurologist, Neuro Oncologist

DEVELOPING NEW DRUGS, "OPTIDES"

[illegible]

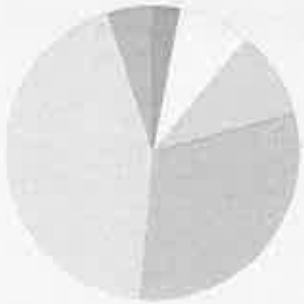
BONE MARROW TRANSPLANTS FOR GLIOBLASTOMA

[illegible]

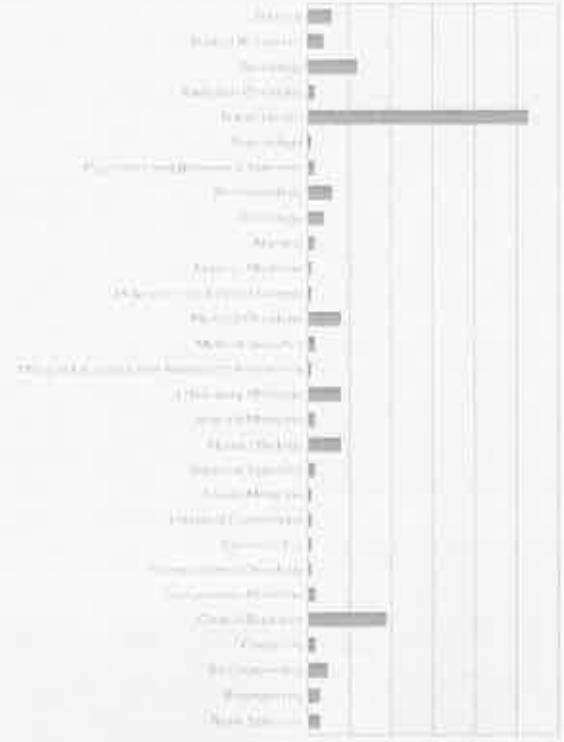
Breast Cancer Program

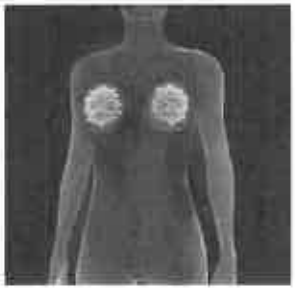
Our top-ranked, multidisciplinary breast cancer team provides a full spectrum of clinical care, from early detection, diagnosis and staging to the provision of cutting-edge treatments and long-term follow-up through our survivorship programs. The breast cancer research program along with the cancer-focused population scientists at Fred Hutch have long been leaders in research on the etiology and prevention of breast cancer.

"Seeing the impact the Breast group is having in the community and around the world is inspiring." *Jalle Gebisa (STTR Research Coordinator)*



BREAST CANCER TRANSLATIONAL RESEARCH METRICS





TOP FEATURES

- Best survival outcomes in the nation for stages 0, I, II and III patients
- Top-ranked clinical science program grant (SPORE)
- Lead cutting-edge clinical trials
- Breast Health Clinic
- Survivorship Clinic
- Leader: Breast Health Global Initiative w/ Susan G. Komen Foundation

WOMEN'S CENTER

The Women's Center at SCCA was created to care for women through all phases of cancer treatment, from diagnosis to follow up, in one space utilizing the Breast Health Clinic, Newly-diagnosed Options for Women Clinic, Breast Cancer Specialty Center, Breast and Ovarian Cancer Prevention Program, and Women's Wellness Clinic. Each clinic targets a specific need in the general population, forming a comprehensive network of support services for women pre- and post-diagnosis.

Patient Appointments
855-557-0555

BREAST CANCER TRANSLATIONAL RESEARCH SPOTLIGHT

This year, more than 225,000 women in the United States will learn they have breast cancer. Three-fourths of them will be 50 or older, but breast cancer also affects younger women and men.

"Patients should not have to grin and bear it—that's exactly why I'm here."

Cassie Bjarnadot, Caregiver/SCCA Patient Navigator

TOP-RANKED SCIENCE PROGRAM

The Seattle Cancer Consortium receives research funding as a Breast SPORE (Specialized Program Of Research Excellence), which recognizes expertise in research and clinical care. Led by Drs. Peggy Porter and Martin "Marc" Chavez, the goal of the Breast Cancer Program is to reduce the incidence and subsequent mortality of breast cancer by fostering interdisciplinary collaboration between researchers in basic science, genetics, clinical medicine, cancer prevention, and epidemiology at Fred Hutch, UW, and the clinical community.

EARLY DETECTION THROUGH ADVANCED SCREENING

UNDERSTANDING TUMOR RESISTANCE TO STOP THE SPREAD OF DISEASE

GLOBAL ONCOLOGY INITIATIVES

Dr. Julie Gralow

SEATTLE BUSINESS MAGAZINE'S 2014 LEADERS IN HEALTH CARE AWARD

Dr. Julie Gralow, Director of Breast Medical Oncology at SCCA, received the Achievement in Community Outreach (Pink Award) for helping women heal and thrive. "My goal is to help cancer patients of all stages and in all parts of the world live a balanced, healthy and full life. Change of those factors over which they have control – including healthy diet, physical activity and mental well-being," says Dr. Gralow.

BREAST CANCER TRANSLATIONAL RESEARCH SPOTLIGHT

Dr. Marilyn Kwan

COMBINING DISCIPLINES TO IDENTIFY RISK FACTORS

Dr. Kwan's projects explore the genetic determinants of developing breast cancer (e.g., BRCA1/2 and other genes), the relationship of risk factors and prognostic markers of outcomes after breast cancer. The ultimate goal of her work is to improve strategies for reducing individual risk for initial diagnosis, recurrence and other adverse outcomes after breast cancer.

OTHER FACULTY CONTRIBUTIONS TO RISK PREVENTION

Dr. Christopher Li has shown that smoking is a risk factor and has also found a link between injectable contraceptive and an aggressive form of breast cancer in young women.

Drs. Amanda Phipps and Anne McTiernan contributed to a growing body of evidence that obesity and inactivity lead to an increased risk of breast cancer. Conversely, risk reduction is observed as activity increases.

Dr. Polly Newcomb has shown that women who consume 14 or more alcoholic drinks per week increase their risk of breast cancer by 24 percent.

SAVING LIVES

Drs. Garnet Anderson and Ross Prentice joined a working group in the Women's Health Initiative (WHI), a national study of disease prevention in 161,809 postmenopausal women. From 1991 to 2002, the WHI [illegible] on the increased risk of breast cancer associated with hormone replacement therapy. The [illegible] saved $371 billion, led to [illegible] fewer breast cancer cases a year and saved [illegible] lives. Fred Hutch continues to receive funding to follow more than 100,000 women still enrolled in the study.

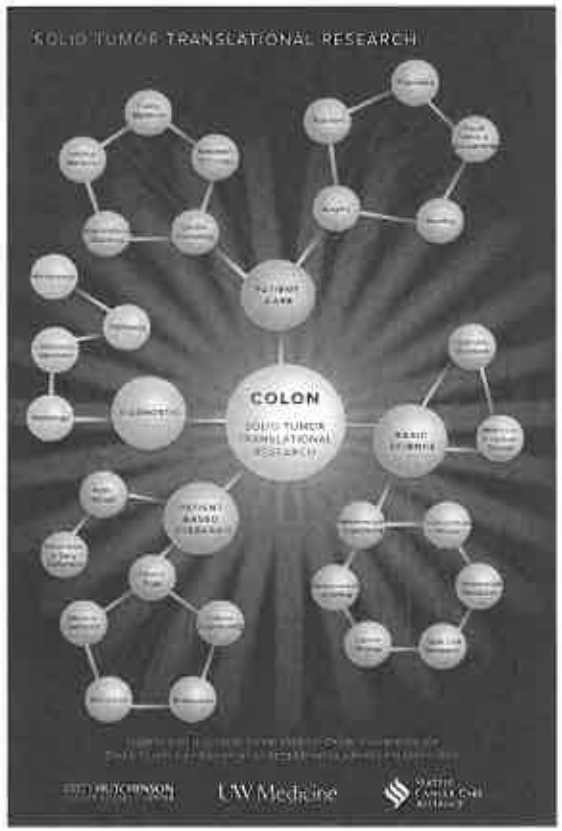
Dr. Garnet Anderson
Dr. Ross Prentice, Fred Hutch

CENTER FOR POPULATION HEALTH AND HEALTH DISPARITIES

UNDERSTANDING AND PREVENTING BREAST CANCER DISPARITIES IN LATINAS

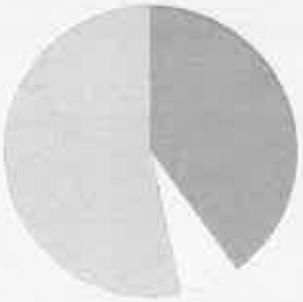
Colon Cancer Program

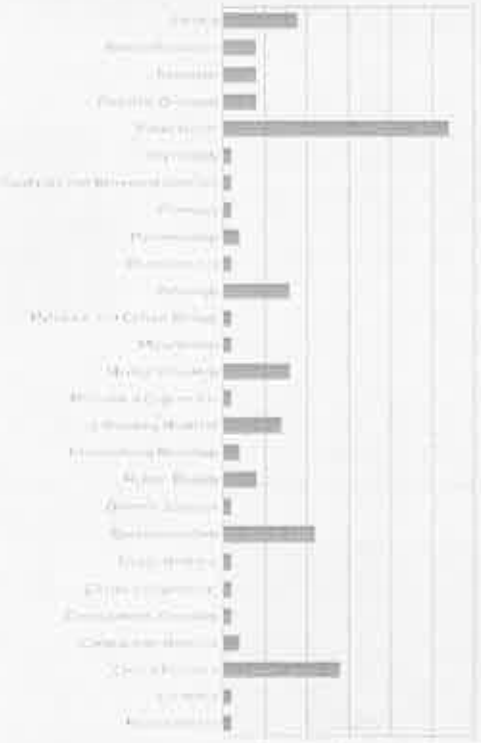
The colorectal cancer team is a highly interdisciplinary group of investigators dedicated to improving the prevention and effective treatment of colorectal cancer. Research in basic science, genetics, clinical medicine, cancer prevention, and epidemiology at Fred Hutch and the UW has advanced our understanding of colorectal cancer and is establishing better prevention and treatment strategies including innovative screening and surgical techniques, and targeted therapy for this common cancer.



"The doctors are outstanding at Seattle Cancer Care Alliance and UW Medical Center. When I was diagnosed, several of my friends, who are nurses, told me there was only one place for me to go, and that was SCCA." Anita Mitchell (colon cancer survivor)

COLORECTAL CANCER TRANSLATIONAL RESEARCH METRICS





TOP FEATURES

- Best survival outcomes in the nation for stage I, II and IV patients
- GI Cancer Prevention Clinic
- Multidisciplinary Colorectal Cancer Clinic, which includes gastroenterologist, colorectal surgeons, medical oncologists, radiation oncologists, and genetic counselors
- Heritable risk assessment and genetic testing using cutting edge genetic testing method

COLORECTAL CANCER FAMILY REGISTRY

The Seattle Colorectal Cancer Family Registry, hosted by Fred Hutch, is one of six colon cancer registries in the world. It has become one of the largest collections of interview and biospecimen data, with an enrollment of more than 2,300 colorectal cancer patients and more than 5,500 of their relatives.

Patient Appointments
855-657-0535

COLORECTAL CANCER TRANSLATIONAL RESEARCH SPOTLIGHT

Colon cancer is the third most common cancer in the United States. Each year colon cancer afflicts approximately 150,000 patients and their families, resulting in approximately 50,000 deaths. However, it can take up to 10 or more years for polyps to become cancerous. This long window of time, in which disease could potentially be detected, offers a unique opportunity to save lives. Our researchers are actively working on risk prevention, identification of molecular markers for cancer detection and treatment, and improvements in cancer treatment.

RISK PREVENTION

Calcium – Dr. Ulrike Peters found that

Sunlight – Researchers at our institutions are investigating whether the risk of colon cancer

Exercise – Dr. Anne McTiernan found that

Identifying At-Risk Populations – The risk of advanced-stage colon cancer and death varies extensively by race. African Americans, American Indians, Chinese, Filipinos, Koreans, Hawaiians, Mexicans, South/Central Americans and Puerto Ricans are 10 percent to 50 percent more likely than non-Hispanic whites to be diagnosed with advanced-stage colon cancer.

Effect of Aspirin on Smokers – Aspirin and other nonsteroidal anti-inflammatory drugs may reduce the risk of colorectal cancer by up to 40 percent. Our researchers found that

SCREENING INNOVATIONS

MOLECULAR MARKERS FOR COLON CANCER SCREENING

COLORECTAL CANCER SPECIALTY CLINIC

In a single appointment [illegible] with their entire team of [illegible] and surgeon. Patients le[illegible] comprehensive treatme[illegible] clear next steps.

END COLON CANCER NOW CAMPAIGN

Community leaders acro[illegible] joined forces with Fred H[illegible] awareness about colon [illegible] screening at EndColonC[illegible] This site is loaded with [illegible]

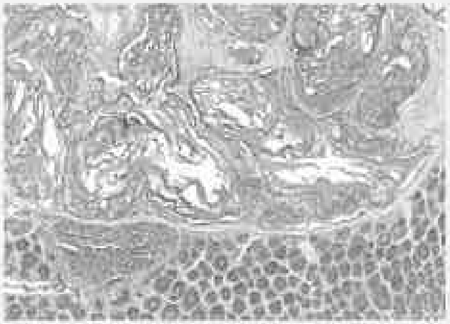
COLORECTAL CANCER TRANSLATIONAL RESEARCH SPOTLIGHT

ESCAPING DRUG RESISTANCE

[illegible] Dr. Edward Lin is leading a Phase II clinical trial for advanced stage colorectal cancer patients. Observing that cancer stem cells become resistant to conventional chemotherapy, his team developed a novel therapy called ADAPT: Activating (CSCs) from Dormancy And Potentiate for subsequent Targeting.

ADAPT therapy is a unique approach that activates, exposes and destroys evasive colorectal cancer stem cells. To da[illegible] have been treated with ADAPT therapy. About 40 percent of Dr. Lin's patients have achieved complete, or near complete, responses, which means there is little or no detectable cancer. Even more encouraging is that ADAPT therapy has extended patients' lives to a median survival of 92.7 months, all while avoiding the traditional and more toxic regimen of intravenous chemotherapy.

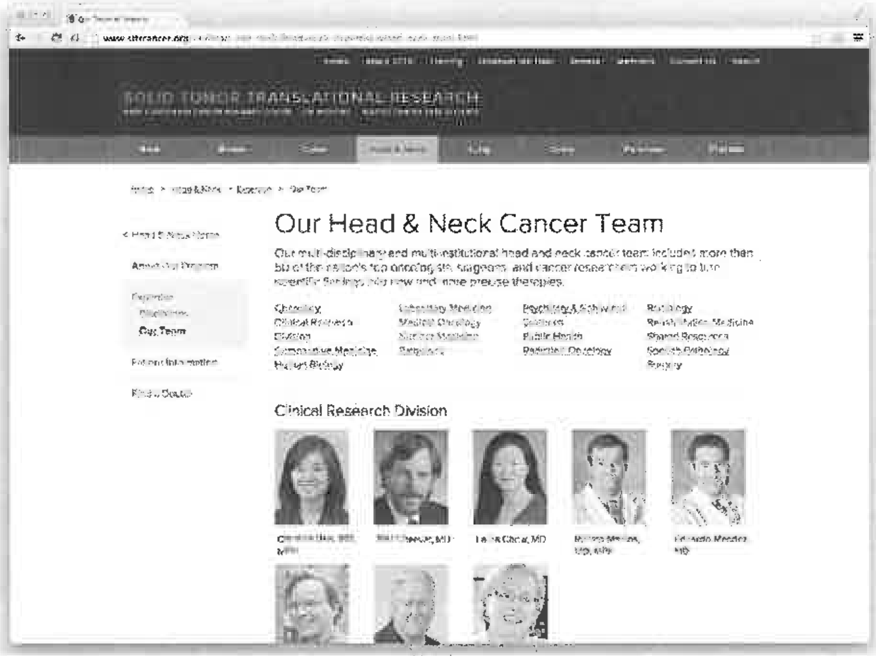
"The excellent working team relationships I have with my colleagues—oncologists, radiologists, pathologists, and gastroenterologists—is one of the highlights of my job. I am grateful to be working with such bright, caring, knowledgeable specialists."
Dr. Karen Horvath, Colorectal Cancer Surgeon



MEDICAL ONCOLOGY CLINIC

Head and Neck Cancer Program

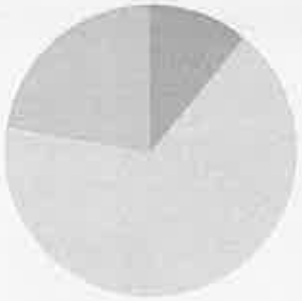
Nationally recognized as leaders in the field, the multidisciplinary cancer care team delivers state-of-the-art care for all cancers of the head and neck. This team includes head and neck surgeons, reconstructive surgeons, oral and maxillofacial surgeons, radiation oncologists, medical oncologists, and neuro-radiologists. The head and neck program offers patients the broadest menu of therapy options locally and regionally.

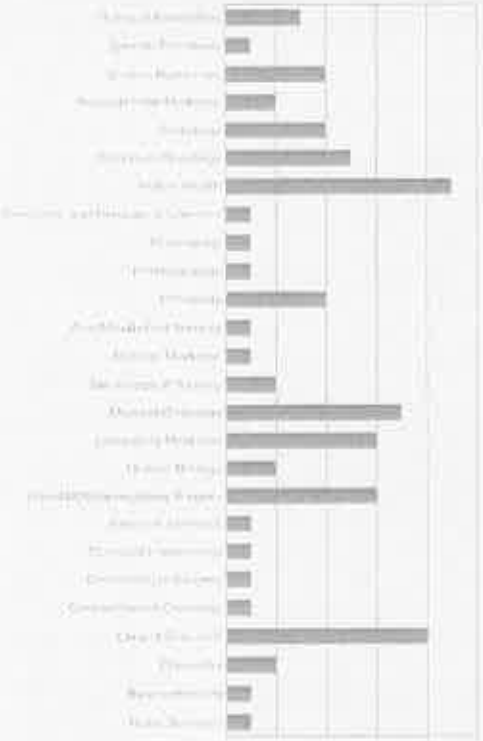


"The passion and enthusiasm demonsrated by the Head and Neck group is impressive and exciting to see." *Rachel Galbraith (STTR Research Coordinator)*

"Treating a patient as I would like to be treated if I were one." *Dr. Upendra Parvathaneni, Radiation Oncologist*

HEAD AND NECK TRANSLATIONAL RESEARCH METRICS





TOP FEATURES

- Largest number of immunotherapy clinical trials for head and neck cancer using anti-PD-L1 therapies on the West Coast
- Neutron therapy
- Molecular profiling
- Multidisciplinary patient care
- Physician-scientists

TUMOR BOARD AND PERSONALIZED CARE

Every year, 350 new head and neck cancer patients are evaluated at UW Medical Center. A multidisciplinary Head and Neck Tumor Board, which includes head and neck reconstructive and dental surgeons, radiation and medical oncologists, and neuro-radiologists, meet weekly to come up with the best treatment plan for each patient. Every patient receives a personal care team: a head and neck surgeon, hematologist/oncologist, nurse case manager, and a radiation oncologist, if needed.

Patient Appointments
855-857-0595

HEAD AND NECK TRANSLATIONAL RESEARCH SPOTLIGHT

Head and neck cancers account for approximately 3 percent to 5 percent of all cancers in the United States. This year, an estimated 55,070 people (40,220 men and 14,850 women) will develop head and neck cancers. SCCA is the Northwest's leader in head and neck cancer care. UW Medicine and Fred Hutch doctors are working to develop new cancer treatments every day. Our goal is to achieve a cure and simultaneously minimize short and long-term side effects of therapy.

RESTRICTING TUMOR GROWTH FACTOR GENES

Dr. Cao Chan and Eduardo Mendez have identified gene signatures in patient tissue and blood samples that can better predict patient survival. Dr. Mendez is also discovering innovative ways to block genes, thereby limiting cancer cell growth.

A NOVEL APPROACH TO DRUG DISCOVERY

Research led by Dr. Chris Kemp has created a "Discovery Engine" using computational and functional genomics to identify targeted drug therapies for some of the most highly aggressive, treatment-resistant forms of head and neck squamous cell carcinoma. We found that [illegible] method to identify new therapeutics for cancer cells, including those containing mutations in TP53, and have shown that targeting these vulnerabilities with drugs [illegible]

DETERMINING ORAL CANCER RISK FACTORS

PREVENTING UNNECESSARY SURGERY

GROUND-BREAKING TESTING TECHNIQUES

Our program features innovative testing platforms, utilizing the most cutting-edge research available. Access to these tools not only allows us to provide better diagnostic and clinical care, it also helps us

Precision medicine is based on the idea that knowing the genetic [illegible] causes a person's cancer enables [illegible] therapies for those genes, leading to shrinkage or elimination of the tumor.

[illegible] targeted therapies and treatments. In addition, their work will enhance UW Medicine's expertise in genomic medicine and will serve as a [illegible]

HEAD AND NECK TRANSLATIONAL RESEARCH SPOTLIGHT

State-of-the-Art Patient Care

Targeted Therapies

Neutron Therapy

Surgery

Proton Therapy

PRECISION MEDICINE

ADVANCING TREATMENT

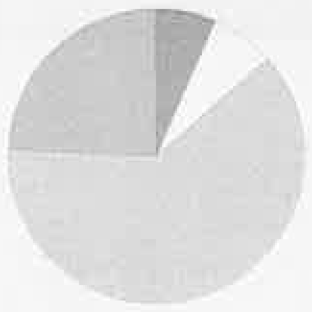
Lung Cancer Program

A multidisciplinary team of researchers across UW Medicine, SCCA and Fred Hutch are combining laboratory and clinical studies focused on improving lung cancer survival. Pulmonologists, chest radiologists, medical oncologists, thoracic surgeons, and radiation oncologists offer comprehensive services for both diagnosis and treatment, and offer access to numerous clinical trials for novel lung cancer therapeutics.

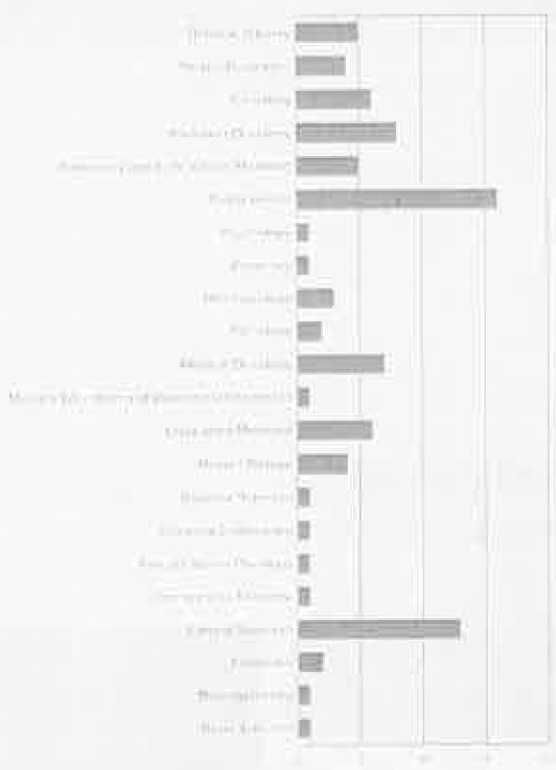
Dr. David Mades, director, Lung Cancer Early Detection and Prevention Clinic

"It is very important to me that every patient receive courteous, compassionate, and state-of-the-art medical care, just as I would want for members of my family. Our team approach to the diagnosis and treatment of lung cancer enables me to provide the very best care for my patients."

Dr. David Mades, Director, Lung Cancer Early Detection and Prevention Clinic



LUNG CANCER TRANSLATIONAL RESEARCH METRICS



TOP FEATURES

- Highest survival rates in the nation for stage I, II, III, and IV patients
- Lung Cancer Prevention Clinic
- Nodule Board: multidisciplinary team reviews charts and plans follow-up
- Translational research working group
- Screening program with Department of Energy and Hanford Nuclear Reservation retirees

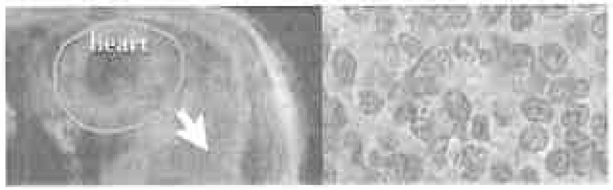
SCREENING CENTER OF EXCELLENCE

SCCA is one of only two centers in Washington state recognized as a Screening Center of Excellence by the Lung Cancer Alliance, a nonprofit organization dedicated to saving lives and advancing research by empowering those living with and at risk for lung cancer.

Patient Appointments
855-557-0555

LUNG CANCER TRANSLATIONAL RESEARCH SPOTLIGHT

Lung cancer is the leading cause of cancer death in the United States, and the five-year survival rate—just 15 percent, a number that has not changed significantly in three decades—reflects the challenge in clinical management of this disease. Each year, about 228,000 people are diagnosed with lung cancer, which is responsible for one-third of all cancer deaths in the United States. Researchers are looking into ways to detect, prevent and cure lung cancer through new gene therapies.



THE ROLE OF VITAMIN D IN CANCER PREVENTION

Research published in The American Journal of Clinical Nutrition, under the direction of Dr. Marian Neuhouser, found that increased vitamin D intake was associated with a lower lung cancer risk in never-smoking postmenopausal women.

DETECTING LUNG CANCER IN NON-SMOKERS

In women, roughly half of lung cancer ... test to detect early-stage lung cancer. Global estimates suggest that as many as 25 percent of all lung cancers worldwide—15 percent of those in men and 50 percent of those in women—are not attributable to smoking.

BUILDING NATIONAL PARTNERSHIPS

The Building Trades National Medical Screening Program (BTMed) and SCCA have expanded their early lung cancer detection program for high risk construction workers in western ...

IDENTIFYING GENE MUTATIONS AS A MEANS TO THERAPIES

EARLY DETECTION & PREVENTION CLINIC

EARLY DETECTION IN HIV-POSITIVE INDIVIDUALS

Lung cancer is a leading cause of cancer death among HIV-infected persons. Dr. Kristine Crothers and her colleagues are developing a mathematical model to estimate the [illegible] among HIV-positive individuals [illegible] and [illegible] for screening. This work will provide relevant, clinically useful results to improve care of HIV-positive patients and policy surrounding lung cancer screening in this population.

LUNG CANCER TRANSLATIONAL RESEARCH SPOTLIGHT

Dr. Miguel Vargas, Fluvio Seattle Cancer Care Alliance.

REGION'S MOST EXPERIENCED TREATMENT PROGRAM

Our Lung Cancer Program is the largest, most experienced program [illegible]. Through SCCA, patients have access to [illegible] treatments. Most clinical studies on lung cancer take place here than anywhere else in the region, so our patients have access to the latest treatment options.

Due [illegible] Dr. Mulligan and his colleagues, the UW Medical Center has been recognized as a regional center of excellence for video-assisted thoracic surgery (VATS) and other lung care procedures, handling a large volume of referrals. While a few other Northwest hospitals use VATS, Dr. Mulligan has become the leading surgeon for training new doctors in the technique.

Dr. Leah Backhus

"I truly enjoy the act of helping people, and I like using my hands to make things work. Being a surgeon allows me to do both."

Dr. Leah Backhus, Thoracic Surgeon

IMMUNE CELLS AND TUMOR GROWTH

[illegible]

EXPANDING TREATMENT OPTIONS

[illegible]

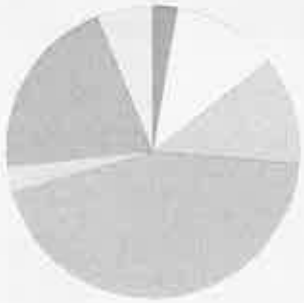
Ovarian Cancer Program

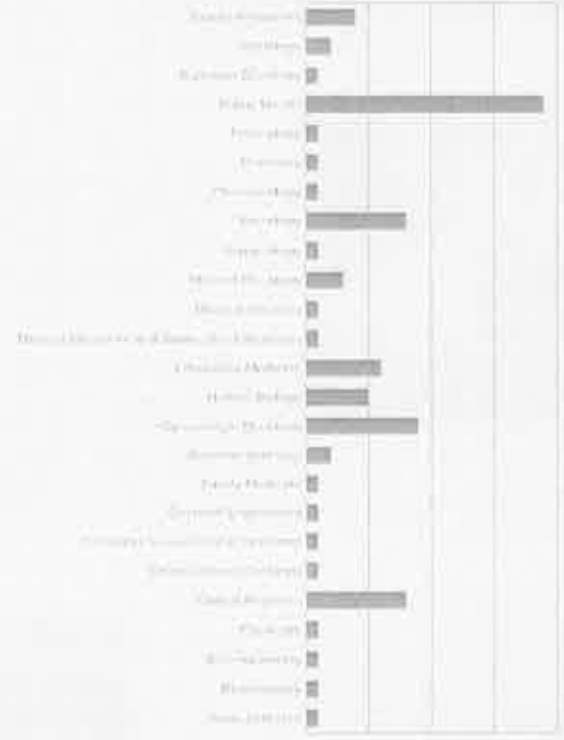
We have a comprehensive multidisciplinary team approach to the treatment of patients with ovarian cancer that includes state-of-the-art surgery, chemotherapy, radiation, nutrition, social work, physical therapy, psychiatry, and nursing. Our translational science promotes the best chances of cure and the highest possible quality of life. Our genetic program in ovarian cancer is world-renowned and focuses on using genetic information to drive prevention and novel, targeted treatments.

[illegible]

"I consider myself a partner in my patients' care. Having a multidisciplinary approach is key. I enjoy it when patients take an active role in their health care. My role is to give them options, as there is no one right way to do things. Seattle Cancer Care Alliance is a great place because of this multidisciplinary approach." [illegible]

OVARIAN CANCER TRANSLATIONAL RESEARCH METRICS





TOP FEATURES

- Top-ranked clinical science program grant (SPORE)
- Immunotherapy clinical trials
- Women's Cancer Prevention Program
- Multidisciplinary patient care physician-scientists

NEW SCREENING METHODS

Drs. Barbara [illegible] Andersen and their team found that combining a patient questionnaire with a standard blood test could improve early detection of ovarian cancer by 20 percent. Their study represents the first evaluation of an ovarian cancer symptom screening tool in a primary care setting among normal risk women.

Patient Appointments
855-537-0855

OVARIAN CANCER TRANSLATIONAL RESEARCH SPOTLIGHT

In the United States, approximately 25,000 women will be diagnosed with ovarian cancer each year, and 15,000 will die from the disease. This is due to the fact that almost 70 percent of women with epithelial ovarian cancer are not diagnosed until the disease is in the advanced stages, having spread to the abdomen or beyond. However, there are new tools being explored to detect ovarian cancer early. When ovarian cancer is caught in the early stages, before it has spread beyond the ovary, more than 90 percent of women will survive beyond five years.

COMPREHENSIVE TRANSLATIONAL RESEARCH PROGRAM

The Pacific Ovarian Cancer Research Consortium (POCRC) led by Dr. Nicole Urban, has been continuously funded since 1999 by NIH grants conduct innovative ovarian cancer research. The POCRC is a community-based, multidisciplinary research program that involves clinicians, laboratory and public health scientists from private research and medical institutions on the West Coast with the goal of translating laboratory discoveries into clinical treatments or diagnostic tests to improve patient outcomes.

IMMUNOTHERAPY IN ACTION

A POCRC project, led by Dr. Nora [illegible], investigated the use of immunotherapy in the treatment of ovarian cancer. In only five years, the multidisciplinary team proposed a vaccine for use in the adjuvant setting, [illegible] a clinical trial, opened a [illegible] and completed a Phase I clinical trial. This trial is an exceptional example of translational and collaborative research. Preliminary results indicate a promising rate of response among advanced ovarian cancer patients.

"My goal is to achieve the best possible care for my patients by tailoring individual treatments and employing a multidisciplinary approach." Dr. John Lee, Gynecologic Oncologist

PIONEERING IMMUNOGENIC CANCER RESEARCH

COMBINED SCREENING APPROACHES WITH GLOBAL IMPACTS

Dr. Elizabeth Swisher

GENETIC RISK ASSESSMENT

[illegible] peritoneum. Most patients with [illegible] previously thought. Dr. Elizabeth Swisher and her research team are looking for a more complete genetic picture of ovarian and related cancers, finding the genes of [illegible] and developing a simple test to detect these mutations, could lead to earlier [illegible]

OVARIAN CANCER TRANSLATIONAL RESEARCH SPOTLIGHT

BIOMATERIAL ENGINEERING TO DELIVER CANCER-KILLING CELLS

[illegible] cavities.

APPLYING T-CELL THERAPY TO OVARIAN CANCER

Drs. Thomas Spies and Veronika Groh Spies are studying the divergent roles of the NKG2D lymphocyte receptor and its ligands in human cancer. They found that subsets of carcinoma cells, including ovarian, co-opt expression of the NKG2D receptor, thus exploiting the presence of its ligands for self-stimulation of tumorigenicity. Their current study aims at addressing the relative contributions of the immunologic (T cell and NK cell-mediated) versus [illegible] cell-mediated) roles of the NKG2D receptor in ovarian cancer.

[illegible]

T-CELL SEQUENCING FOR FUTURE THERAPIES

[illegible]

EXPERT CARE AND TREATMENTS

[illegible]

Pancreatic Cancer Program

We have developed an integrated, multidimensional translational program across Fred Hutch, UW Medicine, and SCCA—the Center for Accelerated Translation in Pancreas Cancer (CATPAC). The components of CATPAC include population sciences, high-risk disease, and preclinical and clinical trials.

[illegible]

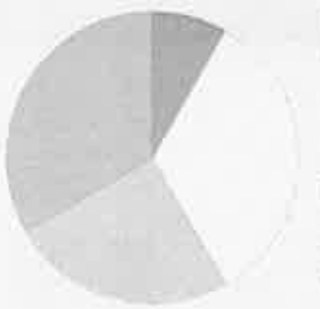
Neal Bank, lead participant, cancer survivor

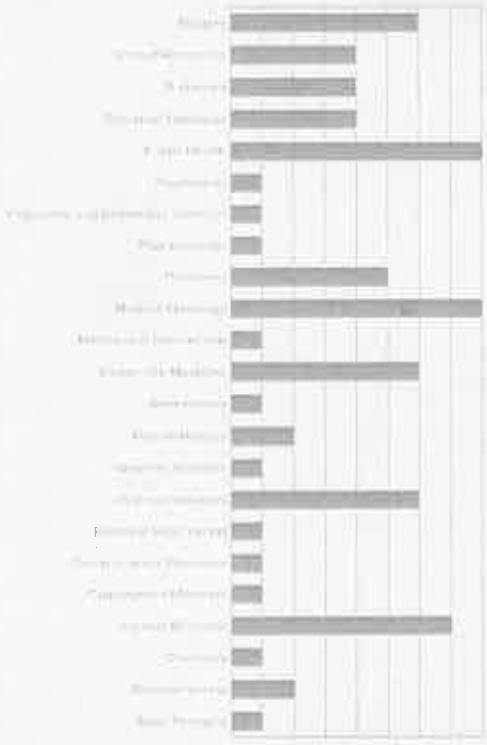
"One thing about SCCA...we got constant follow-up...everyone was so compassionate." Dan Berglund

"Dr. (Teresa) Brentnall came to visit me in the hospital. The team I had was amazing." Frank Silencio

"(Seattle Cancer Care Alliance was) the best choice that could have been made. The care was superb from day one." Robert Lowe

PANCREATIC CANCER TRANSLATIONAL RESEARCH METRICS





TOP FEATURES

- Preclinical program for new detection and treatment strategies
- Genetically engineered cancer models developed and in use around the world
- Ground breaking immunotherapy research
- World's largest population-based study examining environmental and genetic risk factors
- Proton therapy center
- Advanced imaging and molecular diagnostics
- Sophisticated endoscopic procedures

PANCREAS CANCER SPECIALTY CLINIC (PCSC)

Multidisciplinary care is taken to a new level at the PCSC. Our dedicated team includes surgical, medical and radiation oncologists, radiologists, and pathologists, as well as nurses, palliative care experts, nutritionists, social workers, and other patient support providers, working together so patients leave their first appointment with a comprehensive evaluation and treatment recommendation.

Patient Appointments:
855-557-0555

PANCREATIC CANCER TRANSLATIONAL RESEARCH SPOTLIGHT

The American Cancer Society estimates that about 44,000 people in the United States will be diagnosed with pancreatic cancer each year. Pancreatic cancer is the 10th most common cancer in men and women, but is the fourth leading cause of cancer-related deaths. These cancers could be curable if diagnosed early, if innovative treatments are used to tackle the tumor's unique features, and if researchers uncover the underlying causes for the disease.

Dr. Sunil Hingorani (left) Dr. Nigam Shenoy of [illegible] prepare cells under the microscope.

IMPROVING THERAPEUTIC EFFECTIVENESS

A few years ago, Dr. Sunil Hingorani and his team made an exciting discovery: pancreatic cancers secrete large amounts of a polymer that forms a protective shield, collapses blood vessels and prevents systemic chemotherapies from penetrating into the tumor bed. They further found that dissolving this barrier with an enzyme called PEGPH20 enabled chemotherapy drugs to readily perfuse the tumor. "It appears that the very same chemotherapies that essentially did not work at all previously do seem to work in conjunction with the enzyme," says Dr. Hingorani. "And the genetic [illegible]

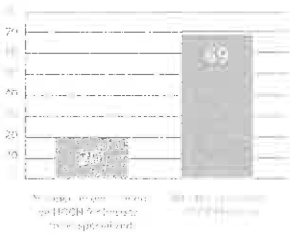
Based on promising results from an already completed Phase Ib study, Dr. Hingorani and colleagues are now leading the ability to [illegible] enzyme treatment. His team has also discovered that pancreatic cancers shield themselves with suppressor [illegible]

SUPERCHARGING THE IMMUNE SYSTEM TO KILL CANCER

SURGERY EXPERIENCE MATTERS

Surgery is the only treatment with the potential to cure pancreatic [illegible] of complications from this [illegible] center by a surgeon who [illegible] procedure frequently. Our [illegible] perform roughly three times the number of pancreatic resections [illegible] specialized practice.

Pancreatic Resections Performed in 2013



PANCREATIC CANCER TRANSLATIONAL RESEARCH SPOTLIGHT

CAUSES OF FAMILIAL CANCER

Dr. Teresa Brentnall is leading a research group that studies the growth of tumors in the gastrointestinal tract with an emphasis on pancreatic cancer. A passionate cancer researcher, Dr. [illegible] detection methods.

[illegible] expression of Palladin allows cells to become increasingly mobile, a key feature of cancer cells. Dr. Brentnall's discovery is unlocking a key to our understanding of familial pancreatic cancer and blazing a path for future [illegible] of research into this disease.

"Compassion is the guiding principle of our multidisciplinary approach to patient care; therefore, we strive to advise patients as we would our own family while recognizing there may be fundamental differences in our belief systems."

Dr. Venu Pillarisetty, Surgical Oncologist

PANCREATIC BIOMARKER DISCOVERY

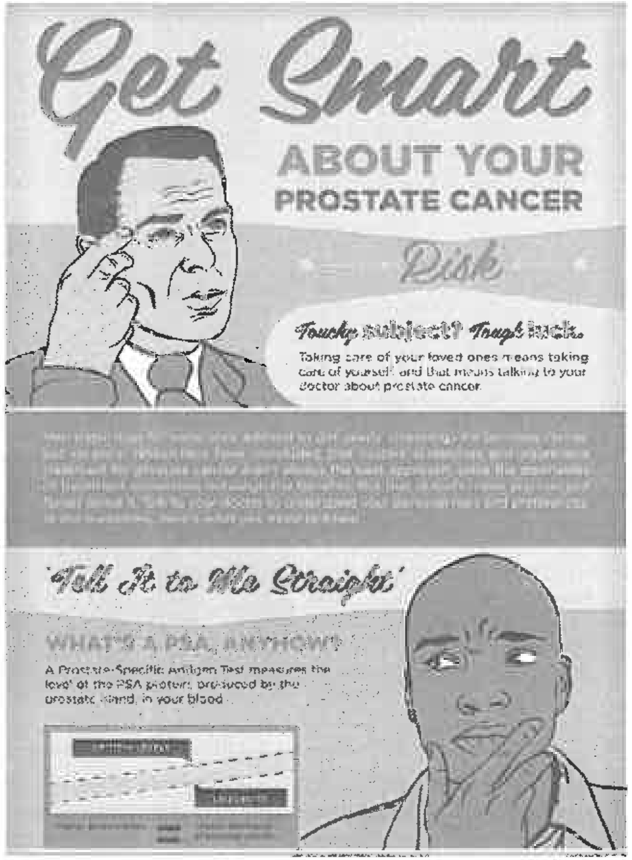
[illegible]

INNOVATIVE BIOENGINEERING FOR EARLY DETECTION

[illegible]

Prostate Cancer Program

Our team of medical oncologists, pathologists, radiation oncologists, and surgeons bring deep clinical and translational science expertise in the prevention, detection and treatment of early and late-stage prostate cancer. These physician-scientists who specialize only in prostate cancer, help set national guidelines and promote the early testing of the newest treatments. Major efforts now bring precision medicine approaches to patients through the SU2C (Stand Up 2 Cancer) Dream Team project.

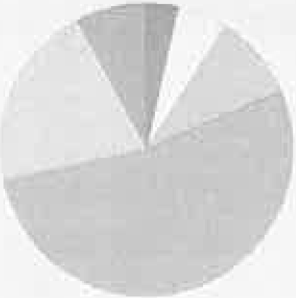


"My goal is to provide the highest level of medical and surgical care in a compassionate environment where the patient is an active member of the team."

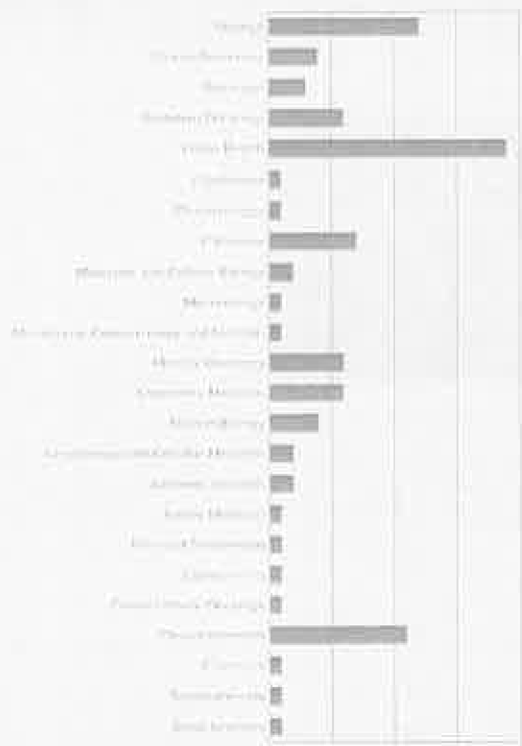
Dr. Jonathan Wright,
[illegible]

"We want to provide the best care, all the time, for every patient."

Dr. Robert Bruce Montgomery,
Clinical Director, Genitourinary Medical Oncology



PROSTATE CANCER TRANSLATIONAL RESEARCH METRICS



TOP FEATURES

- Highest survival rate in the nation for stage II, III and IV patients
- Top-ranked clinical science program grant (SPORE)
- StandUp2Cancer Dream Team Project (genomic sequencing for patients)
- PASS (Prostate Active Surveillance Study)
- Highest accrual site for first immunotherapy trial

PIONEERING PSA

Drs. Robert Vessella, Paul Lange, and colleagues were integral to the implementation of the PSA screening test as standard of care. Their 1987 paper entitled "Prostate specific antigen and prostatic acid phosphatase in monitoring and staging of patients with prostatic cancer" was instrumental in the FDA's decision to approve PSA [illegible] Since [illegible] on the cutting edge of prostate cancer research.

PROSTATE CANCER TRANSLATIONAL RESEARCH SPOTLIGHT

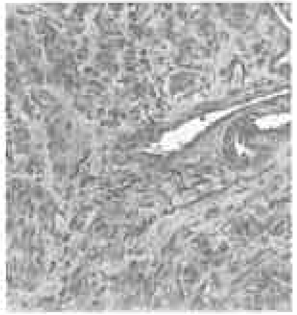
One in six men will be diagnosed with prostate cancer in their lifetime. It is the second most common cancer in men and accounts for a significant number of cancer deaths in the United States, claiming 30,000 lives each year. Our program brings together the expertise of interdisciplinary teams of international research leaders—all focused on understanding the causes of prostate cancer and preventing its progression to lengthen survival and improve quality of life.

"I still find myself returning to the center from time to ... beginning."

PACIFIC NORTHWEST SPORE

... across the nation. Originally awarded in 2002, this five-year grant has been competitively renewed twice, an accomplishment that underscores the innovative and groundbreaking progress achieved by this team.

The PNW Prostate Cancer SPORE includes partnerships with the UW, the University of British Columbia and its affiliate, the Vancouver Prostate Centre, ... to address the morbidity and mortality ...



GENOMIC MEDICINE TRANSFORMING CARE

A WORLD-RENOWNED CANCER RESOURCE

ACTIVE SURVEILLANCE: SAFER MANAGEMENT OF DISEASE

While prostate cancer is [illegible] frequently diagnosed cancer [illegible] in North America, not all [illegible]. Some cases of prostate cancer grow so [illegible] that patients tend to die with the disease rather than from it. In these cases conventional treatment for prostate cancer may cause more [illegible] [illegible] lead the Prostate Active Surveillance Study one of the largest [illegible] [illegible] markers that distinguish aggressive lethal prostate cancers from those that are slow growing. This work will help reduce harm and health care costs for countless men down the road.

PROSTATE CANCER TRANSLATIONAL RESEARCH SPOTLIGHT

PREVENTION STUDIES

The Prostate Cancer Genetic Research Study (PROGRESS) led by Dr. Janet Stanford is a nationwide research project exploring why select families have an increased incidence of [illegible] 300 families with multiple members diagnosed with prostate cancer, some at particularly early ages. Discovering the inherited genes for prostate cancer in families and how they work will [illegible] treat, cure, and even prevent prostate cancer in future generations.

INSTITUTE FOR PROSTATE CANCER RESEARCH (IPCR)

IPCR, a collaborative effort of UW Medicine and Fred Hutch, is a natural outgrowth of established research and clinical collaborations. The IPCR brings together a world-renowned team whose mission is to understand the causes of prostate cancer and its progression, develop new prevention strategies, devise innovative diagnostics, and improve survival and quality of life.

[illegible]

MOLECULAR SEQUENCING

[illegible]

CLINICAL TRIAL PROGRESS

[illegible]

Using Analytics to Inform Strategic Plans: Our Metrics

STTR has compiled five-year historic metrics on faculty across the eight organ sites. Over 400 faculty members were identified, and data was gathered on their global collaborations, clinical trials, research grant funding, and publications. These metrics are being used to guide newly formed, multidisciplinary working groups in making decisions about future initiatives that will drive their translational science forward.

Global Presence

As the global burden of cancer is on the rise, our scientists and [illegible] are focused on the dissemination of collaborative [illegible] as evidenced by their effort over the past five years.

The map below reflects the global presence of STTR faculty by marking our national and international collaborations. STTR faculty have presented at conferences in over 650 locations across 61 countries; published with investigators and clinicians at 603 institutions across 60 countries; and have grants with 42 partners nationally and two internationally.

Country List

[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	France	[illegible]	[illegible]
[illegible]	Germany	Lebanon	Singapore
[illegible]	Greece	[illegible]	Slovenia
[illegible]	Honduras	[illegible]	South Korea
[illegible]	Hungary	[illegible]	[illegible]
[illegible]	Iceland	Nicaragua	Sweden
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Ireland	[illegible]	[illegible]
[illegible]	Iran	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	The Netherlands
[illegible]	Italy	[illegible]	[illegible]
[illegible]	Japan	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	United Arab Emirates
			[illegible]

2008-2013: Select Publications in High-Impact Journals

Our faculty have been extremely successful and have published several thousand journal articles. The following represent a selection of our publications in several high-impact journals.

Anderson BO, et al. Optim[illegible] of breast cancer management [illegible] [illegible]dle-resource countries: executive summary of [illegible] consensus, 2010. Lancet Oncol. 2011 Apr;12(4):387-98.

Anderson GL, et al. Conjugated equine oestrogen and breast cancer incidence and mortality [illegible] hysterectomy: extended follow-up of the Women's Health Initiative randomised placebo-controlled [illegible] Lancet Oncol. 2012 May;13[illegible]

Anderson GL, McIntosh M, ... Goodman G, ... Drescher C, Urban N. Assessing lead time of [illegible] case-control study. J Natl Cancer Inst. 2010 Jan 6;102(1):26-38.

Benitez AC, ... Groh V, Spies T. [illegible] NKG2D lymphocyte receptor in human cancer cells. Proc Natl Acad Sci U S A. 2011 Mar 8;108(10):4081-6.

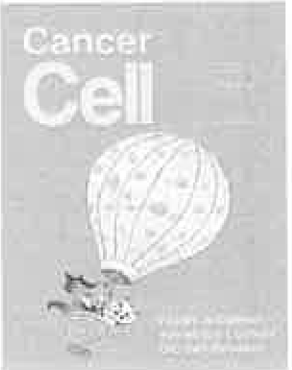
Brasky TM, ... Tangen CM, ... Goodman GE, et al. Plasma phospholipid fatty acids and prostate cancer risk in the SELECT trial. J Natl Cancer Inst. 2013 Aug 7;105(15):1132-41.

Chamberlain MC. Elderly people with glioblastoma. Lancet Oncol. 2012 Aug;13(8):e328-9.

Chen LS, ... Potter JD, ... Prentice RL, Peters U, Hsu L. Insights into colon cancer etiology using a regularized approach to gene set analysis of GWAS data. Am J Hum Genet. 2010 Jun [illegible]

Chlebowski RT, Anderson GL. Changing [illegible] 2012 [illegible]

Chubak J, ... Barlow WE, Buist DS. [illegible]



Cieslewicz M, ... Lieber A, ... Pun SH. Targeted delivery of proapoptotic peptides to tumor-associated macrophages improves survival. Proc Natl Acad Sci U S A. 2013 Oct 1;110(40):15919-24.

Coghill AE, Newcomb PA, Potter JD. Aspirin use, colorectal cancer survival, and loss to follow-up. JAMA. 2009 Dec 16;302(23):2519.

Davis MA, ... Clurman BE. The SCF-Fbw7 ubiquitin ligase degrades MED13 and MED13L and regulates CDK8 module association with Mediator. Genes Dev. 2013 Jan 15;27(2):151-6.

Diede SJ, ... Tapscott SJ. Genome-wide analysis of palindrome formation. Nat Genet. 2010 Apr;42(4):279.

Dong LM, Potter JD, White E, Ulrich CM, ... Peters U. Genetic susceptibility to cancer: the role of polymorphisms in candidate genes. JAMA. 2008 May 28;299(20):2423-36.

Etzioni R, et al. Studies of prostate-cancer mortality: caution advised. Lancet Oncology. 2008 May;9(5):407-9.

Foygel K, ... Chen R, ... Brentnall TA, et al. Detection of pancreatic ductal adenocarcinoma in mice by ultrasound imaging of thymocyte differentiation antigen 1. Gastroenterology. 2013 Oct;145(4):885-894.e3.

Friend SH, et al. Metcalfe's law and the biology information commons. Nat Biotechnol. 2013 Apr;31(4):297-303.

Ghajar CM, et al. The perivascular niche regulates breast tumour dormancy. Nat Cell Biol. 2013 Jul;15(7):807-17.

Gore JL, et al. Survivorship beyond [illegible] 12-month quality of life [illegible] after treatment for localized [illegible] cancer. J Natl Cancer Inst. 2009 Jun [illegible]

[illegible] ... Holland EC. [illegible] pathway regulates survival of [illegible] cells residing in the [illegible] niche following radiation [illegible]blastoma in vivo. Genes Dev. 2009 Feb 15;23(4):438-43.

[illegible] Pritchard CC, ... Shendure J. [illegible] for targeted, high-accuracy [illegible] of low-frequency variation. Genome Res. 2013 May;23(5):843-51.

Houghton AM, et al. Neutrophil elastase-mediated [illegible]

[illegible] Bradley RK, ... Olson JM, Parkinson RJ. G[illegible] Genes Dev. 2012 May [illegible]

[illegible] ... Holland EC. [illegible] Genes Dev. 2008 [illegible]

Jackson SL, ... Barlow WE, ... Elmore JG. Variability of interpretive accuracy among diagnostic mammography facilities. J Natl Cancer Inst. 2009 Jun [illegible]

Klezovitch O, ... True LD, Nelson PS, Vasioukhin V. A causal role for ERG in neoplastic transformation of prostate epithelium. Proc Natl Acad Sci U S A. 2008 Feb 12;105(6):2105-10.

Kumar A, ... Corey E, Lange PH, Morrissey C, Vessella RL, Nelson PS, Shendure J. Exome sequencing [illegible] A. 2011 Oct 11;108(41):17087-92.

Lee MJ, ... Randolph-Habecker J, Knoblaugh SE, ... Olson JM. Hedgehog pathway inhibitor saridegib (IPI-926) increases lifespan in a mouse medulloblastoma model. Proc Natl Acad [illegible]

Li CI, ... Prentice R. Alcohol consumption and risk of postmenopausal breast cancer by subtype: the Women's Health Initiative observational study. J Natl Cancer Inst. 2010 Sep 22;102(18):1422-31.

Luebeck EG. Cancer: Genomic evolution [illegible]

Margolin K, et al. Ipilimumab in patients with melanoma and brain metastases: an open-label, phase 2 trial. Lancet Oncol. 2012 May;13(5):459-65.

McIntosh M, et al. [illegible] by targeted mass spectrometry. Nat Biotechnol. 2009 Jul;27(7):522-3.

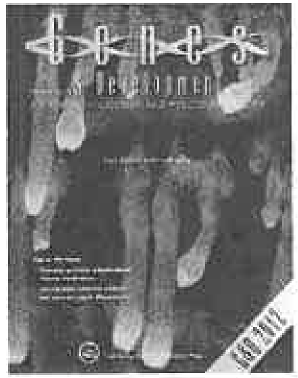
Moinpour CM, et al. Health-related [illegible]

Monsees GM, Malone KE, ... Newcomb PA, Li CI. Bisphosphonate use after estrogen receptor-positive breast [illegible]

Peters U, ... Makar KW, ... Newcomb PA, Potter JD, Prentice RL, ... Ulrich CM, White E, ... Hsu L, et al. [illegible]

Phipps AI, ... Prentice R, McTiernan A, ... Li CI. Reproductive history and oral contraceptive use in relation to risk of [illegible]

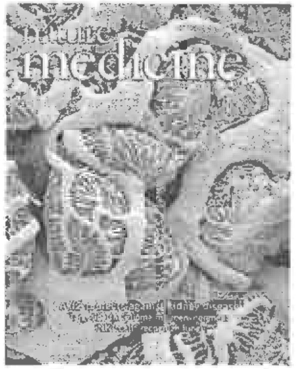
Pilarski R, ... Swisher E. Cowden [illegible]



Porter P. "Westernizing" women's risks? [illegible]

Provenzano PP, Cuevas C, ... Hingorani SR. [illegible]

Rossing MA, ... Weiss NS. Predictive [illegible]



[illegible] resistance through WNT16B. Nat Med. 2012 Sep;18(9):1359-68.

Taplin S, ... **Barlow WE, ... Elmore JG.** Mammography facility characteristics associated with interpretive accuracy of screening mammography. J Natl Cancer Inst. 2008 Jun 18;100(12):876-87.

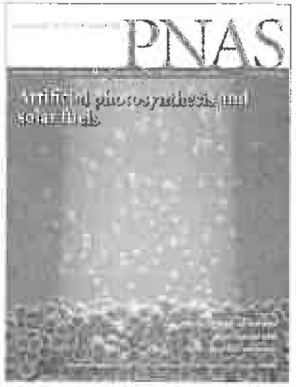
Thompson IM, ... **Tangen CM.** Prostate-specific antigen, risk factors, and prostate cancer: confounders nestled in an enigma. J Natl Cancer Inst. 2010 Sep [illegible]

Thompson IM, **Tangen C.** Prostate Cancer: uncertainty and a way forward. N Engl J Med. 2012 Jul 19;367(3):270-1.

Trobridge P, **Knoblaugh S, ... Tsuchiya KD, ... Ulrich CM, ... Grady WM.** TGF-beta receptor inactivation and mutant Kras induce intestinal neoplasms in mice via a beta-catenin-independent pathway. [illegible]

Toyoshima M, ... **Grandori C.** Functional [illegible] Sci USA. 2012 Jun 12;109(24):9545-50.

Ussakli CH, ... **Brentnall TA, ... Rabinovitch PS, Risques RA.** Mitochondria and tumor progression in ulcerative colitis. J Natl Cancer Inst. 2013 Aug 21;105(16):1239-48.



Sakai W, **Swisher EM, ... Urban N, Taniguchi T.** Secondary mutations [illegible] Feb 28;451(7182):1116-20.

Sitnik S, **Cooper JA.** [illegible] dendritic branching by Cdc42 [illegible] Genes Dev. 2012 Aug 1;26[illegible]

Sun S, ... **Vessella RL, ... Mostaghel EA, Page ST, ... Nelson PS, ... Plymate SR.** Castration resistance in human prostate cancer is conferred by a frequently occurring androgen receptor [illegible]

Swisher E, et al. BRCA1 and BRCA2 mutations in ovarian cancer. JAMA. 2012 [illegible] 25;307(4):359-60.

Swisher EM, Taniguchi T. [illegible] Molecular scores to predict [illegible] 2012 May 2;104(9):642-5.

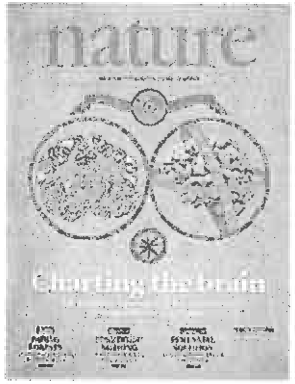
Squatrito M, ... **Holland EC.** [illegible] ATM/CHK2 p53 pathway [illegible] 14;18(6):619-29.

Sun Y, ... **Higano C, ... Porter P, ... True L, Nelson PS.** Treatment-induced [illegible]

Urban N, ... Anderson GL, ... McIntosh MW, ... Drescher CW. Potential role of HE4 in multimodal screening for epithelial ovarian cancer. J Natl Cancer Inst. 2011 Nov 2;103(21):1630-4.

Walsh T, ... **Garcia RL,** King MC, **Swisher EM.** Mutations in 12 genes for inherited ovarian, fallopian tube, and peritoneal carcinoma identified by massively parallel sequencing. Proc Natl Acad Sci U S A. 2011 Nov 1;108(44):18032-7.

Walter RB, ... **Potter JD, White E.** Height as an explanatory factor for sex differences in human cancer. J Natl Cancer Inst. 2013 Jun 19;105(12):860-8.



Whiteaker JR, ... **Gafken PR, ... Nelson PS, McIntosh MW, Kemp CJ, Paulovich AG.** A targeted proteomics-based pipeline for verification of biomarkers in plasma. Nat Biotechnol. 2011 Jun 19;29(7):625-34.

Weiss NS, Newcomb PA. Quantifying the potential benefit of sigmoidoscopic rescreening for colorectal cancer. J Natl Cancer Inst. 2012 Feb 22;104(4):259-60.

Zeliadt SB, ... Etzioni R, Gore JL, Kessler LG, Lin DW. Influence of publication of US and European prostate cancer screening trials on PSA testing practices. J Natl Cancer Inst. 2011 Mar 16;103(6):520-3.

Select Solid Tumor Clinical Trials

Below is a partial list of solid tumor clinical trials. A full list is available at http://www.seattlecca.org/clinical-trials/clinical-trials.cfm

Brain

Celldex Act-IV Vaccine Study for Newly Diagnosed Glioblastoma (UW11038)

An International, Randomized, Double Blind, Controlled Study of Rindopepimut/GM-CSF with Adjuvant Temozolomide in Patients with Newly Diagnosed, Surgically Resected, EGFRvIII-Positive Glioblastoma

Investigator: Maciej Mrugala, MD, PhD

Glioma Imaging Study (7185)

Distinguishing Recurrent Glioma from Post-Radiation Change: Can Advanced MRI Techniques Predict Outcome?

Investigator: James Fink, MD

NW Avastin trial for Progressive or Recurrent Meningiomas (7329)

Phase II Trial of Bevacizumab (Avastin) in Patients with Recurrent or Progressive Meningiomas

Investigator: Marc Chamberlain, MD

Radiation Therapy with or without Temozolomide for Anaplastic Glioma (RTOG 0834)

[illegible] Trial on Concurrent and Adjuvant [illegible] Chemotherapy in Non-[illegible] Anaplastic Glioma: The [illegible] Intergroup Trial

[illegible]: George Laramore, MD, PhD

Breast

Acupuncture vs. Sham Acupuncture for AI-induced Arthralgias (S1200)

[illegible] Blinded Sham- and Waitlist-Controlled Trial of Acupuncture for Joint [illegible] Related to Aromatase Inhibitors [illegible] with Early Stage Breast Cancer

Investigator: Julie Gralow, MD

DCE-MRI and DWI for Detection and Diagnosis of Breast Cancer (9049)

[illegible]

Investigator: Savannah Partridge, PhD and Habib Rahbar, MD

Monitoring Patients with Triple Negative Breast Cancer (8132)

[illegible]

[illegible]

STAR Study (Screening Tomosynthesis and ABUS Research Study)

[illegible]

[illegible]

Vaccine Therapy for HER2+ Stage IV Breast Cancer

[illegible]

Investigator: Lupe Salazar, MD

Colorectal

Capecitabine and Celecoxib w/wo Radiation Therapy for Colorectal Cancer Patients Previously Treated with Fluorouracil (ADAPT-7707)

[illegible]

Investigator: Edward Lin, MD

Chemotherapy or Chemotherapy + Radiation for Rectal Cancer Patients Undergoing Surgery (The PROSPECT Trial)

[illegible]

[illegible]

Molecular Markers for Colon Cancer Screening

[illegible]

[illegible]

TheraSphere® Metastatic Colorectal Carcinoma of the Liver (7627-TS-102)

[illegible]

Investigator: William Harris, MD

Head and Neck

Induction Chemotherapy for Locally Advanced Squamous Cell Carcinoma of the Head and Neck (7797)

A Phase II Study of Carboplatin, Nabpaclitaxel and Cetuximab for Induction Chemotherapy for Locally Advanced Squamous Cell Carcinoma of the Head and Neck

Investigator: Renato Martins, MD, MPH

MPH Postoperative Radiation Therapy +/- Cetuximab for Head and Neck Cancer (RTOG 0920)

A Phase III Study of Postoperative Radiation Therapy (IMRT) +/- Cetuximab for Locally Advanced Resected Head and Neck Cancer

Investigator: George Laramore, MD, PhD

Recombinant Interleukin-15 in Treating Patients with Advanced Melanoma, Kidney Cancer, Non-Small Cell Lung Cancer, or Head and Neck Cancer

[illegible]

[illegible]

VTX-2337 for Recurrent or Metastatic Squamous Cell Carcinomas of the Head and Neck (7409)

Phase I Clinical Trial of VTX-2337, a Small Molecule Toll-Like Receptor 8 (TLR8) Agonist in Combination with Cetuximab in Patients with Recurrent or Metastatic Squamous Cell Carcinomas of the Head and Neck (SCCHN)

Investigator: Laura Chow, MD

Lung

Alisertib (MLN8237) in Combination With Paclitaxel for Small Cell Lung Cancer

[illegible]

[illegible]

MEDI4736 (Anti PD-L1) w/ Gefitinib for Non-Small Cell Lung Cancer

[illegible]

[illegible]

Radiation Therapy + Cisplatin and Etoposide for Inoperable NSCLC (7506)

A Phase I Dose Intensification Study [illegible] Radiation Therapy and Con[illegible] Cisplatin and Etoposide for [illegible] Inoperable Non-Small Cell L[illegible]

Investigator: Shilpen Patel, MD

SPECT/CT in Measuring Lung Function in Patients with Lung Cancer Undergoing Radiation Therapy (8180)

[illegible] Imaging for Radiation [illegible] in Lung Cancer

Investigator: Jing Zeng, MD

Ovary

FDG PET for Advanced Ovarian Cancer (Fred Hutch-7009)

FDG PET and Biomarkers in [illegible] Response in Advanced Ov[illegible]

[illegible]

Memory and Thinking Skills Workshop in Improving Cognitive Rehabilitation in Ovarian Cancer Survivors (7750)

[illegible]

Investigator: Heidi Gray, MD

Novel Markers to Predict Malignancy in Elevated-Risk Women (Novel Markers Trial-6973)

[illegible]

[illegible]

Temsirolimus + Carboplatin/Paclitaxel Stage III-IV Clear Cell Carcinoma of the Ovary (GOG-0268)

[illegible]

[illegible]

Vaccine Therapy for Stage III-IV Ovarian Cancer (7390)

[illegible]

[illegible]

Pancreas

FOLFIRINOX [illegible] Pancreatic Cancer (P028)

[illegible]

[illegible]

PEGPH20 with Nab-Paclitaxel Plus Gemcitabine for Stage IV Untreated Pancreatic Cancer

[illegible]

[illegible]

PRI074 Cancer Stem Cell Therapy Gemcitabine and PRI074 in Previously Treated Metastatic Pancreatic Cancer

[illegible]ase Ib [illegible] Cohort Dose Escalation Trial to Determine the Safety, Tolerance and Preliminary Antineoplastic Activity of Gemcitabine Administered in Combination with Continuous Intravenous Doses of PRI-724, a CBP/β-Catenin Inhibitor, to Patients with Advanced or Metastatic Pancreatic Adenocarcinoma Eligible for Second-Line Therapy after Failing First-Line Therapy with FOLFIRINOX or FOLFOX] Protocol PRI-724-102

[illegible]

Prostate

ARN-509 for Relapsed Hormone Sensitive Prostate Cancer (20130917)

The Role of Highly Selective Androgen Receptor (AR) Targeted Therapy in Men with Biochemically Relapsed Hormone Sensitive Prostate Cancer

Investigator: Celestia Higano, MD

GTx-758 for Castration Resistant Prostate Cancer

Phase II, Open Label Study of the Effect of GTx-758 as Secondary Hormonal Therapy on Serum PSA and Serum Free Testosterone Levels in Men with Metastatic Castration Resistant Prostate Cancer Maintained on Androgen Deprivation Therapy

Investigator: Evan Yu, MD

MLN8237 for Metastatic Castrate Resistant and Neuroendocrine Prostate Cancer

A Phase II Trial of the Aurora Kinase A Inhibitor MLN8237 in Patients with Metastatic Castrate Resistant and Neuroendocrine Prostate Cancer

Investigator: R. Bruce Montgomery, MD

Radiation Therapy versus Androgen Deprivation

A Phase III Trial of Short Term Androgen Deprivation with Pelvic Lymph Node or Prostate Bed Only Radiotherapy (SPPORT) in Prostate Cancer Patients with a Rising PSA after Radical Prostatectomy (RTOG 0534)

Investigator: George Laramore, MD, PhD

SCORE (30824)

SCORE -- Assessment of Mood, Information Processing and Quality of Life in Prostate Cancer Survivors and Patients

Investi[illegible]

Priorities for the Future

The People:

- [illegible] STTR to more [illegible] including bladder cancer [illegible]
- [illegible] the transition of [illegible] recruited faculty into the Seattle community
- [illegible]
- [illegible] team science while [illegible] individual discovery
- [illegible]

The Programs:

- Advance the field by coupling clinical data with ever evolving genetic data by processing donated cancer tissue in biorepositories
- Expand the HIDRA clinical database project and natural language processing beyond brain to other organ sites
- Utilize high tech biotools to improve standard of care by speeding translation of laboratory and population research into the clinical environment—precision oncology in [illegible]
- Facilitate data sharing and collaboration among faculty through grant writing support, new forums for exchanging ideas and community-building tools
- Foster collaboration rather than competition between Seattle biomedical institutions and [illegible]
- Implement first STTR faculty retreat (2015)
- Continue outreach to foundations and supporters

The Promise:

- [illegible]
- [illegible] from:
  - [illegible]
  - Foundations
  - [illegible]
- [illegible]

- Our patients and their families with whom we stand in solidarity
- Funds to be raised for STTR at annual Hutch Holiday Gala (December 2014), which will be used to support cutting-edge research and faculty recruitment

For tickets to the Hutch Holiday Gala please call (206) 667-6583

FRED HUTCHINSON
CANCER RESEARCH CENTER

1100 Fairview Ave. N., PO Box 19024, Seattle, WA 98109

Seattle Children's Analytics and Big Data Initiatives

Eric Tham, MD, MS
Chief Research Information Officer

Ryan Sousa
Director of Seattle Children's Enterprise Analytics

Seattle Children's

Agenda

- Introductions
- Big Data and Analytic Initiatives
- Current and Future Analytic Platform

Seattle Children's

Eric Tham, MD, MS, FAAP

- Research Areas and Expertise
  - Distributed Research Networks and Analytics
  - Research Data Warehouses
  - Computerized Clinical Decision Support and Implementation of Clinical Rules and Recruitment for Clinical Trials
  - Pediatric Disaster Medicine Training (Collaboration with MOH and Pediatric Societies in China, Philippines, Haiti)
- Training
  - General Pediatrics, Children's Hospital of Pittsburgh
  - Pediatric Emergency Medicine, Children's Hospital of Pittsburgh
  - MS, Biomedical Informatics, University of Pittsburgh
  - MD, Northwestern University Medical School, Chicago, IL
- Experience
  - Associate Professor of Pediatrics, University of Colorado
  - Director of Research Informatics, Children's Hospital Colorado

Seattle Children's

Ryan Sousa

- Areas of Expertise
  - Architect & leader commercializing large-scale analytics
  - Data Warehousing, Business Intelligence & Consumer Relationship Mgt
  - Massively Parallel Computing Environments – Hadoop & Big Data
  - Agile Software Development & making analytics part of an orgs DNA
  - Co-author books on Information Delivery with Bill Inmon, "Father" of data warehousing
- Experience
  - CTO Intelligent Solutions
    - Strategic consultant & industry leader in BI, EDW & CRM
  - Director, Business Intelligence & CRM
    - Amazon & Starbucks
  - Vice President, Global Business Intelligence & Data Warehousing
    - Expedia
  - Head of Predictive Analytics Platform
    - HERE (a Nokia Company)
  - SVP, Engineering for two successful analytic startups
    - Acquired by Amazon & HERE (a Nokia Company)

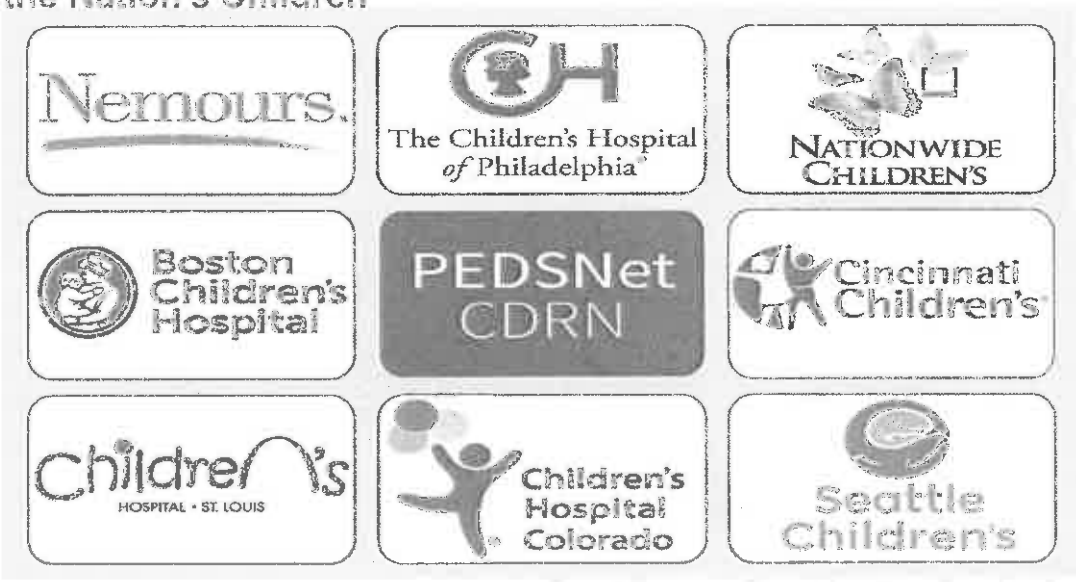
Seattle Children's

Big Data Initiatives

Seattle Children's

PEDSNet: A Pediatric Learning Health System

2.5% of the Nation's Children



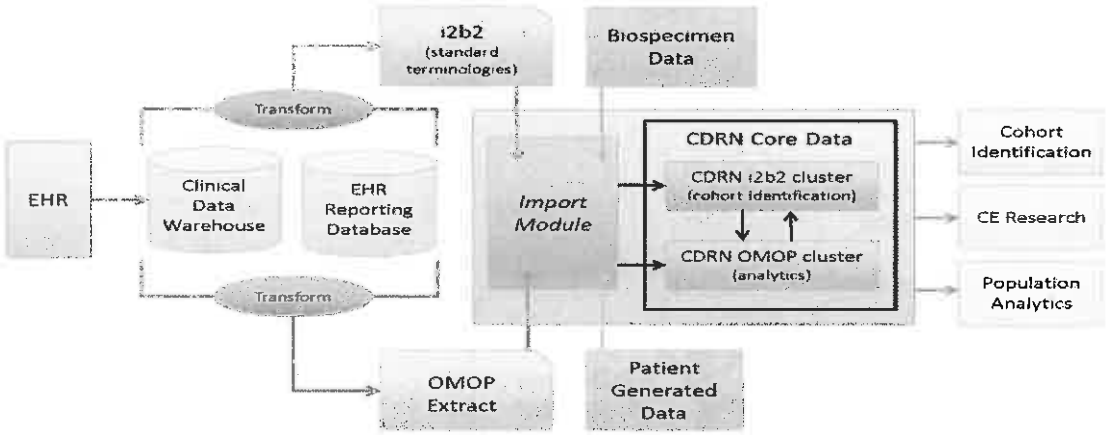
Seattle Children's

PEDSNet vanguard institutions and networks are working on:

- Data Network, common data standards, interoperable data infrastructure, query infrastructure, recruitment resources
- Scientific/Regulatory, novel recruitment strategies and single IRB with master reliance agreement; common consent language
- Social issues, relationships, shared sense of trust and ownership; strategies for communication; integration of patients/parents (engagement model)

Seattle Children's

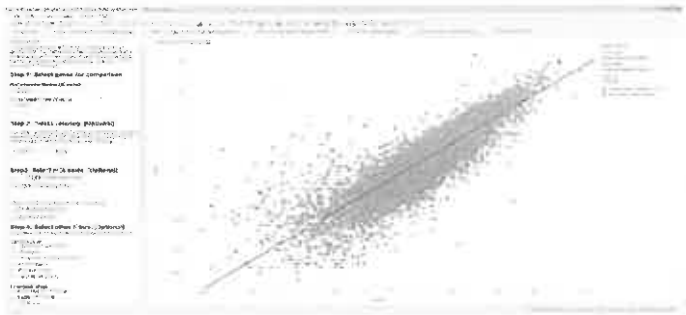
PEDSNet Architecture



Seattle Children's

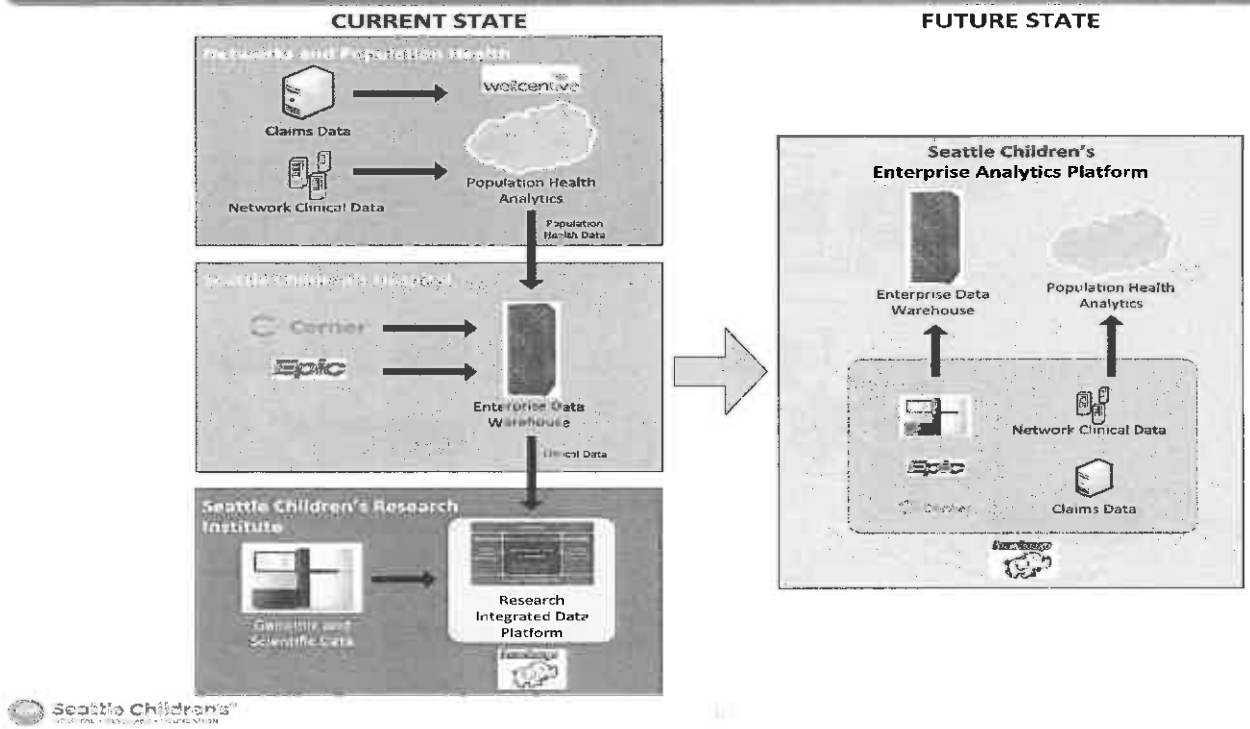
Seattle Children's and Cloudera Co-Development of an Omics Platform

- cloudera Hadoop Big Data Platform hadoop
- Goals:
  - Ingestion of Next Gen Sequencing and Genomic Data
  - Integration with Clinical Data
  - Analyze and Visualize Novel Associations and Correlations



Seattle Children's

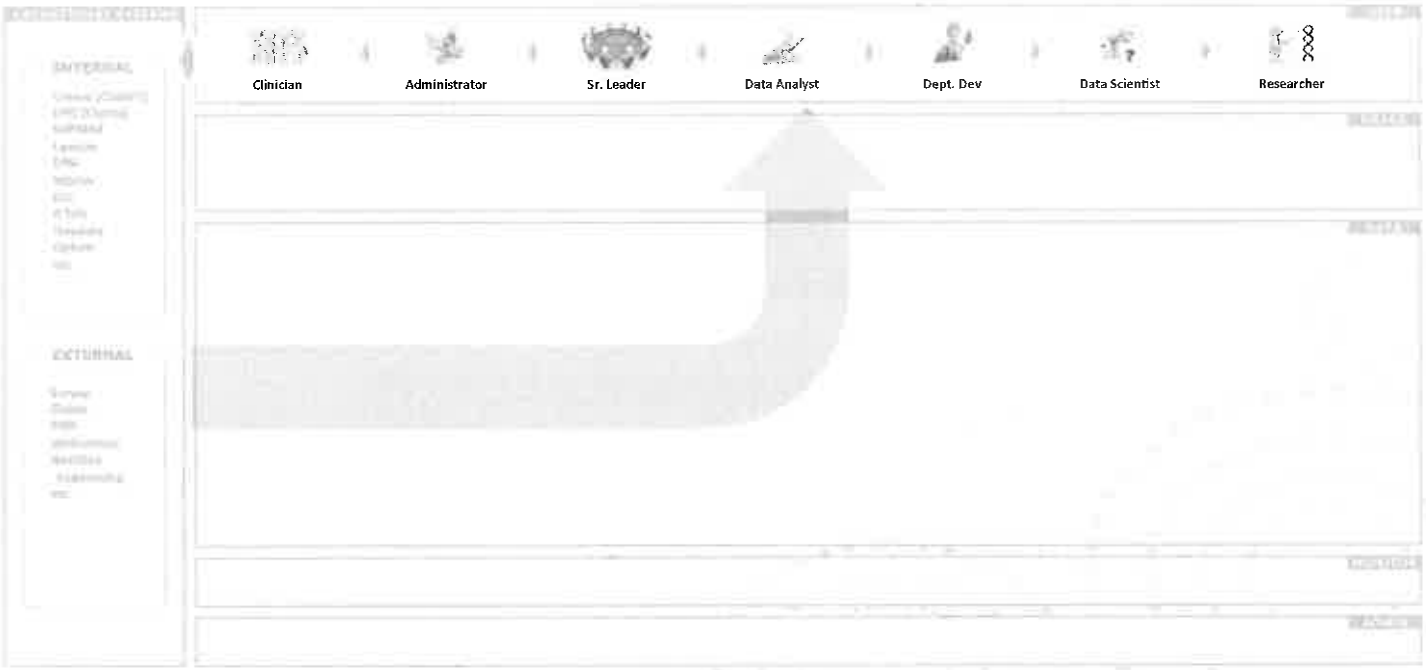
Enterprise Analytics Platform | Integration Strategy



Seattle Children's

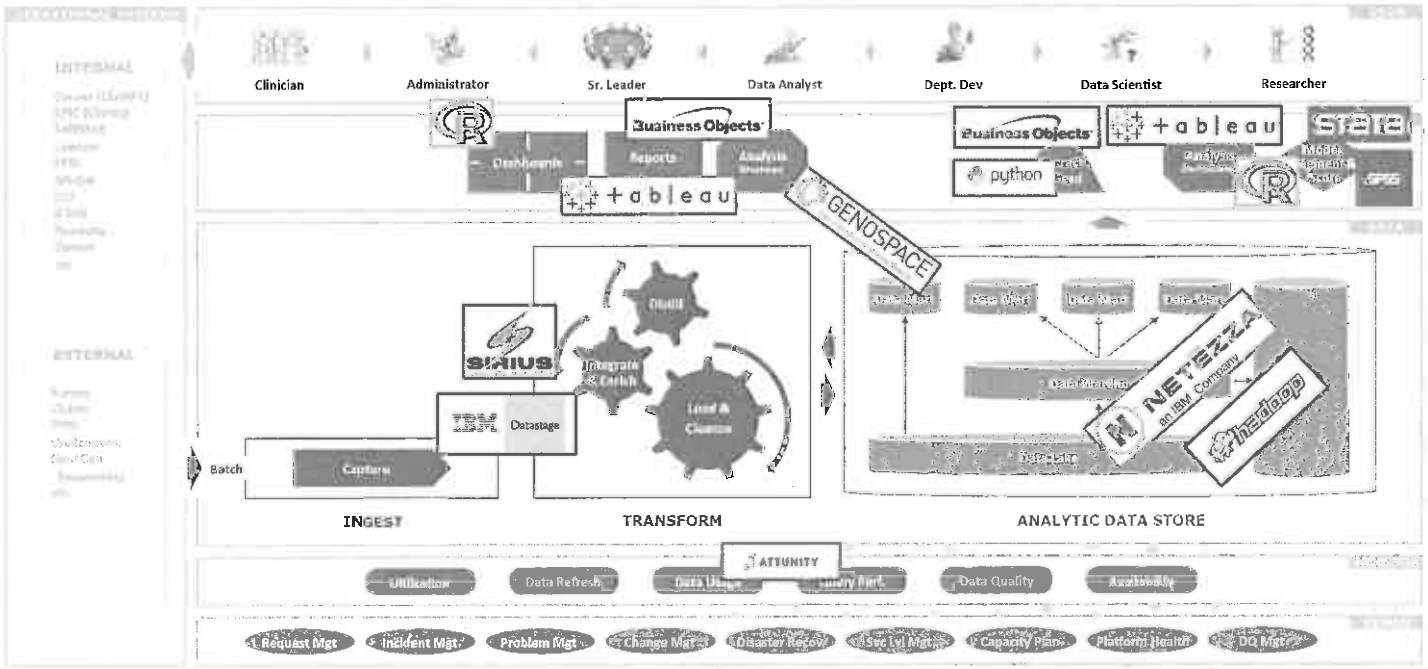
Enterprise Analytics

Platform Direction



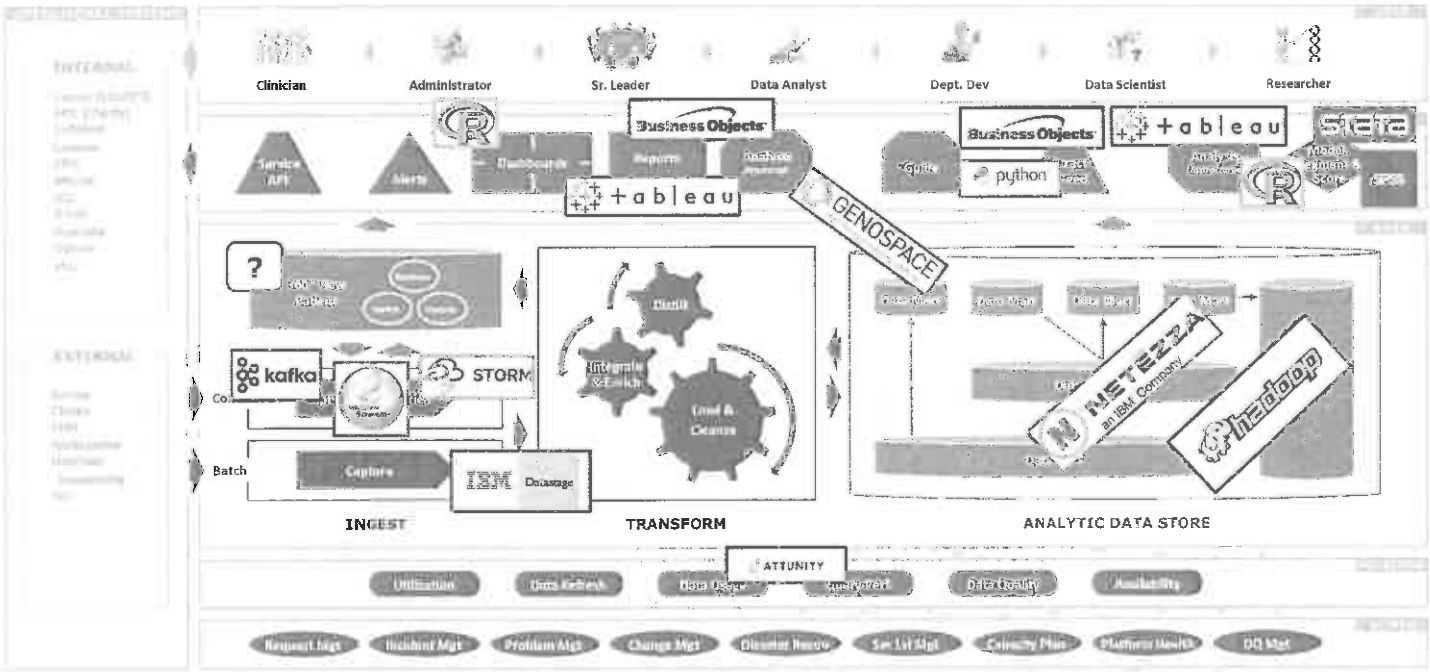
Enterprise Analytics

2016 Focus



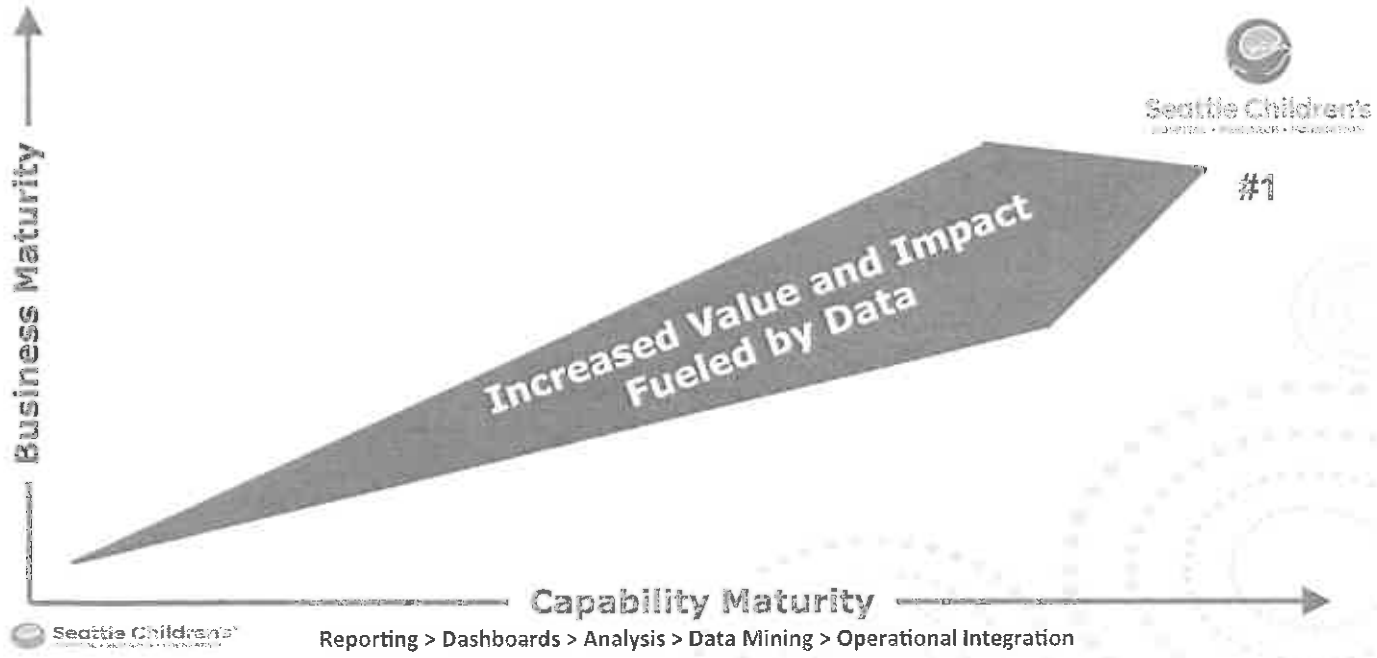
Enterprise Analytics

2017 Focus



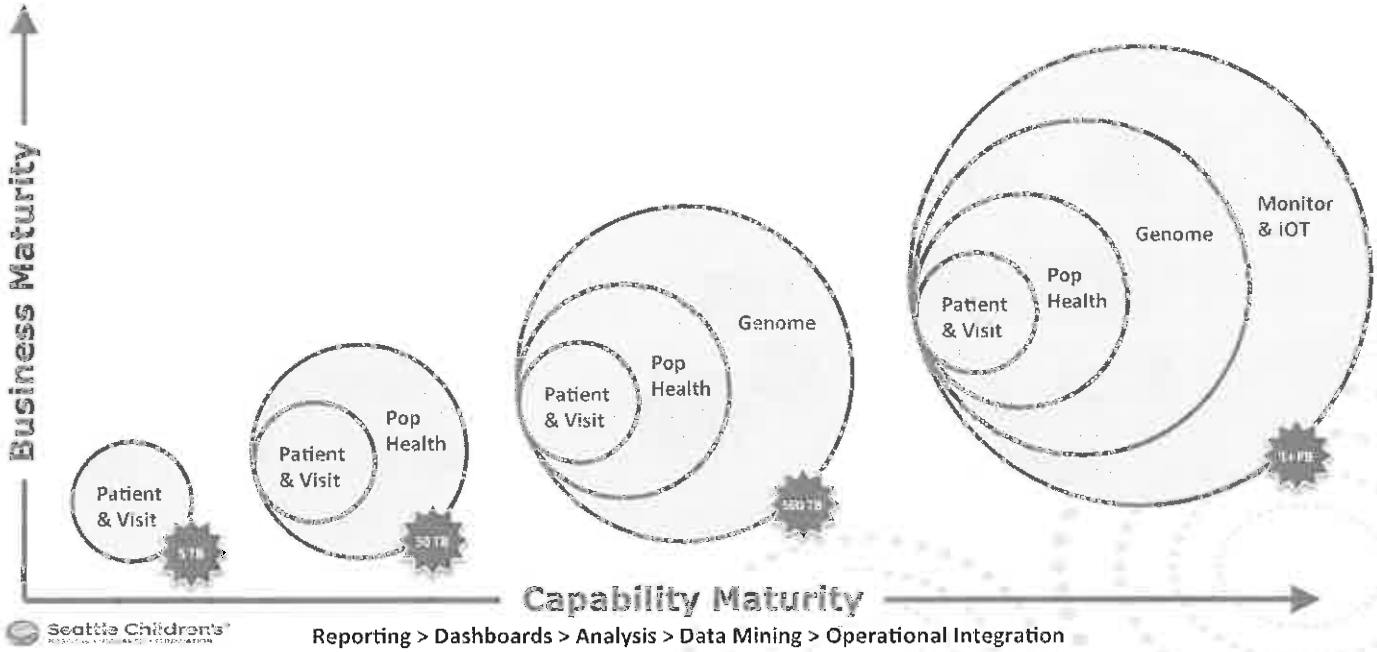
Enterprise Analytics

The Evolution



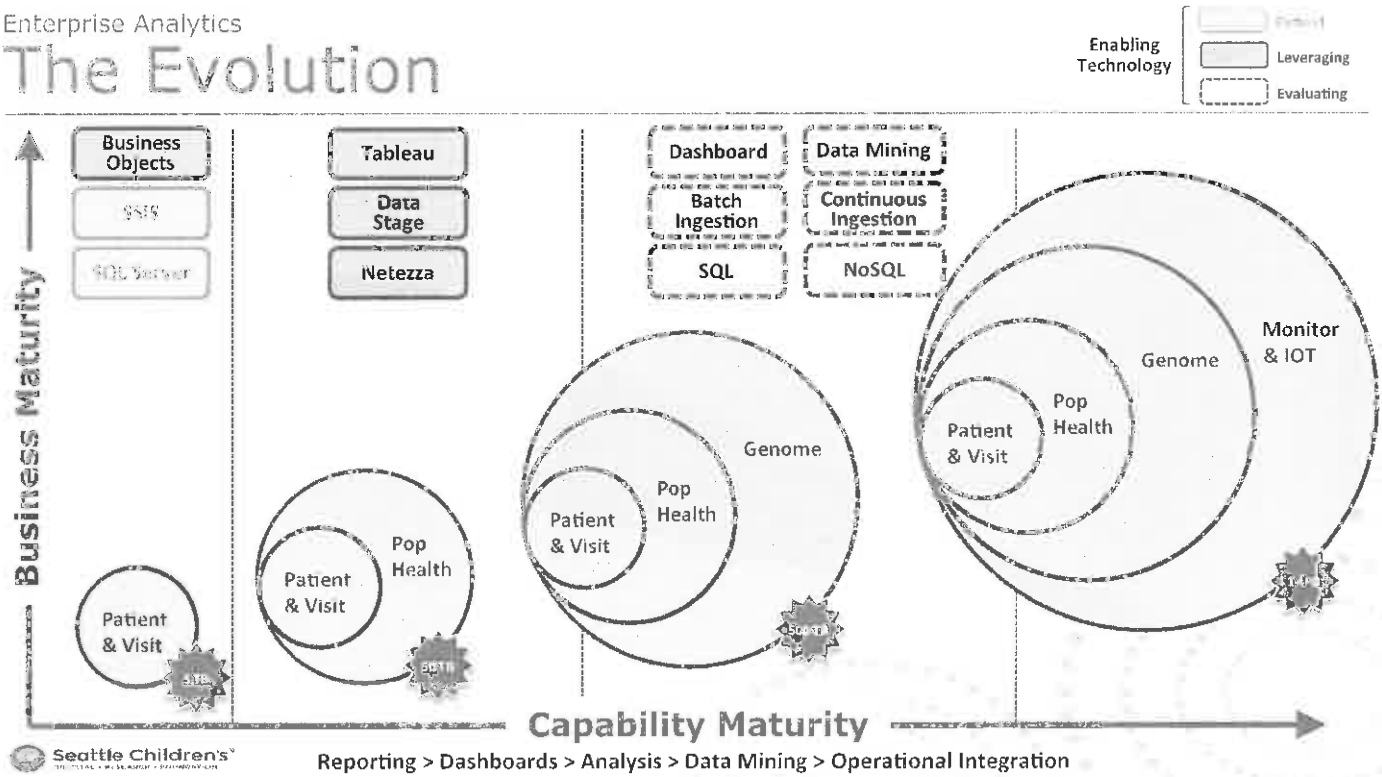
Enterprise Analytics

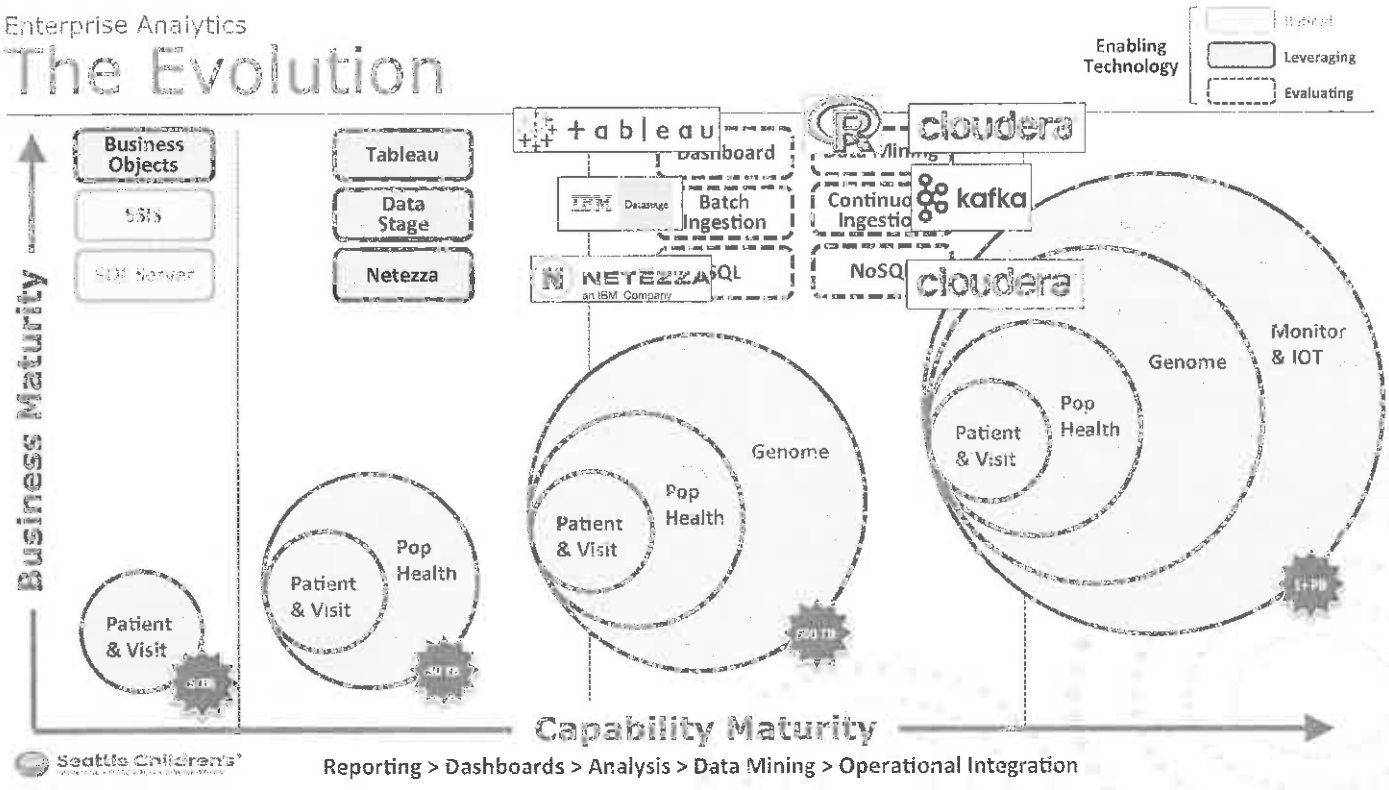
The Evolution



Enterprise Analytics

The Evolution





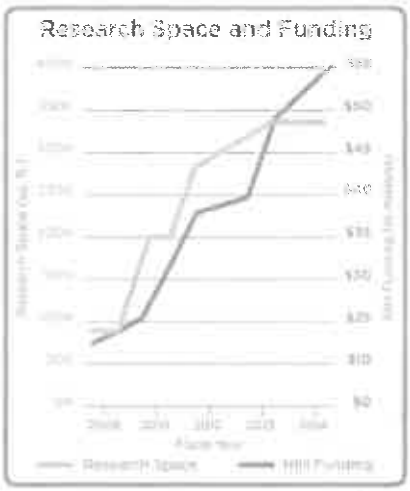
Questions

- Ryan Sousa ryan.sousa@seattlechildrens.org
- Eric Tham eric.tham@seattlechildrens.org

Seattle Children's

Seattle Children's Research Institute

- One of the top five pediatric research institutions
- Founded in 2007
- Over $99.1 million in extramural grants
  - $55 million in NIH grants
- Workforce of over 1,100
- 330,000 ft^2 (30,600 m^2) of basic and clinical laboratory research space
- Planning to expand to another 600,000 ft^2 (56,000 m^2) of laboratory space



Seattle Children's

Seattle Children's Research Institute

- 8 Research Centers
  - T- Cell Immunotherapy for Relapsed Leukemia Clinical Trials
    - >92% Remission in First 22 Patients
  - Cystic Fibrosis Network Data Coordination Center
    - First Tobramycin trials
    - Lead trials for Kalydeco (ivacaftor) and Orkambi (lumacaftor/ivacaftor)

Seattle Children's

THE SCRIPPS RESEARCH INSTITUTE

The Scripps Research Institute

La Jolla, California and Jupiter, Florida

Mission

To Serve Humanity

- By creating basic knowledge in the biosciences
- By applying breakthroughs in research to the advancement of medicine
- By educating and training the next generation of young scientists

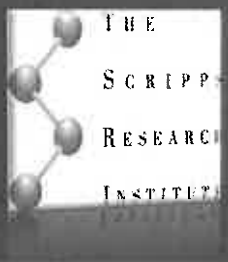
Our History

1924

Scripps Metabolic Clinic founded

1961

1st Research Department of Experimental Pathology created



1993

Research branch separates from Scripps Health as The Scripps Research Institute

2004

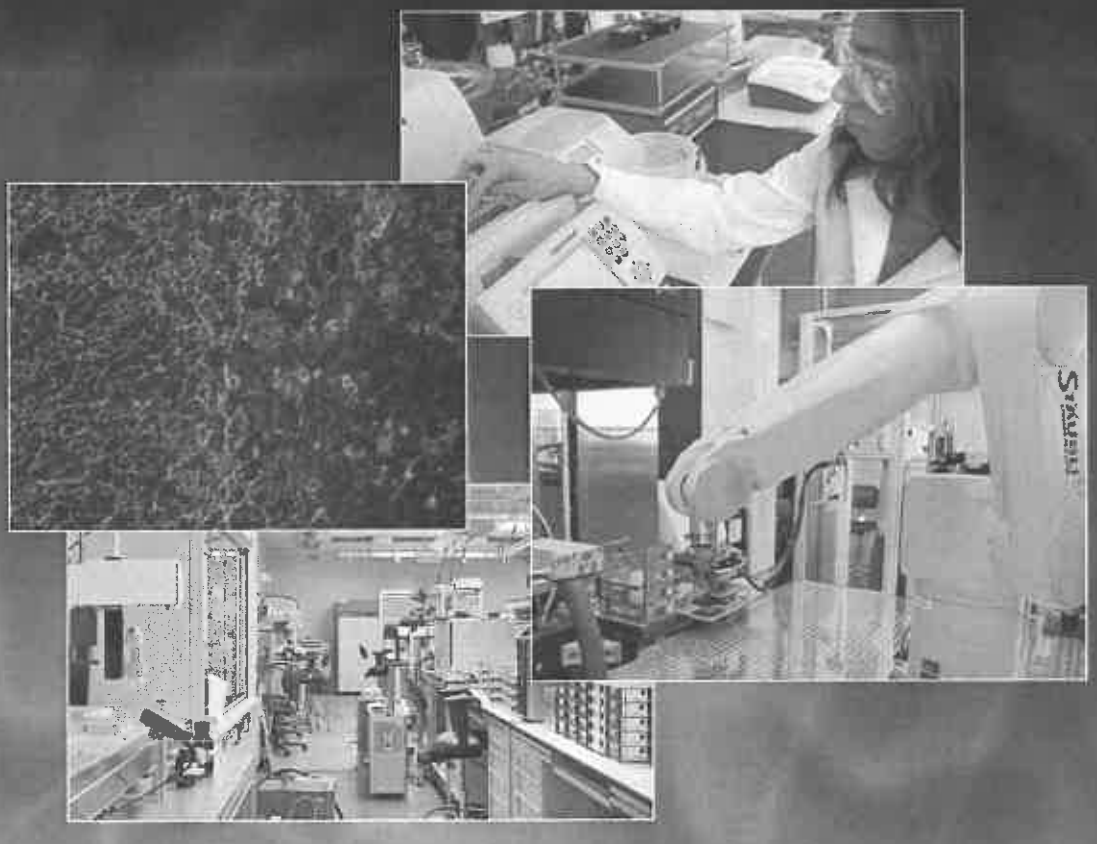
New campus in Florida established

Scripps California Campus

- 1 million square feet of laboratory space in 15 buildings on Torrey Pines Mesa
- Staff total: 2,000+
  - 200 faculty members
  - 355 postdoctoral fellows
  - 165 graduate students
  - About 1,200 technical and support staff

Scripps Florida Campus

- Advanced 350,000-square-foot facility opened in 2009
- Staff Total: 600+
- 55 faculty members
- 174 postdoctoral fellows
- 43 graduate students
- Over 300 technical and administrative support personnel
- Additional interns, visiting investigators, etc.



Faculty Recognition

- 2 Nobel Laureates
- 16 National Academy of Sciences members
- 16 American Academy of Arts and Sciences members
- 9 Academy of Medicine members
- 4 Wolf Prize in Chemistry recipients
- Also: MacArthur fellow, HHMI investigator, National Academy of Engineering member

Graduate Program

U.S. News & World Report Ranking

- #2 in Biochemistry
- #7 in Chemistry
- #9 in Biological Sciences

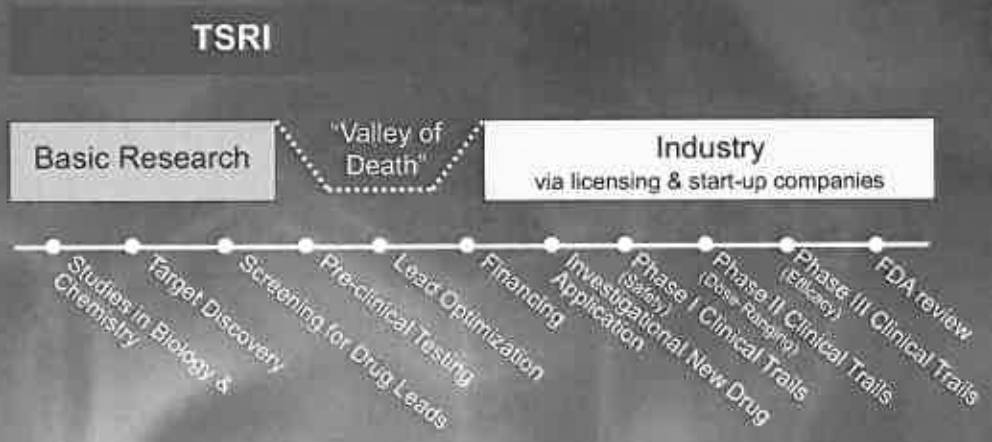
- Degree program with Oxford University Selected students are offered joint Ph.D. and D.Phil. degrees.

At the Forefront of Biotech

Scripps Research faculty are among the most prolific and entrepreneurial in the world

- About 1,000 papers appearing in scientific journals per year
- Generating more than 200 invention disclosures per year
- Close to 700 U.S. patents issued, among the highest of all U.S. academic institutions

Drug Discovery Process



Industrial Partnerships

- Janssen Pharmaceuticals
- Bristol-Myers Squibb
- Sigma-Aldrich Corporation

More than 50 Start Up Companies

2014
- Aldabra Biosciences
- Padlock Therapeutics
- Transplant Genomics, Inc

2013
- Blackthorn Therapeutics Inc.
- iGenomiX
- Sirenas Marine Discovery
- Zebra Biologics

2012
- Abide Therapeutics
- Cypher Genomics
- Vesper Biologics

2011
- RQx Pharmaceuticals

2010
- Ember Therapeutics
- Epic Science

2009
- Receptos Pharma
- Protix, Inc.
- Zyngenia

2008
- aTyr Pharma
- Curna
- Eyecyte, Inc.
- Fate Therapeutics
- Proteostasis Therapeutics
- Sapphire Energy

2007
- Fabrus, Inc.
- Xcovery

2006
- Affinity Pharmaceuticals
- Calmune
- Virome LLC
- Wittycell S.A.S

2004
- Achaogen Inc.
- Motility, Inc.
- Promosome
- Rincon Pharmaceuticals (acquired by Sapphire Energy)

2003
- Ambrx Inc.
- FoldRx Pharmaceuticals
- Prion Solutions (acquired by Chiron)

2002
- **CovX Research** (acquired by Pfizer)
- **NanoRX** (acquired by Adaptive Therapeutics)
- **VAXDesign** (acquired by Sanofi Pastueur)

Start Up Companies, *continued*

2001
- **Kalypsys**
- **Phenomix**
- **Syrxx**
  (acquired by Takeda)

2000
- ActivX Biosciences
  (acquired by Kyorin)
- Neurome

1999
- Geneformatics
  (merged with Structural Bioinformatics)
- Optimer Pharmaceuticals
- Prolifaron
  (acquired by Alexion Pharmaceuticals)

1997
- Epicyte
  (acquired by Biolex Therapeutics)

1996
- Digital Gene Technologies
  (purchased by Neurome)
- Discovery Labs
  (merged with Acute Therapeutics)
- Drug Abuse Sciences
- Sangamo Biosciences

1995
- PharMore
- Thrombosys

1994
- Apovia AG
  (formerly EVAX Technologies, originally Immune Complex Corp.)
- Applied Molecular Evolution
  (formerly Lexys, acquired by Lilly, Inc.)
- CombiChem (acquired by Dupont Merck Pharmaceutical and merged with Bristol-Myers Squibb)

1993
- Ciphergen Biosystems
  (acquired by Bio-Rad Laboratories)

1992
- Sequel Therapeutics
  (later acquired by Cytel, which was subsequently spun-out as Epimmune)

1989
- Avanir Pharmaceuticals
  (formerly Lidak)
- Corvas
  (acquired by Dendreon Corporation)
- UNASYN

1986
- MP Biomedicals
  (formerly Cytogene and Bio101)
- NeoMPS
  (formerly Multiple Peptide Systems)

1984
- Stratagene

1982
- Synbiotics

1981
- Quidel

Therapies Developed at TSRI

- **Humira®** for rheumatoid arthritis and other autoimmune diseases
- **Surfaxin®** for infant respiratory distress syndrome
- **Leustatin®** for hairy cell leukemia
- **Benlysta®** for lupus
- **Factor VIII** for hemophilia
- **Vyndaqel®** for TTR-FAP
- **Cyramza®** for gastric and non-small cell lung cancer
- **Unituxin™** for the childhood cancer neuroblastoma

In the Pipeline

Dozens of compounds in clinical development

Addressing medical problems including:

- Cancer
- Diabetes
- Heart disease
- Parkinson's disease
- Autoimmune conditions
- Inflammation
- Eye disease

Pipeline of New Drugs and Therapies

COMPOUND	THERAPEUTIC AREA	COMPANY	PHASE I	PHASE II	PHASE III	NDA	MARKET
LATE STAGE PRODUCTS							
Solithromycin	Antibiotic	Cempra					
RPC-1063	Autoimmune	Receptos/Celgene					
OTHER CAT PRODUCTS							
Tralokinumab	Respiratory	Medimmune/AstraZeneca					
CAM-3001	Inflammation	Medimmune/AstraZeneca					
Rzorolimupab	Cardiovascular	Symphogen					
GC-1008	Multiple Areas	Genzyme					
BI-505	Oncology	Bioinvent					
MT-203	Inflammation	Micromet					
Bertilimumab	Allergy	iCo Therapeutics					
SANGAMO PRODUCTS							
SB-728	HIV	Sangamo					
SB-313	Oncology	Sangamo					
CLICK CHEMISTRY PRODUCTS							
AZ-01	Autoimmune	Allozyne					

Pipeline of New Drugs and Therapies, *continued*

Compound	Therapeutic Area	Company	Phase I	Phase II	Phase III	NDA	Market
AMBRYX PRODUCTS							
ARX-201	Growth Deficiency	Ambrx					
ARX-424	Autoimmune	Ambrx					
ARX-618	Diabetes	Ambrx					
ARX-328	Lipodystrophy	Ambrx					
OTHER EARLY STAGE PRODUCTS							
C-14	Respiratory	Implicit					
ALT-801	Oncology	Alter					
Shok-Pak	Organ Failure	InflammaGen					
RG-2833	Friedreich's Ataxia	BioMarin					
HSC-835	Oncology	Novartis					
3K3A-APC	Cardiovascular	ZZ Biotech					
VS-4718	Oncology	Verstem					
Resokine-IV	Autoimmune	aTyr					

Accelerating Discoveries, Saving Lives

Five Prime Therapeutics, Inc.
Corporate Overview

FivePrime

November 2015

NASDAQ:FPRX

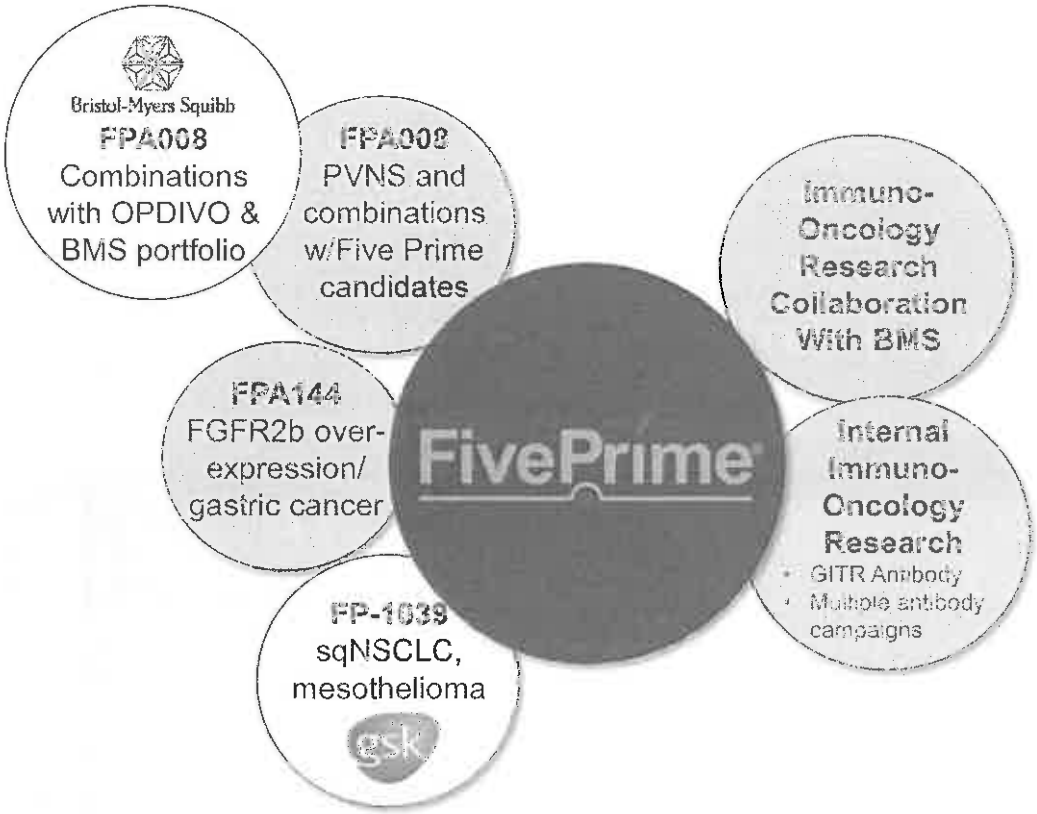
Forward-Looking Statements Disclaimer

This presentation contains forward-looking statements within the meaning of the Private Securities Litigation Reform Act of 1995. Words such as "may," "will," "expect," "plan," "anticipate" and similar expressions (as well as other words or expressions referencing future events or circumstances) are intended to identify forward-looking statements. These forward-looking statements reflect FivePrime's current beliefs and expectations. Each of these forward-looking statements involves risks and uncertainties. Actual results may differ from these forward-looking statements. Forward-looking statements contained in this presentation include statements about (i) the timing of IND filings; (ii) the timing of initiation, progress and scope of clinical trials for our product candidates; (iii) the timing of receipt of clinical data for our product candidates; (iv) the potential use of our product candidates to treat patients; (v) the extent of gene amplification and protein overexpression in certain patient populations; (vi) the advancement of our immuno-oncology program; and (vii) the period during which we expect to be able to fund operations.

Many factors may cause differences between current expectations and actual results, including unexpected safety or efficacy data observed during preclinical or clinical studies, clinical site activation rates or clinical trial enrollment rates that are lower than expected, changes in expected or existing competition, failure of our collaborators to support or advance collaborations or product candidates and unexpected litigation or other disputes. Other factors that may cause our actual results to differ from current expectations are discussed in FivePrime's filings with the U.S. Securities and Exchange Commission, including the "Risk Factors" sections contained therein. Except as required by law, we assume no obligation to update any forward-looking statements contained herein to reflect any change in expectations, even as new information becomes available.

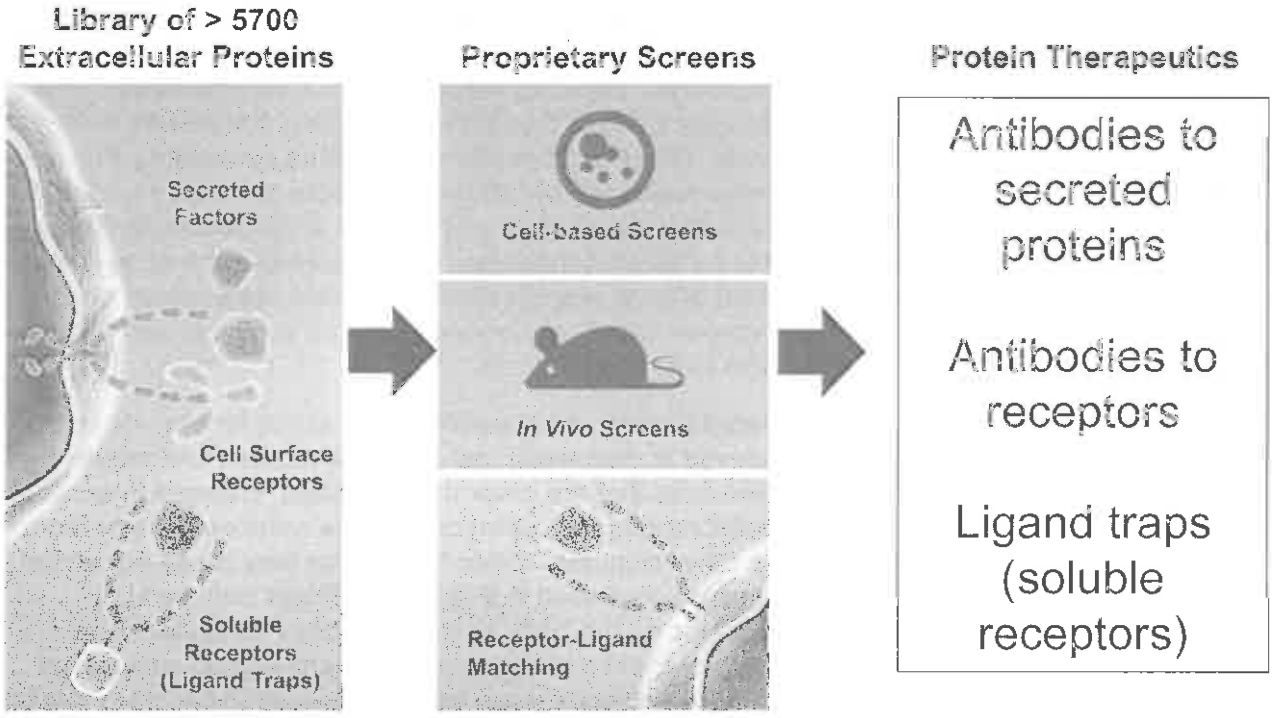
Five Prime Value Proposition

3 clinical stage therapeutics in multiple indications



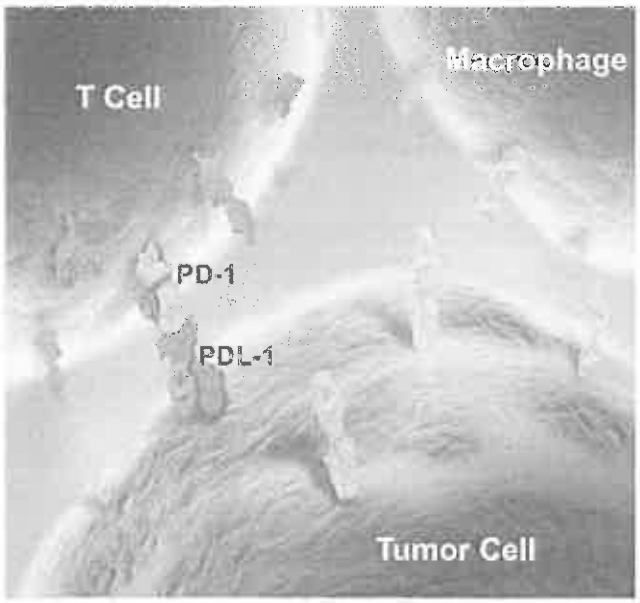
FivePrime

Platform: A Library of Substantially All Extracellular Proteins to Identify New Targets and Therapeutics

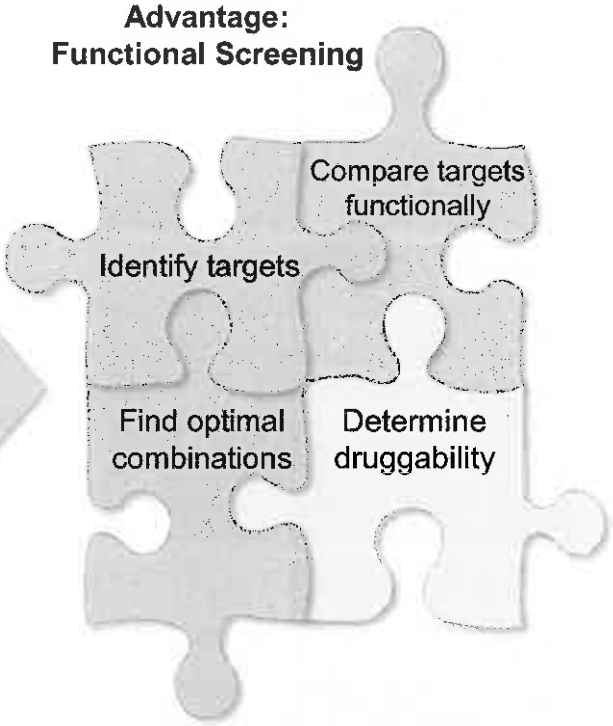


Many Immuno-Oncology Targets Remain to be Discovered

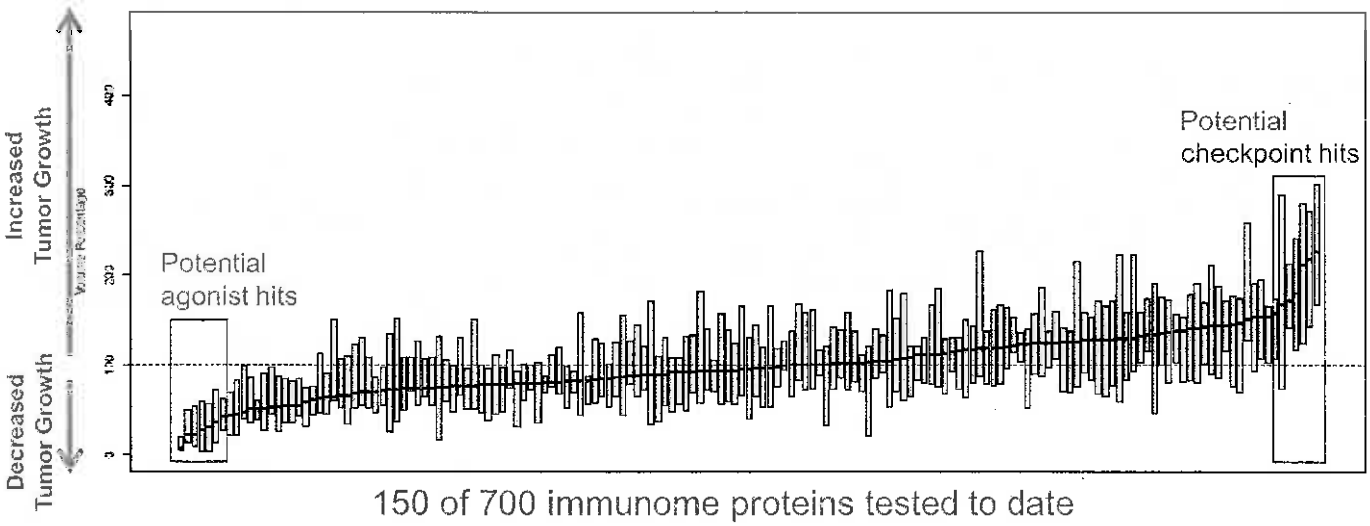
The Five Prime Immunome: ~700 Cell Surface Receptors Enriched for Regulators of Immune-Tumor Response



The Five Prime Advantage: Functional Screening

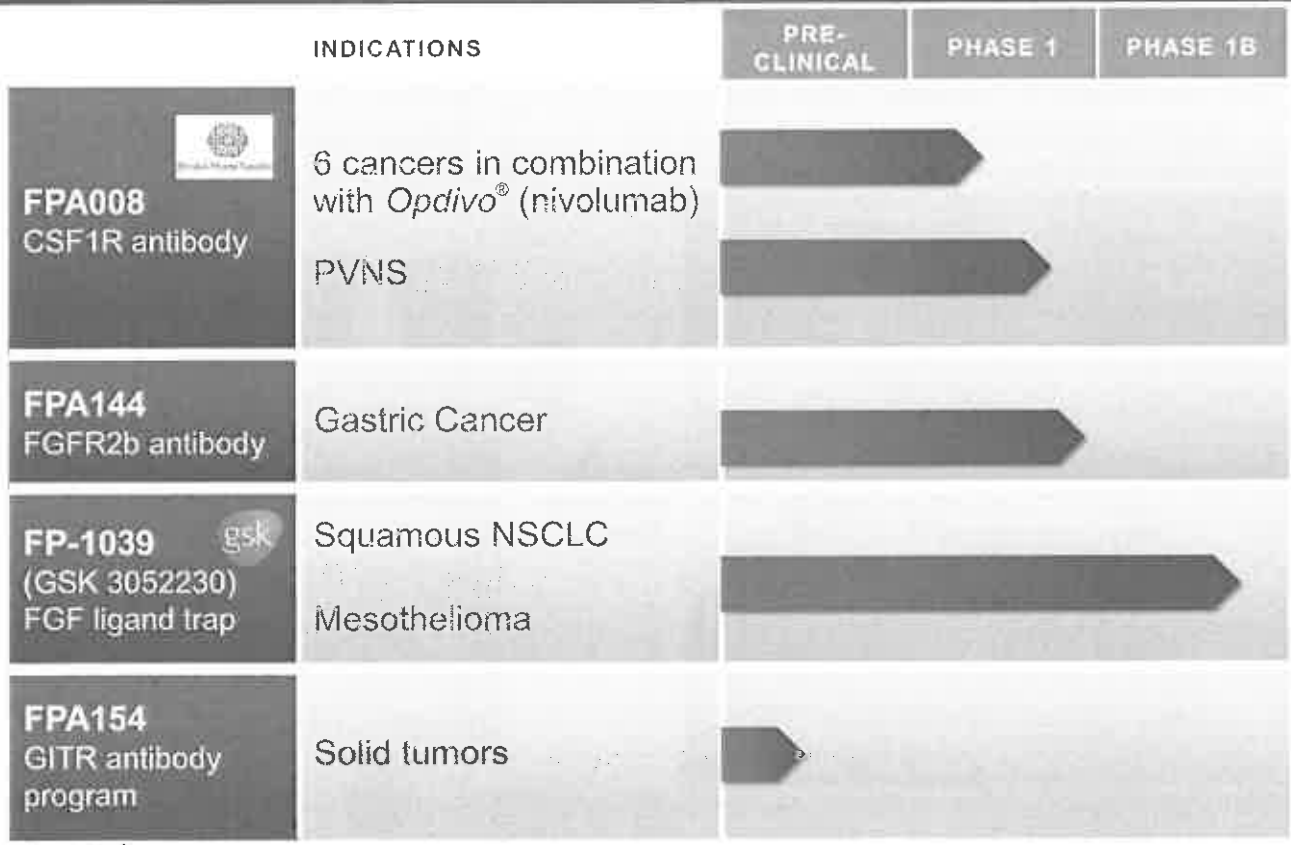


Potential Immunome Hits Identified In an Ongoing *In Vivo* Tumor Screen



150 of 700 immunome proteins tested to date

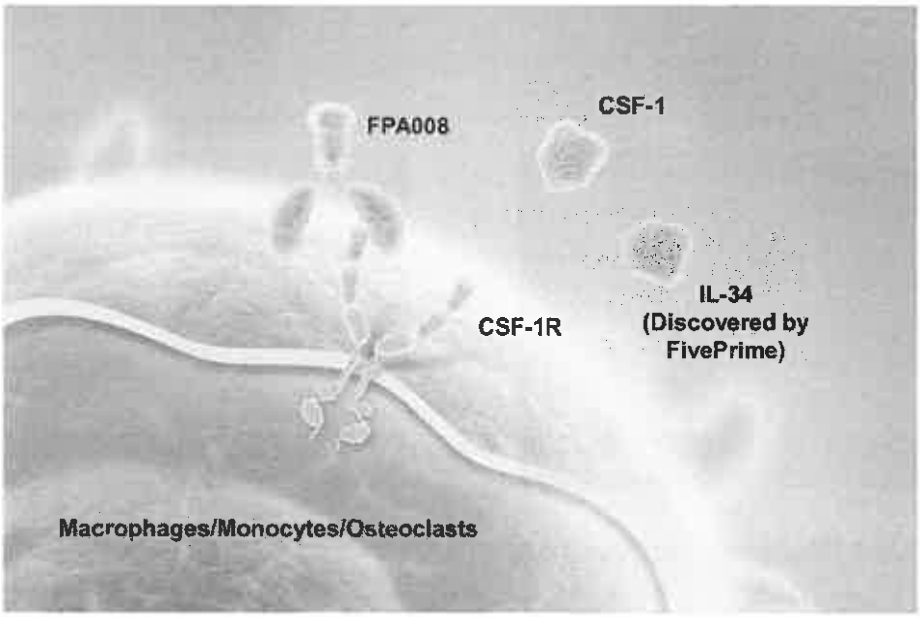
Multiple Pipeline Candidates Covering Numerous Indications



FivePrime

FivePrime

FPA008 Blocks CSF-1R Ligand Binding and Thus Activation and Survival of Macrophages

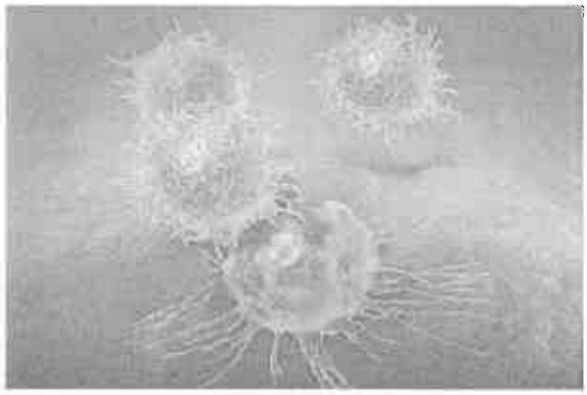


Survival Activation

Immuno-Oncology: FPA008 Targets Tumor Associated Macrophages (TAMS)

Tumor-associated macrophages

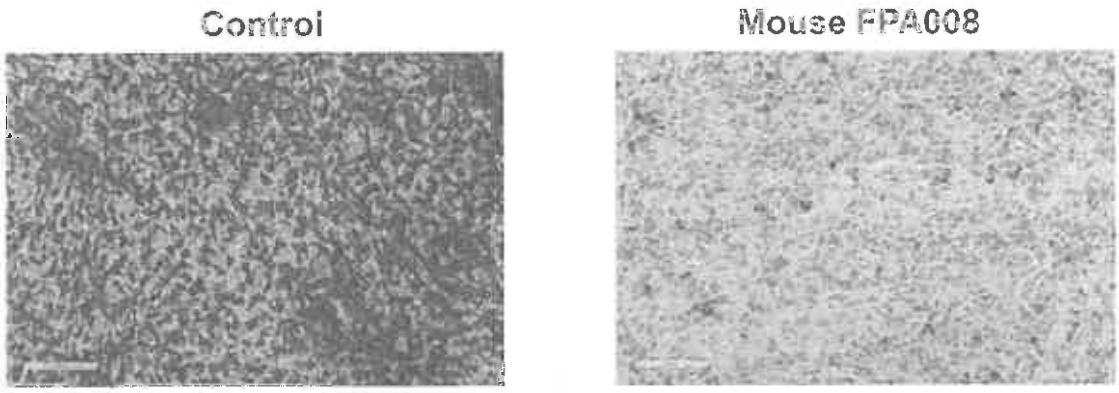
- are in the tumor microenvironment
- are immunosuppressive
- correlate with poor prognosis
- are associated with resistance to IO therapy
- depend on CSF-1R for survival



FPA008 CSF1R antibody blocks TAMs

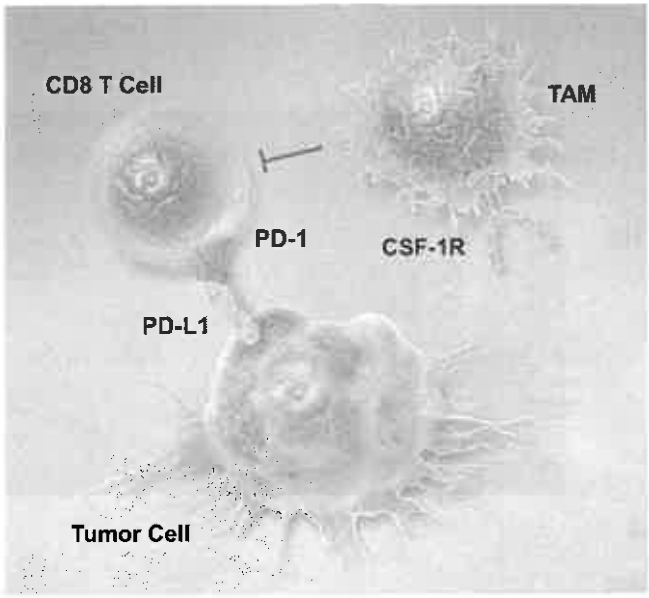
- Based on our discovery of IL-34
- Phase 1a/1b with *Opdivo*® began in September 2015

Immuno-Oncology: FPA008 Reduces TAMs



F4/80 Staining for Macrophages in the MC38 Tumor Model

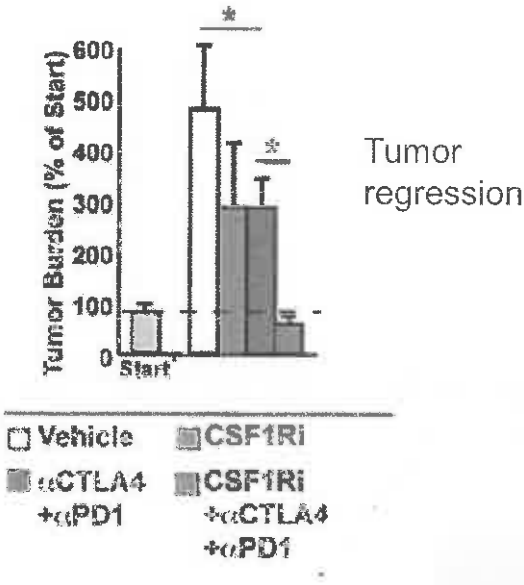
TAMs and PD-1 Activation Suppress Tumor Killing by CD8 T Cells



- FPA008 (CSF-1R antibody) blocks TAM suppression of T cells
- Nivolumab blocks PD-L1/PD-1 suppression of T cells
- The combination of TAM reduction and PD-1 inhibition enhances tumor killing by CD8 T cells

CSF-1R Inhibition Synergizes with Checkpoint Inhibitors

Pancreatic tumor model

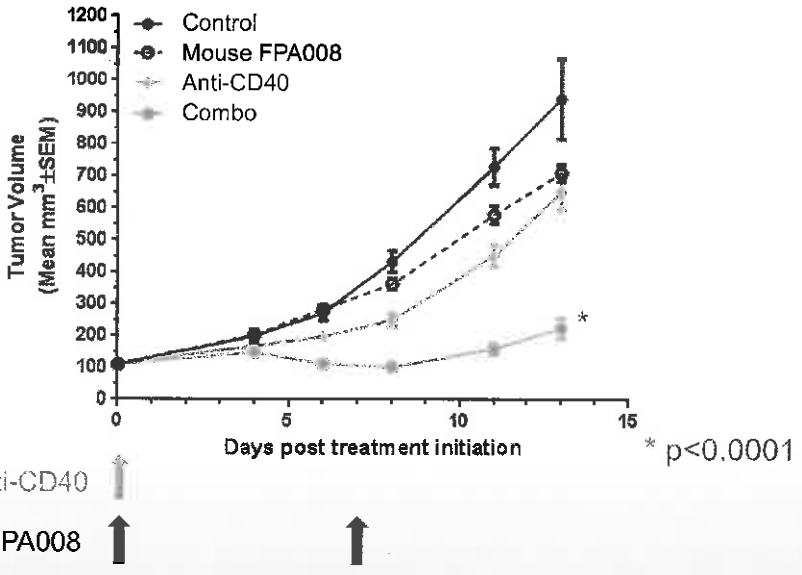


Tumor regression

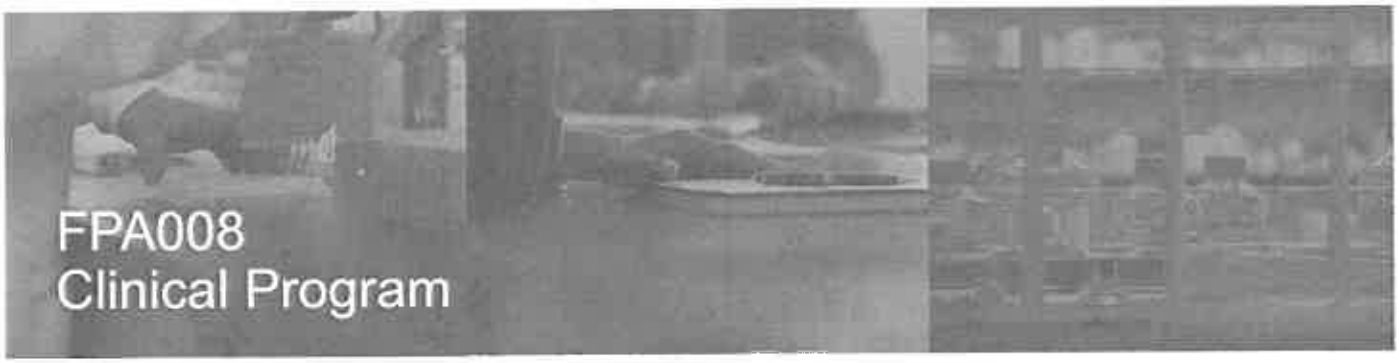
Zhu et al., (2014) Cancer Research

FPA008 Activity Synergizes with Immune Agonists

MC38 Colon Cancer Xenograft



Potential for Future Combinations with Other I-O Modalities



FivePrime

FPA008/Nivolumab Combination Trial in 6 Tumor Types Underway

Five Prime conducting combination Phase 1a/1b clinical trial

- 1a: Dose escalation to assess safety and tolerability of the combination
- 1b: Expand into multiple tumor settings to assess preliminary efficacy

Demonstrated nivolumab activity
Non-small cell lung cancer*
Melanoma*
Head & neck

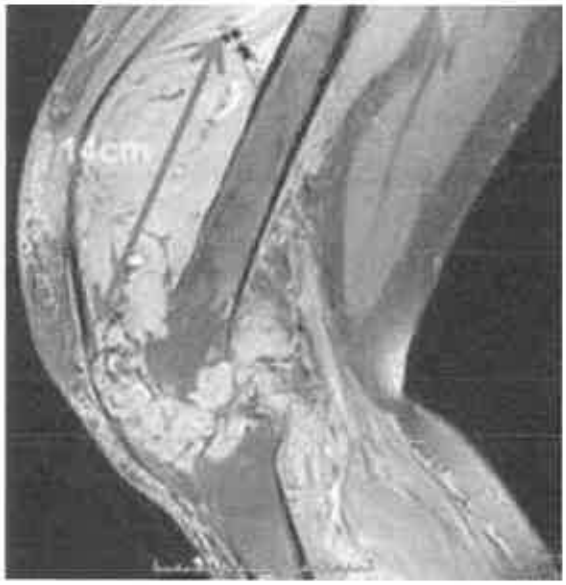
Exploratory
Pancreatic cancer
Colorectal cancer
Malignant glioma

- Baseline and on-treatment biopsies to assess monotherapy versus the combination

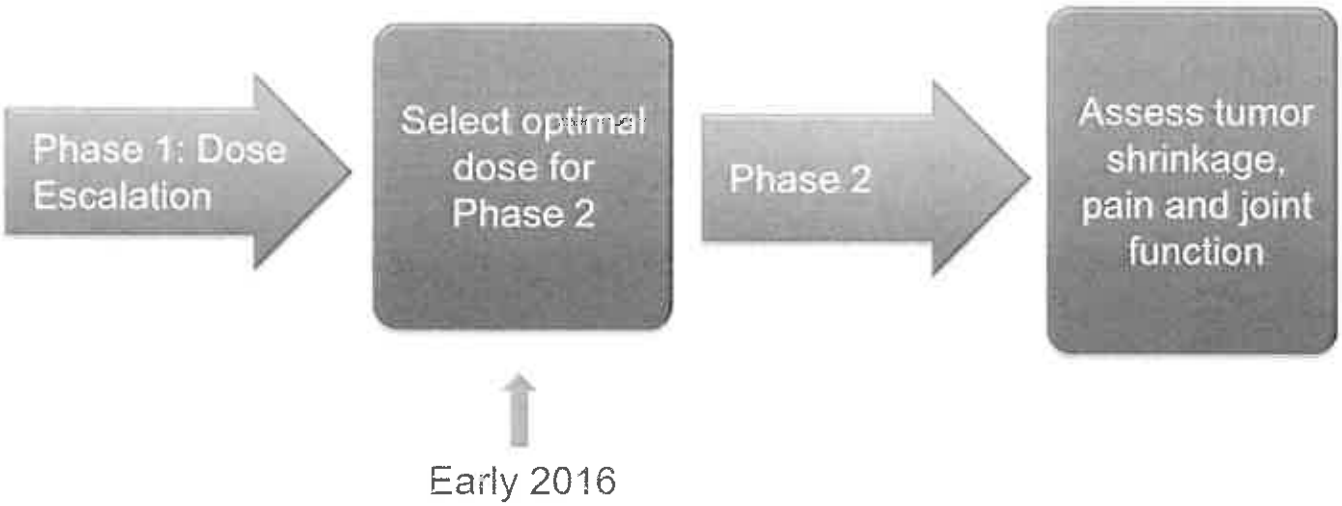
*Approved indications for *Opdivo*® (nivolumab); study will include two patient cohorts for these tumor types– anti-PD-1 therapy naïve and anti-PD-1 therapy resistant

PVNS: a CSF-1-Driven Orphan Disease

- Rare, locally aggressive tumor of synovium
  - Over-expression of CSF-1 recruits macrophages forming the tumor mass
  - High morbidity
- Incidence of diffuse PVNS ~1.8 patients/million, prevalence poorly characterized but patients live decades with the disease
- No approved therapies



Phase 1/2 PVNS Trial Underway



Unique Deal Structure optimizing FPA008's potential

FivePrime®

- Undisputed I-O leader
- Substantially expands I-O development program
  - Combinations with *OPDIVO*
  - Potential combinations with other BMS products
- Regulatory prowess and commercial infrastructure

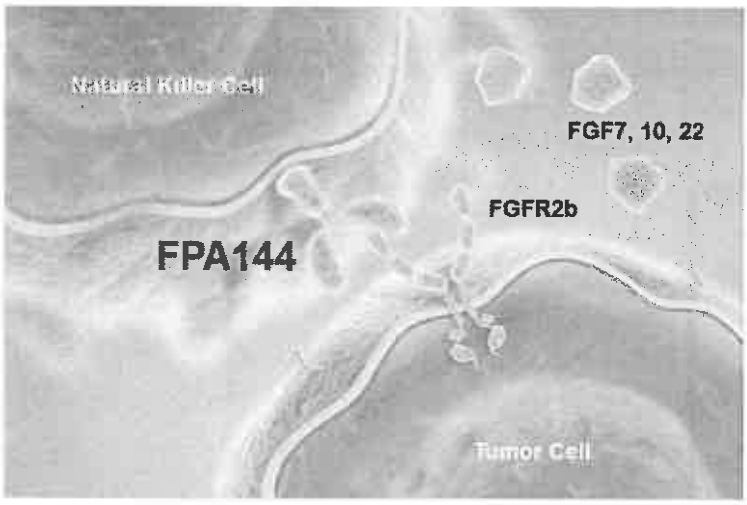
- Leads current I-O & PVNS Phase 1 trials
- Continues development in PVNS
- Ability to combine FPA008 with other BMS or future Five Prime assets
- Potential to pursue non-oncology indications

An Opportunity Worth Pursuing Now

- Fast-moving, hypercompetitive field
- BMS best positioned to expand and accelerate I-O development
- Exceptional terms:
  - $350 million upfront
  - Development and regulatory milestone payments:
    - Up to $505.0 million for combinations with Opdivo®
    - Up to $542.5 million for oncology combinations with other BMS or Five Prime proprietary products, at least one of which is not Opdivo®
    - Up to $340.0 million in developmental and regulatory milestone payments for therapeutic uses in PVNS and non-oncology indications
  - Tiered royalty percentages ranging from the high teens to the low twenties
  - Additional low single-digit percentage royalty on U.S. net sales if Five Prime exercises co-promotion option
  - Reimbursement for costs associated with Five Prime independent development paths if these are eventually added to the BMS development plan

FivePrime

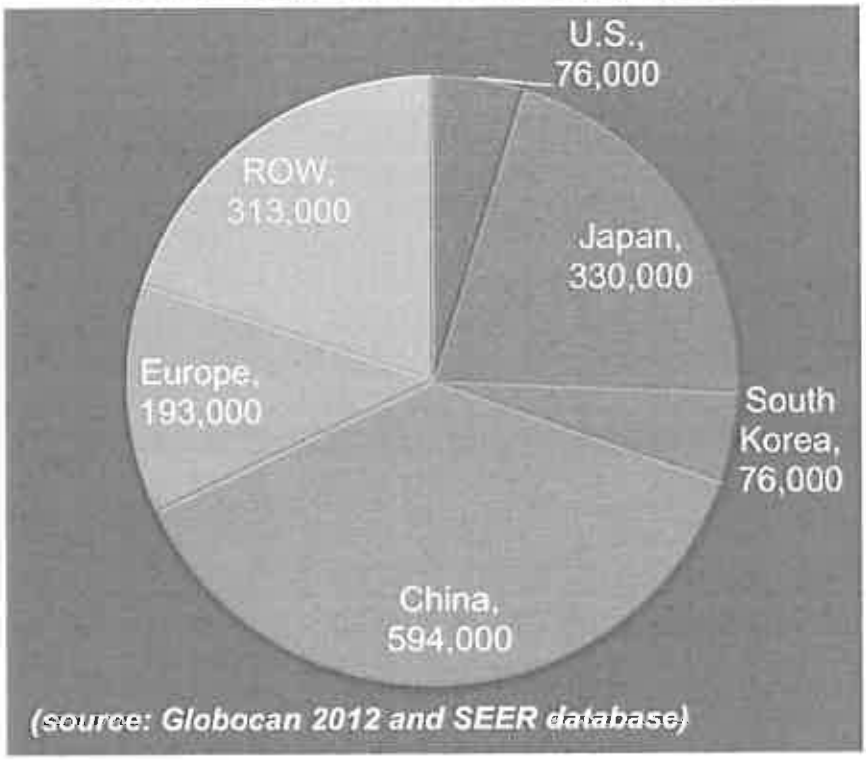
FPA144: FGF Receptor 2b Antibody with Enhanced ADCC



- Recruits natural killer (NK) cells more effectively than native antibody
- Tumor cell killing by ADCC enhanced via glycoengineering

Opportunity in *FGFR2*-Gene Amplified Gastric Cancer

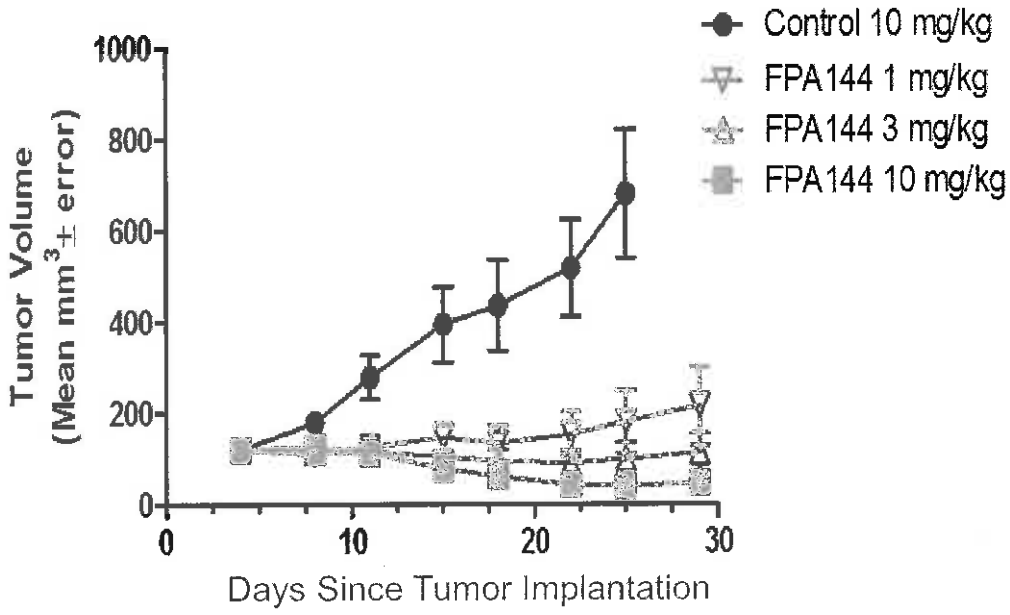
Gastric Cancer Prevalence by Region



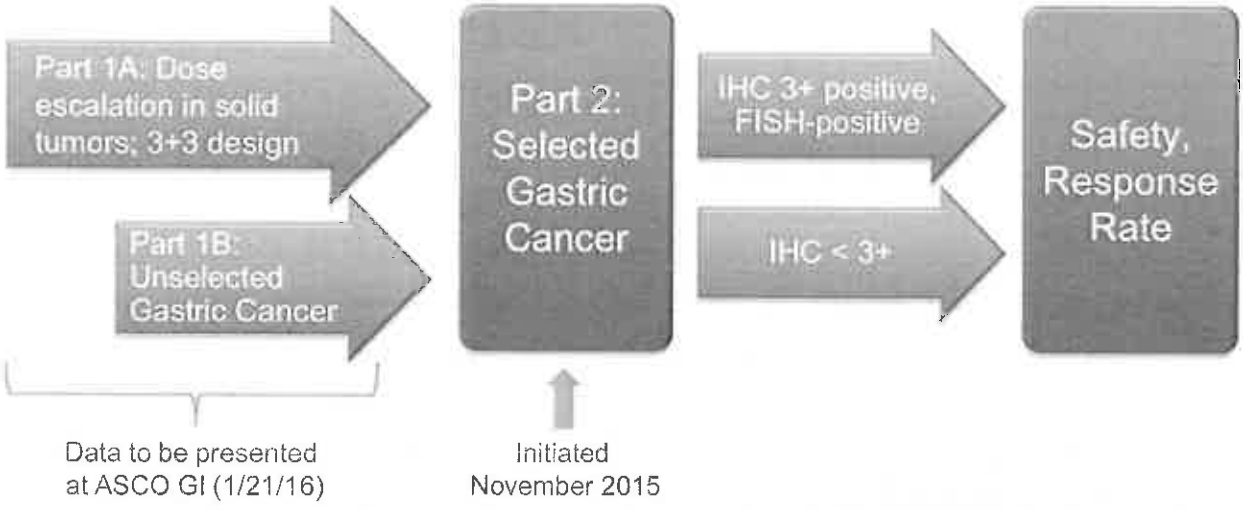
- ***FGFR2* gene amplification**
  - 5% of gastric cancer
  - Associated with lower survival
- **Orphan indication in the US**

FPA144 is effective in preclinical models

OCUM2 Gastric Cancer Xenograft

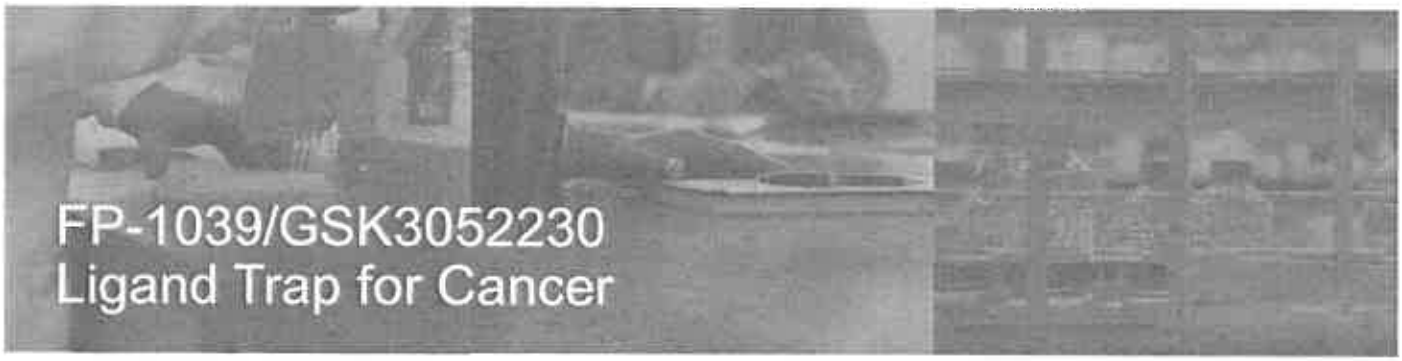


FPA144 Phase 1 Study Continues to Advance



- If clinical activity seen in Phase 1, potential for accelerated development as monotherapy
- Companion diagnostic strategy focused on IHC & FISH
- Preclinical studies underway to evaluate potential combination therapies in gastric cancer and other indications that may be suitable for FPA144 therapies

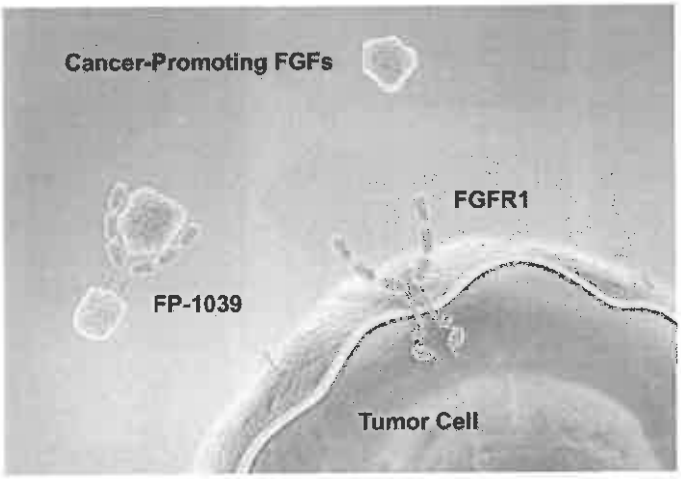
FivePrime



gsk

FivePrime

FP-1039 Selectively Blocks FGFR1 Ligands



Tumor cell growth
Tumor cell survival

- Selectively blocks cancer-promoting FGFs that bind to FGFR1, not unrelated FGFs
- *FGFR1* amplification in sqNSCLC is associated with diminished survival
- Safe and well-tolerated as monotherapy in Phase 1; target engagement demonstrated
- Avoids retinal detachment, hyperphosphatemia, mucositis, nailbed changes and asthenia seen with small molecule TKIs

GSK-Funded Global Phase 1b Trial

FGFR1 amplification (10-20%)

Squamous NSCLC
1st-line, paclitaxel/carboplatin
Previously treated, docetaxel

FGF2 ligand over-expression

Mesothelioma
1st-line, cisplatin/pemetrexed

Safety and Tolerability in combination with SOC

Dose/PK

Overall Response Rate & Duration

Preliminary Data Presented at the 2015 World Conference on Lung Cancer

- As of August 5, 2015, 176 patients with first-line or previously-treated squamous NSCLC were centrally tested for FGFR1 gene amplification
  - Positive amplification rate approximately 20%
- 44 patients dosed with FP-1039 at doses from 5 mg/kg to 20 mg/kg across a 3 arms
- 3 DLTs, all in Arm C, 20 mg/kg
  - Grade 5 GI perforation/ischemia, Grade 3 elevated creatinine, Grade 3 infusion reaction
- The most common AEs across all arms were neutropenia, anemia, constipation, diarrhea, vomiting, decreased appetite, pyrexia, fatigue, asthenia, alopecia and infusion reaction

FivePrime

Best Tumor Response Across All Arms

Presented at the World Conference on Lung Cancer, September 9, 2015

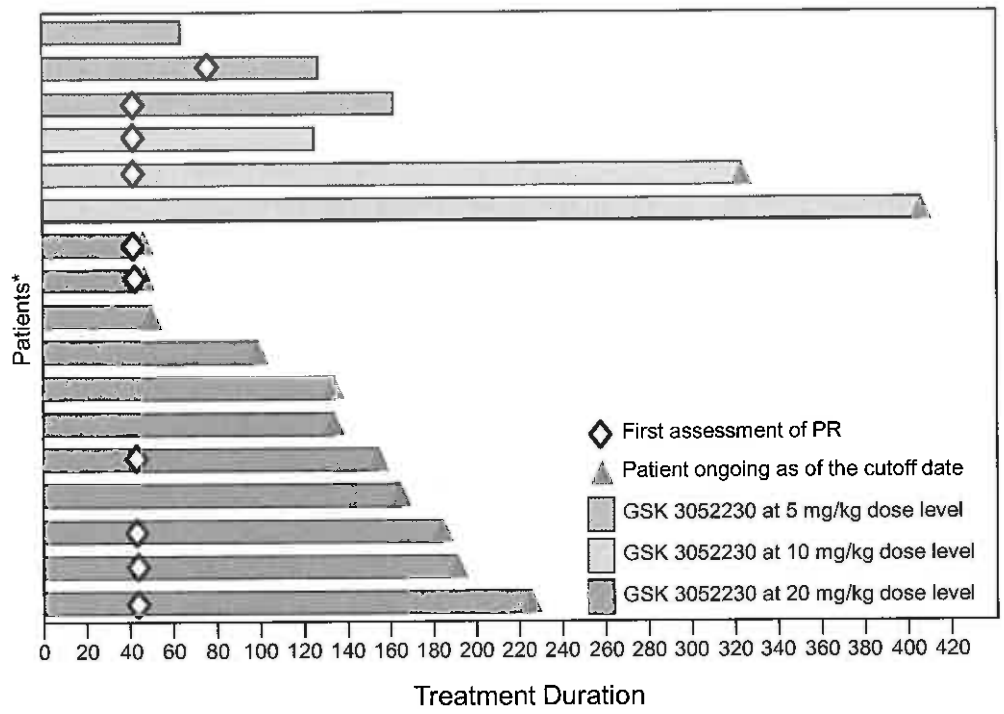
Best Tumor Response	Arm A (1L sqNSCLC): paclitaxel + carboplatin + FP-1039 (n=18)	Arm B (2L+ sqNSCLC): docetaxel + FP-1039 (n=7)	Arm C (1L MPM): pemetrexed + cisplatin + FP-1039 (n=19)
Partial response	10*	0	3
Stable disease	3	4	5
Progressive disease	2	1	1
Not evaluable	3	2	10
ORR	55%**	0%	16%
Disease control rate	72%	57%	42%

*Includes 2 unconfirmed partial responses.
** Historical ORR = 24%, Socinski, 2012.

FivePrime

Duration of Treatment in Arm A (1L sqNSCLC)

Presented at the World Conference on Lung Cancer, September 9, 2015



* Data cutoff: 5AUG2015; data were incomplete/not available for 1 patient.

Financials

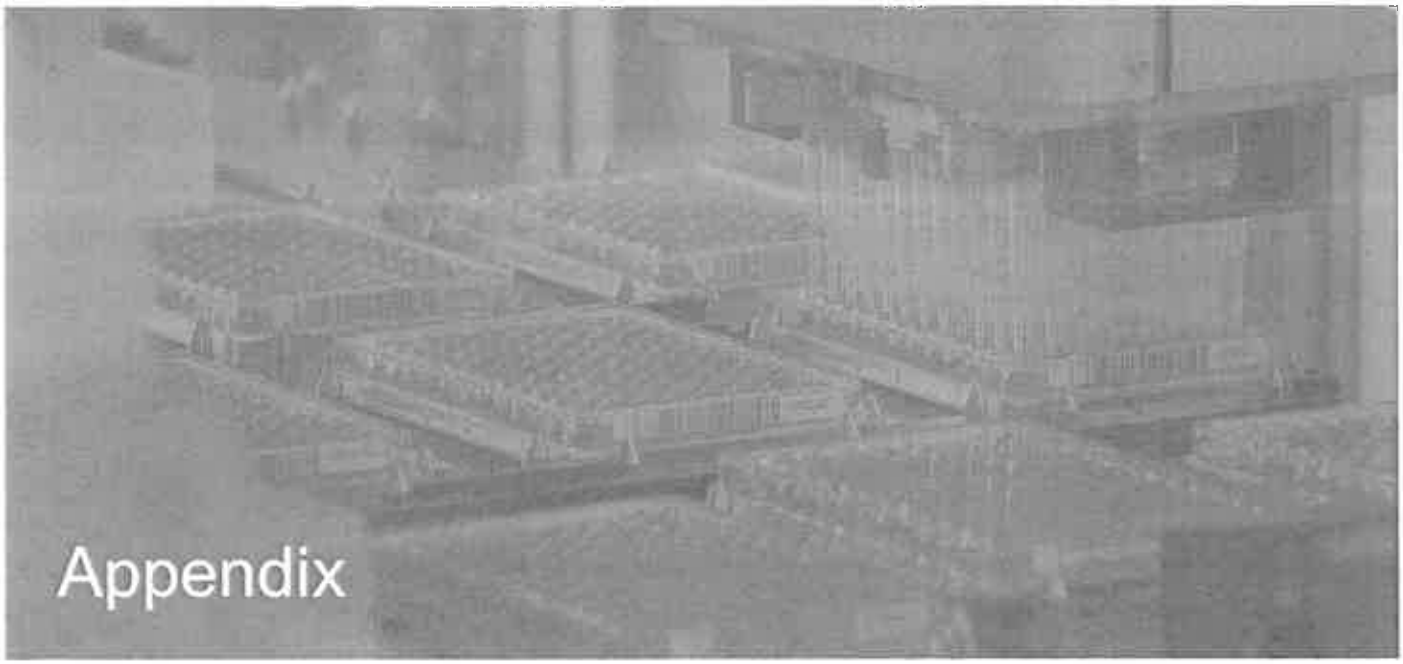
Cash and Cash Equivalents	Estimated Net Cash Used in Operations	Shares Outstanding
• $183 million as of September 30th • Over $500 million upon receipt of $350 million upfront payment from BMS	$65-70 million* for FY 2015	27.5 million

**Without consideration of the $350 million upfront payment from BMS*

Expectations

PROGRAM	INDICATION	EXPECTATIONS
FPA008 CSF1R antibody	6 Cancers	Complete Phase 1a dose escalation & expand to Phase 1b in early 2016
	PVNS	Expand into Phase 2 in early 2016
FPA144 FGFR2b antibody	Gastric Cancer	Enrolling Part 2 FGFR2b-positive tumors Report data from Part 1 at ASCO GI in January 2016
FP-1039 FGF ligand trap (gsk)	Squamous NSCLC & Mesothelioma	Continue dosing in ongoing trial
Immuno-Oncology Research	Cancer	Add one new molecule into our clinical pipeline per year beginning 2017

FivePrime



FivePrime

New Research Program: Novel GITR Agonist Antibodies Complement IO Pipeline

INHIBRX

- Five Prime's platform identified GITR as one of the most potent inhibitors of tumors
  - Immune checkpoint selectively expressed on effector T cells & Tregs
  - Agonist antibodies induce tumor regressions pre-clinically, particularly in combination with IO therapies
- Inhibrx's technology: potentially best-in-class for agonist antibodies
  - Multivalent scaffolds differentiated from conventional antibodies; multimerize and activate GITR independent of Fc binding
- Expands internal IO pipeline & potential for combinations

Collaborations Illustrate the Platform Potential and Drive Future Value

	Focus	DISCOVERY	PRE-CLINICAL	IND
Bristol-Myers Squibb	Immuno-Oncology: Two undisclosed checkpoint pathways			
bluebirdbio	CAR T cell therapies for hematologic malignancies and solid tumors			
gsk	Muscle diseases including sarcopenia and cachexia			
ucb	Fibrosis-related inflammatory diseases and central nervous system disorders			
gsk	Respiratory diseases: refractory asthma and COPD			

Immuno-Oncology Relationships

Bristol-Myers Squibb

- IO discovery collaboration - established March 2014
  - Therapies directed toward targets in two undisclosed immune checkpoint pathways
  - ~$50M in upfront, equity investment and research funding; up to $300M in milestones per target; tiered royalties
- FPA008 license and collaboration agreement – established October 2015
  - $1.74 billion deal: $350 million upfront and potential development and regulatory milestones; additional double-digit royalties on future sales and U.S. co-promotion option
  - Five Prime may continue development of FPA008 in PVNS), in potential combinations with its own immuno-oncology candidates, and in non-oncology indications

bluebirdbio

- CAR T license agreement - established May 2015
  - Bluebird to develop CAR T cell therapies using Five Prime's antibodies to an undisclosed target for hematologic malignancies and solid tumors
  - $1.5M upfront to Five Prime; up to $128.5M in potential milestones; tiered royalties

UW MEDICINE AND *U.S. NEWS & WORLD REPORT'S* 2016 "BEST MEDICAL SCHOOLS" RANKINGS

IN SPRING 2015, *U.S. News & World Report* released its 2015–16 rankings of top American medical schools. The University of Washington School of Medicine is ranked the best in primary care, an honor it has held for 20 of the last 21 years.

Of the eight medical disciplines the magazine reviewed, the UW School of Medicine ranked in the top 10 in seven of them, as follows: family medicine and rural medicine (both No. 1, for the 24th consecutive year); AIDS (No. 4); geriatrics (No. 8); internal medicine (No. 8); pediatrics (No. 8); and drug and alcohol abuse (No. 10). Below, we show you those rankings and those of other highly rated medical schools, as rated at usnews.com.

In addition, UW Medicine is ranked second, after Harvard, in receipt of research funding from the National Institutes of Health.

Primary Care

1 **University of Washington**
2 University of North Carolina-Chapel Hill
3 University of California-San Francisco
4 University of Nebraska Medical Center
5 Oregon Health & Science University
5 University of Michigan-Ann Arbor
7 University of California-Los Angeles (Geffen)
8 University of Colorado
9 University of Wisconsin-Madison
10 University of Minnesota

Specialty Rankings

FAMILY MEDICINE

1 **University of Washington**
2 University of North Carolina-Chapel Hill
3 Duke University
4 University of California-San Francisco
5 Oregon Health & Science University
5 University of Wisconsin-Madison
7 University of Colorado
7 University of Michigan-Ann Arbor
9 University of Missouri
10 University of New Mexico

(over)

UW Medicine
UW SCHOOL OF MEDICINE

Specialty Rankings (cont.)

RURAL MEDICINE

1 **University of Washington**
2 University of North Dakota
3 University of New Mexico
4 University of Minnesota
5 University of North Carolina-Chapel Hill
6 University of South Dakota (Sanford)
6 University of Wisconsin-Madison
8 East Tennessee State University (Quillen)
9 University of Colorado
10 Oregon Health & Science University
10 University of Iowa (Carver)
10 University of Vermont

AIDS

1 University of California-San Francisco
2 Johns Hopkins University
3 Harvard University
4 Columbia University
4 University of Washington
6 University of North Carolina-Chapel Hill
7 University of Pennsylvania (Perelman)
8 University of California-Los Angeles (Geffen)
9 Duke University
10 University of Alabama-Birmingham

GERIATRICS

1 Johns Hopkins University
2 Icahn School of Medicine at Mount Sinai
3 University of California-Los Angeles (Geffen)
4 Harvard University
4 University of Michigan-Ann Arbor
6 Duke University
6 Yale University
8 University of California-San Francisco
8 University of Washington
10 University of Pittsburgh

INTERNAL MEDICINE

1 Johns Hopkins University
2 Harvard University
3 University of California-San Francisco
4 Duke University
5 Washington University in St. Louis
6 University of Pennsylvania (Perelman)
7 University of Michigan-Ann Arbor
8 Columbia University
8 Stanford University
8 University of Washington

PEDIATRICS

1 University of Pennsylvania (Perelman)
2 Harvard University
3 University of Cincinnati
4 Johns Hopkins University
5 University of Colorado
6 University of California-San Francisco
7 Stanford University
8 University of Washington
9 Baylor College of Medicine
9 Washington University in St. Louis

DRUG AND ALCOHOL ABUSE

1 University of Pennsylvania (Perelman)
2 Harvard University
3 University of Cincinnati
4 Johns Hopkins University
5 University of Colorado
6 University of California-San Francisco
7 Stanford University
8 University of Washington
9 Baylor College of Medicine
9 Washington University in St. Louis

Physician Assistant Programs

The medical school's MEDEX Northwest program for training physician assistants is ranked No. 11 in the country.

Bioengineering

(This specialty crosses two disciplines at the University of Washington: medicine and engineering.)

1 Johns Hopkins University (Whiting)
2 Georgia Institute of Technology
2 University of California-San Diego (Jacobs)
4 Duke University (Pratt)
4 Massachusetts Institute of Technology
6 Stanford University
7 University of California-Berkeley
7 University of Pennsylvania
9 Boston University
9 Rice University (Brown)
9 University of Washington

LEVEL I TRAUMA SERVICES

Across Washington, Alaska, Montana and Idaho, Harborview Medical Center is the only facility providing Level I trauma services – the most advanced care, available 24/7 – to adult and pediatric patients. As a knowledge resource, Harborview also assists in the training and care provided by scores of emergency departments throughout our state and region.

The UW Physicians, nurses and therapists who staff Harborview's trauma program care for the most critically injured patients, from resuscitation through rehabilitation. Emergency physicians, surgeons, nurses, anesthesiologists and other professionals are always in-house to provide immediate care.

Quick facts

Nearly 6,000 trauma admissions per year make Harborview one of the highest-volume centers in the nation. Among those admissions:

- Are 45 percent of Washington state's most severely injured patients.
- Almost half are transferred from regional facilities.
- Are nearly 1,000 severely burned people, who receive care at the UW Medicine Regional Burn Center.
- Are nearly 1,000 children, whose small size often requires distinct expertise.

Injury Prevention

The Harborview Injury Prevention & Research Center is among the premier institutions researching how and why people sustain injuries. The center's role in developing laws about seatbelts and distracted driving, and to protect children from school sports injuries, demonstrates its value, as does the success of the campaign to put helmets on Washington's child bike riders.

(over)

Research

Harborview's research to advance the standards of trauma care – for instance, investigating how genetics affect an individual's recovery after an injury – is internationally recognized. All Harborview physicians are faculty of the University of Washington and support an active research program to enhance the care of trauma patients.

Training Excellence

Ensuring outstanding care and outcomes for patients requires ongoing training on procedures and medications. Staff members respond to simulated emergencies, among other initiatives, which maintain our readiness. Harborview's trauma training seminars attract urgent-care specialists and first-responders from throughout the Pacific Northwest, including the paramedics of Medic One programs serving King County.

History & Partnerships

- In 1993, Harborview became Washington's first hospital designated as a Level I adult trauma center. Two years later, by partnering with Seattle Children's for rehabilitation services and therapies, Harborview became the region's only Level I pediatric trauma center.
- Harborview provides medical oversight and education to the flight nurses of Airlift Northwest, which transports patients to area hospitals from throughout the region.
- Harborview partners with the Seattle Fire Department to train all Medic One paramedics in King County.
- Harborview actively supports LifeCenter Northwest's mission to increase organ donation.
- Harborview partners with King County Public Health for disaster-preparedness and serves as the region's Disaster Medical Control Center.

UW MEDICINE

Mission

UW Medicine's mission is to improve the health of the public by:

- Advancing medical knowledge
- Providing outstanding primary and specialty care to the people of the region
- Preparing tomorrow's physicians, scientists and other health professionals

Components of UW Medicine

UW Medicine owns or operates:

- Harborview Medical Center
- Northwest Hospital & Medical Center
- Valley Medical Center
- UW Medical Center
- UW Neighborhood Clinics
- UW School of Medicine
- UW Physicians
- Airlift Northwest

UW Medicine shares in the ownership and governance of:

- Children's University Medical Group
- Seattle Cancer Care Alliance

People

- More than 25,000 employees contribute to the mission of UW Medicine.
- The School of Medicine has approximately 2,400 employed faculty members and more than 4,700 clinical faculty across the WWAMI program who teach medical students, residents and post-doctoral fellows.
- More than 4,900 students and trainees

Faculty includes the following:

- Nobel Prize – 3 living recipients (5 in the school's history)
- Institute of Medicine – 36 members
- National Academy of Sciences – 34 members
- Gairdner International Award – 10 recipients
- Howard Hughes Medical Institute – 13 investigators
- National Academy of Engineering – 5 members

UW Medicine

Patient care

- Over 64,000 admissions annually to the four hospitals owned or operated by UW Medicine: Harborview Medical Center, Northwest Hospital & Medical Center, Valley Medical Center and UW Medical Center.
- About 1.6 million outpatient and Emergency Department visits.
- UW Medicine hospitals are ranked No. 1 and No. 2 in the region by *U.S. News & World Report*. Multiple UW Medicine programs are ranked highly by *U.S. News*, including rehabilitation medicine and cancer care.

Visit uwmedicine.org/about/awards/uw-rank for more information.

Education

The UW School of Medicine is widely known for high-quality, cost-effective education. Trainees include medical students, residents, fellows, physician-assistant students and other health-professions students.

- *U.S. News & World Report* has ranked the UW School of Medicine in the top two in the nation for training in primary care for the past two decades. Training programs in family medicine and rural health have been ranked No. 1 in the nation for the past 22 years.
- Students and trainees enter careers in primary care and specialty care, research, policy work and other areas.
- The School's five-state WWAMI (Washington, Wyoming, Alaska, Montana and Idaho) regional medical education program is widely considered the nation's benchmark program for training and placing physicians in rural and underserved areas. First-year medical students are accepted from the five states, and first-year training occurs in each state at partner universities. Medical students and residents have many opportunities to receive clinical training throughout the region.

Medical discovery

UW Medicine faculty are second in the nation in research funding from the National Institutes of Health (NIH), with more than $611 million of NIH funding and total research funding of over $1 billion in fiscal year 2012. Faculty have made advances in a number of areas, including:

- Stem cell and regenerative medicine
- Neurosciences, including neurogenetics
- Cardiovascular disease
- Global health metrics
- Genome science and gene therapy
- Molecular pharmacology, cellular regulation and neuropharmacology
- Cancer treatment and prevention
- Diabetes treatment and prevention
- HIV treatment and prevention
- Protein design

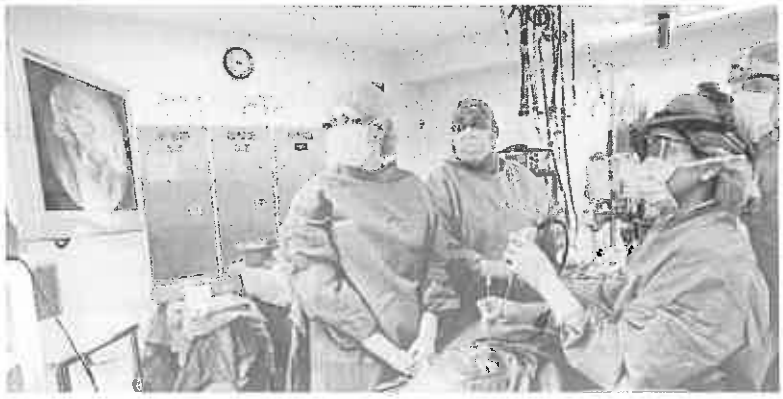
Many research activities and programs are based in collaborative, interdisciplinary centers and institutes, including:

- Institute for Protein Design
- Institute for Translational Health Sciences
- Institute for Stem Cell and Regenerative Medicine
- Center for AIDS Research
- Institute for Health Metrics and Evaluation
- Center for Emerging and Reemerging Infectious Diseases
- Center for Lung Biology
- Center for Comparative and Health Systems Effectiveness
- Harborview Injury Prevention and Research Center

UW Medicine 1959 Northeast Pacific Street | Box 356350 | Seattle, Washington 98195
206.598.7718 | uwmedicine.org

Rev 10/14

HARBORVIEW MEDICAL CENTER



Harborview Medical Center is owned by King County, governed by a county-appointed board of trustees and managed by the University of Washington. UW Medicine physicians, staff and other healthcare professionals based at Harborview serve patients from all walks of life in world-class centers of emphasis and also serve a mission population for King County.

Harborview is the only designated Level I adult and pediatric trauma and burn center in the state of Washington and serves as the regional trauma and burn referral center for Alaska, Montana and Idaho. UW Medicine physicians and other health professionals based at Harborview provide highly specialized services for emergency medicine, orthopedics, neurosciences, ophthalmology, vascular surgery, behavioral health, HIV/AIDS, complex critical care and rehabilitation.

U.S. News & World Report has ranked Harborview among the nation's top hospitals in rehabilitation medicine, neurology, neurosurgery, geriatrics and sports, spine and orthopedic care. In the magazine's 2013–2014 ranking of best regional hospitals, Harborview ranked number three in the Seattle area and number four in the state.

Harborview is an entity of UW Medicine, which also includes Northwest Hospital & Medical Center, Valley Medical Center, UW Medical Center, UW Neighborhood Clinics, UW Physicians, UW School of Medicine and Airlift Northwest. All physicians who practice at Harborview are members of the UW Physicians practice group, and all staff working at Harborview are University of Washington employees.

UW Medicine
HARBORVIEW
MEDICAL CENTER

(over)

Areas of Specialization

- Level I adult/pediatric trauma and burn care, serving as the sole Level I trauma and burn center for Washington state
- Care for patients with HIV/AIDS
- Comprehensive eye and optometric institute
- Comprehensive range of psychiatric and psychological services, including severe mental illness and substance abuse
- Emergency medicine and disaster management
- Neurosciences institute
- Rehabilitation services for people with disabilities from illnesses, injuries and congenital conditions
- Sports, spine and orthopedic care
- Surgical and nonsurgical treatments for simple and complex vascular conditions

Awards, Accolades & Accomplishments

- The Joint Commission: Full Accreditation for meeting national performance standards
- The Joint Commission: Advanced Comprehensive Stroke Center Certification
- Washington State Emergency Cardiac and Stroke System: Level I Cardiac Center and Level I Stroke Center
- Qualis Health: Multiple awards for excellence in Healthcare Quality and Leadership in Improving Healthcare
- National Patient Safety Foundation and American Essential Hospitals: Leadership Award
- American Association of Critical Care Nurses: Beacon Award for Excellence (Intensive Care Units)
- American Heart Association/American Stroke Association: Target Stroke Honor Roll
- Blue Cross Blue Shield: Blue Distinction Center of Excellence (Spine Surgery)
- State of Washington: Warren Featherstone Reid Award for Excellence in Healthcare (Pioneer Square Clinic and Satellite Clinics for HIV/AIDS patients)

2014 Statistics

Inpatient beds	413
Employees	4,500
Admissions	17,000
Clinic visits	247,350
Emergency Department visits	64,500

Charity care

Harborview is mission driven and provides comprehensive care to patients from all walks of life. In fiscal year 2014, UW Medicine physicians and staff at Harborview provided $168 million in charity care, compared to $219 million in the previous year. With the expansion of healthcare coverage under the Affordable Care Act, many patients who were previously self-pay and uninsured now qualify for Medicaid coverage.

History

In 1877, Harborview was founded as the six-bed King County Hospital in South Seattle. In 1931, it moved to its present location overlooking Puget Sound and its name was changed to Harborview Hospital, now known as Harborview Medical Center. UW Medicine's management of Harborview has enabled the hospital to become a leading academic medical center, and new facilities have been added with support from voter-approved bond projects and Harborview reserve funds. The Norm Maleng Building opened in 2008 and the Ninth & Jefferson Building opened in 2009. UW Medicine physicians and staff continue to expand specialty care services based at Harborview with national experts in the centers of emphasis.

NORTHWEST HOSPITAL & MEDICAL CENTER

Northwest Hospital & Medical Center is a community hospital located in North Seattle that provides comprehensive medical, surgical and therapeutic services. It attracts patients for primary and specialized care. As a winner of multiple industry awards, Northwest Hospital has been recognized for clinical care, emergency medicine and patient safety excellence. *U.S. News & World Report* ranked Northwest Hospital seventh in Seattle and ninth in Washington State in the 2013 *Best Hospitals* issue.

Northwest Hospital has pioneered therapies that have become standards of care in the state and beyond. Northwest Hospital is the site of the Seattle Cancer Care Alliance/Proton Therapy, *A ProCure Center.*

Northwest Hospital & Medical Center is an entity of UW Medicine, which also includes Harborview Medical Center, Valley Medical Center, UW Medical Center, UW Neighborhood Clinics, UW Physicians, UW School of Medicine and Airlift Northwest.

Areas of Specialization

- Level I Stroke Center
- Cardiology, cardiac surgery and cardiac rehabilitation
- Geropsychiatry
- Hernia Center
- Multiple Sclerosis Center
- Neurosciences and spine surgery
- Oncology
- Obstetrics, including midwifery program
- Orthopedic joint surgery
- Rheumatology

UW Medicine
NORTHWEST HOSPITAL & MEDICAL CENTER

(over)

Awards, Accolades & Accomplishments

- Washington State Emergency Cardiac and Stroke System: Level I Cardiac Center and Level I Stroke Center
- Level IV trauma center
- Pioneered radioactive seed implantation for prostate cancer
- Introduced labor, delivery, recovery and post-partum childbirth suites to the region
- Introduced the region's first stereotactic biopsy equipment for breast cancer diagnosis
- Performed the first laparoscopic gall bladder surgery in the region
- Installed the first Gamma Knife in the region for noninvasive brain surgery
- Performed Washington state's first EsophyX GERD surgery
- Built the region's only Easy Street Environment for medical rehabilitation

2013 Statistics

Inpatient beds	281
Employees	1,954
Admissions	11,277
Outpatient visits	450,547
Emergency Department visits	33,942
Births	1,303

History

After a successful community effort to raise funds for a hospital outside of downtown Seattle, Northwest Hospital opened in 1960. It quickly began developing its 33-acre campus with the addition of new facilities and services. Today, Northwest Hospital & Medical Center is a full-service medical center, providing a critical resource for emergency, inpatient and outpatient care to the surrounding community. Northwest Hospital & Medical Center became an entity of UW Medicine in January 2010.

Northwest Hospital & Medical Center | 1550 North 115th St. | Seattle, WA 98133 | 206.362.0500
nwhospital.org

Rev. 07/14

UNIVERSITY OF WASHINGTON MEDICAL CENTER

University of Washington Medical Center (UW Medical Center) is a world-renowned academic medical center. UW Medicine physicians and other healthcare professionals based at UW Medical Center provide highly specialized services for cardiac care; cancer care and stem cell transplantation; obstetrical care (including high-risk neonatal intensive care); sports, spine and orthopedics care; and solid organ transplantation. Patients travel from throughout the Pacific Northwest and far beyond for these and other services.

UW Medical Center has been ranked consistently among the top 15 hospitals in the nation by *U.S. News & World Report*. In addition, UW Medical Center is ranked number one in the magazine's 2011-2012 list of best regional hospitals in the Seattle/Tacoma metropolitan area and ranked in the top ten nationally for cancer care. In 2013, the hospital received University HealthSystem Consortium's 4-star hospital status; and in 1994, the hospital was recognized for excellence in nursing care when it became the nation's first Magnet Hospital, and it has met the rigorous criteria of the American Nurses Credentialing Center to renew this designation for the fifth consecutive time.

UW Medicine shares in the ownership and governance of Seattle Cancer Care Alliance, along with Seattle Children's and the Fred Hutchinson Cancer Research Center and all physicians who practice at Seattle Cancer Care Alliance are UW Physicians. Inpatient care for adult oncology patients who receive treatment through the Seattle Cancer Care Alliance is provided at UW Medical Center by UW physicians and staff.

UW Medical Center is an entity of UW Medicine, which also includes Harborview Medical Center, Northwest Hospital & Medical Center, Valley Medical Center, UW Neighborhood Clinics, UW Physicians, UW School of Medicine and Airlift Northwest. All physicians who practice at UW Medical Center are members of the UW Physicians practice group or Children's University Medical Group and all staff are UW employees.

UW Medicine
UNIVERSITY OF WASHINGTON
MEDICAL CENTER

(over)

Areas of Specialization

- Cancer care and blood and marrow transplantation
- Cardiac care, including advanced procedures, complex surgeries, mechanical assist devices and transplantation
- Level III neonatal intensive care unit
- Obstetrics, including high-risk care
- Otolaryngology: head and neck surgery for treating diseases and disorders of the ear, nose and throat
- Radiation therapy, including stereotactic body radiation therapy (SBRT), image-guided radiation therapy (IGRT), volumetric modulated arc therapy (VMAT), intraoperative radiation therapy and neutron therapy
- Robotic-assisted surgery for gynecological oncology, urology, otolaryngology and general surgery
- Solid organ transplantation of the liver, kidney, heart, lung, pancreas and intestine
- Sports, spine and orthopedics care

Awards, Accolades & Accomplishments

- The Joint Commission: Full Accreditation for meeting national performance standards
- The Joint Commission: Center of Excellence, Ventricular Assist Device Program
- Commission on Cancer: Accreditation with Commendation (with Seattle Cancer Care Alliance)
- Washington State Emergency Cardiac and Stroke System: Level I Cardiac Center and Level III Stroke Center
- Qualis Health: Award of Excellence in Healthcare Quality and Leadership in Improving Healthcare
- American Association of Critical Care Nurses: Beacon Award for Excellence (Intensive Care Units)
- U.S. Health Resources and Services Administration: Silver Medals for Liver and Kidney Transplantation Programs; Bronze Medal for Kidney/Pancreas Program
- 30th Annual Dialysis Conference: 50 years of achievement in nephrology nursing
- American Kidney Fund: Recognition of 50th anniversary of chronic dialysis treatment
- Baxter: 50 years of innovation and exceptional care for patients with kidney disease
- First hospital to achieve Magnet Status five times from the American Nurses Credentialing Center
- Practice Greenhealth Leadership Award in Environmental Stewardship

2013 Statistics

Inpatient beds	450
Employees	4,569
Admissions	17,728
Clinic visits	284,830
Emergency Department visits	22,977
Bone Marrow Transplants (w/SCCA)	474
Organ Transplants	258
Births	1,557

History

UW Medical Center opened as University Hospital in 1959 and quickly became a leader in healthcare innovation and standard setting for safe, high-quality patient care.

VALLEY MEDICAL CENTER

Valley Medical Center is an acute care community hospital and clinic network committed to providing safe, quality, compassionate care for more than 63 years. As the oldest and largest public hospital district system in the state of Washington, Valley Medical Center serves over 600,000 residents in Southeast King County. Dedicated to patient safety and improving the overall health of the community, Valley Medical Center is a thriving medical center and the largest nonprofit healthcare provider between Seattle and Tacoma.

The Valley Medical Provider Group consists of a network of primary care clinics that serve as a medical home for patient care management; urgent care clinics that provide after-hours care and walk-in consultations and treatment; and over a dozen specialty clinics that provide convenient access throughout the district.

In 2014, Valley Medical Center was named by Medicare as a Best Hospital for Joint Replacement.

Valley Medical Center is an entity of UW Medicine, which also includes Harborview Medical Center, Northwest Hospital & Medical Center, UW Medical Center, UW Neighborhood Clinics, UW Physicians, UW School of Medicine and Airlift Northwest.

Areas of Specialization

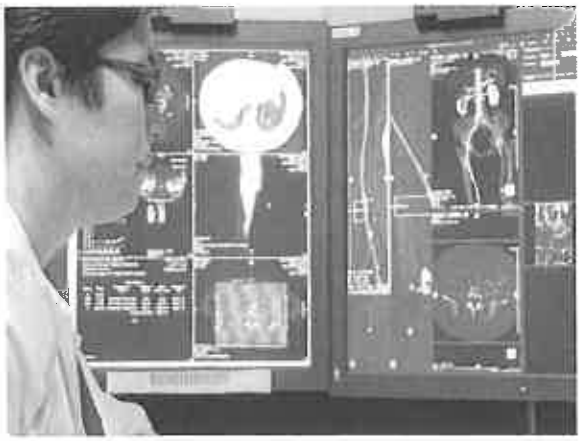
- Level III Trauma Center and emergency services
- Level III Neonatal ICU
- Breast & Bone Density Center
- Cancer treatment and support
- ENT (ear, nose, and throat)
- Diabetes and nutrition clinic
- Gastroenterology
- General and specialty surgery
- Heart and vascular services
- Joint replacement and orthopedics
- Neuroscience, stroke and spine

(over)

UW Medicine
VALLEY
MEDICAL CENTER

Areas of Specialization (continued)

- Occupational health services
- Obstetrics and midwifery
- Ophthalmology
- Sleep medicine
- Urological services



Awards, Accolades & Accomplishments

- "Best Place to Work," *Modern Healthcare* national award for four consecutive years
- "Best Place to Work," *Modern Healthcare* statewide award for 10 consecutive years
- HealthGrades excellence in joint replacement surgery, number one for four years
- American Heart Association Award of Excellence
- American Stroke Association Award of Excellence

2013 Statistics

Licensed beds	303
Employees	2,580
Admissions	17,477
Physicians and other health care professionals	625
Outpatient and clinic visits	552,902
Emergency Department visits	74,202
Births	4,356

History

Valley Medical Center was founded as a public district hospital in 1947 after voters approved general obligation bonds to purchase Renton Hospital. In 1969, voter-approved bonds allowed the medical center to move and expand its services to care for the needs of the rapidly growing Southeast King County area. Numerous expansions and upgrades have occurred over the years. Valley Medical Center became an entity of UW Medicine in July 2011.

UW NEIGHBORHOOD CLINICS

UW Neighborhood Clinics is a network of community-based clinics located throughout the Puget Sound region. The clinics provide a wide spectrum of primary care and secondary care services, from pediatrics to geriatrics using the medical home model. Ancillary services include on-site laboratories, digital radiology facilities and nutrition services. The clinics offer primary care services six days a week, with urgent care services available at select locations. Urgent care services are also available at the UW Medicine Eastside Specialty Center six days a week. Additional offerings include convenient hours with evening and same day appointments available and online access to personal health information through UW Medicine *e*Care. Registered *e*Care users can confidentially email their care team, schedule and cancel appointments, request prescription refills, view their medical history and check lab results.

UW Neighborhood Clinics is an entity of UW Medicine, which also includes Harborview Medical Center, Northwest Hospital & Medical Center, Valley Medical Center, UW Medical Center, UW Physicians, UW School of Medicine and Airlift Northwest.

Areas of Specialization

- Acupuncture
- Behavioral health
- Chronic disease management
- Ear, nose and throat care
- Eye care
- Family medicine
- Geriatrics
- Integrative medicine
- Internal medicine
- Obstetrics and gynecology
- Pediatrics
- Podiatry

(over)

UW Medicine
UW NEIGHBORHOOD CLINICS

Areas of Specialization (continued)

- Sleep medicine
- Sports injuries and musculoskeletal problems
- Travel medicine
- Women's health

Check with your clinic for a list of services available at that location.

Awards, Accolades & Accomplishments

- Accredited by the Accreditation Association of Ambulatory Health Care
- Leadership award from Premera Blue Cross for clinical performance in key areas of healthcare
- National Committee on Quality Assurance has recognized more than two dozen UW Neighborhood Clinics physicians for excellence in diabetic care
- The clinics have participated in both the Washington State Collaborative on Medical Home and the Multi-Payer Pilot on Medical Home

2013 Statistics

Total clinic sites.....9
Employees 270
Clinic visits.....244,139

History

UW Neighborhood Clinics first opened in 1997. There are now nine clinic locations throughout the Puget Sound region: Belltown, Factoria, Federal Way, Issaquah, Kent/Des Moines, Northgate, Ravenna, Shoreline and Woodinville.

Clinic locations

UW Neighborhood Belltown Clinic	2505 2nd Ave., Suite 200 Seattle, WA 98121
UW Neighborhood Factoria Clinic	13231 S.E. 36th St., Suite 110 Bellevue, WA 98006
UW Neighborhood Federal Way Clinic	32018 23rd Ave. South Federal Way, WA 98003
UW Neighborhood Issaquah Clinic	1455 11th Ave. N.W. Issaquah, WA 98027
UW Neighborhood Kent/ Des Moines Clinic	23213 Pacific Highway South Kent, WA 98032
UW Neighborhood Northgate Clinic	314 N.E. Thornton Place Seattle, WA 98125
UW Neighborhood Ravenna Clinic	4915 25th Ave. N.E., Suite 300-W Seattle, WA 98105
UW Neighborhood Shoreline Clinic	1355 N. 205th St. Shoreline, WA 98133
UW Neighborhood Woodinville Clinic	17638 140th Ave. N.E. Woodinville, WA 98072

UW PHYSICIANS

UW Physicians is the practice group for approximately 1,900 physicians and other healthcare professionals who care for patients from western Washington and throughout the WWAMI (Washington, Wyoming, Alaska, Montana and Idaho) region.

UW Physicians is an entity of UW Medicine, which also includes Harborview Medical Center, Northwest Hospital & Medical Center, Valley Medical Center, UW Medical Center, UW Neighborhood Clinics, UW School of Medicine and Airlift Northwest. Its members also practice at the Seattle Cancer Care Alliance, an organization owned by UW Medicine, Fred Hutchinson Cancer Research Center and Seattle Children's. Physicians practicing at Seattle Children's are members of the Children's University Medical Group.

Expertise

All UW Physicians and Children's University Medical Group physicians are active faculty in the UW School of Medicine. They are known for defining state-of-the-art medical care both regionally and nationally and have enhanced the basic understanding of disease processes, medical information technology and treatment options worldwide. They teach future healthcare professionals in one of the most highly regarded and competitive medical schools in the nation. For example, UW School of Medicine's primary care training program is ranked in the top two by *U.S. News & World Report*.

(over)

Areas of Specialization

- Burn care
- Cancer prevention and treatment
- Cardiovascular care
- Gastrointestinal disease care
- High-risk pregnancy and neonatal intensive care
- Primary and specialty care, including complex medical and surgical cases
- Pulmonary and critical care
- Rehabilitation care
- Solid organ and bone marrow transplantation
- Specialized orthopedic surgery
- Trauma care
- Vascular care

2013 Statistics

Physicians and other health care professionals	2,023
Total outpatient visits	1,159,205

History

UW Physicians was formed in 1962 as the Association of University Physicians (AUP) to provide medical services to the community and support the mission of the UW School of Medicine. AUP was incorporated as a nonprofit corporation legally distinct from the University of Washington in 1983 and its name was changed to University of Washington Physicians (UW Physicians) in 1989.

*UW Physicians | 501 Eastlake Ave. E., **Suite** 400 | Seattle, WA 98109 | 206.543.6420*
uwphysicians.org

Rev. 07/14

AIRLIFT NORTHWEST

Airlift Northwest is a preeminent provider of air medical services in the Pacific Northwest dedicated to providing safe, efficient air medical care to critically ill and injured infants, children and adults.

Working with first responders and referring health professionals throughout Washington, Alaska, Montana and Idaho (WAMI), Airlift transports patients to the best care for their medical conditions, whether local hospitals, regional trauma centers or specialty care centers in the contiguous United States or Canada.

Airlift's aircraft are equipped with the most up-to-date safety equipment and are strategically located at six bases throughout the Pacific Northwest. From these bases, emergency flight crews can be rapidly deployed to provide service to one of the largest and geographically varied land masses in the world - from isolated islands in Alaska to coastal villages in western Washington, desert communities in eastern Washington and mountainous areas of Idaho and Montana.

Airlift Northwest is an entity of UW Medicine, which also includes Harborview Medical Center, Northwest Hospital & Medical Center, Valley Medical Center, UW Medical Center, UW Neighborhood Clinics, UW Physicians and UW School of Medicine.

Airlift Northwest Fleet

Washington:

- Three EC-135 high-performance helicopters and one Augusta helicopter based in Bellingham, Arlington, Seattle and Olympia
- Fixed wing Turbo Commander based in Yakima
- Fixed wing Learjet 31A based in Seattle

Alaska:

- One fixed wing Learjet 31A based in Juneau
- One fixed wing Turbo Commander based in Juneau

AIRLIFT NORTHWEST®

Expertise

All aircraft fly with teams of two registered nurses certified in advanced cardiac life support, advanced trauma life support, pediatric advanced life support, trauma nursing care, neonatal resuscitation, critical care nursing, emergency nursing and flight nursing. This high level of expertise is unique in the air medical industry and enables Airlift Northwest to provide critical care to patients in the air during transports.

Accreditation

Airlift Northwest has been accredited by the Commission on Accreditation of Medical Transport Services, or CAMTS, since 1997. Airlift was the first air medical service in Southeast Alaska to receive this recognition, which is based on meeting a series of industry standards and best practices for patient care and safety.

Community Service

Airlift Northwest provides education and training and participates in community outreach throughout the region. Staff provide annual training in setting up safe landing zones for first responders and fire departments. They also review helipads annually, assist hospitals with training in order to make new helipads operational and help hospitals develop policies and procedures pertaining to aircraft safety.

2012 Statistics

Total patients served	3,338
Employees	80
Rotary-wing, inter-hospital transfers (percentage of total flights)	40%
Rotary-wing, 9-1-1/EMS scene responses	28%
Fixed-wing flights	32%

AirCare Program

Airlift Northwest offers a membership program that provides communities with high-quality air medical service at an affordable cost. As part of the membership benefits, the portion of the bill not covered by insurance or Medicare is paid when Airlift Northwest is requested by a medical facility or an emergency response team to fly a critically ill or injured patient to appropriate medical care.

History

Airlift Northwest was founded in 1982 by Dr. Michael Copass and a consortium of hospitals in the Seattle area, including UW Medical Center, Seattle Children's and Harborview Medical Center, to bring high-quality air medical transportation to an underserved area in Southeast Alaska. Since then, Airlift has expanded to provide service for a four-state region.

Support Airlift Northwest

If you are interested in supporting Airlift Northwest, please contact UW Medicine Advancement at 206.543.5686 or writemed@uw.edu.

Airlift Northwest | 6505 Perimeter Road South | Suite 200 | Seattle, Washington 98108
206.521.1599 | airliftnw.org

Rev 05/13

UW SCHOOL OF MEDICINE

The UW School of Medicine is the sole public medical school for the five-state WWAMI region: Washington, Wyoming, Alaska, Montana and Idaho. Our faculty make life-improving discoveries and care for patients while training medical students, residents, fellows and allied healthcare professionals for careers in medicine.

Innovation and excellence in medical education

- *U.S. News & World Report* has ranked the UW School of Medicine the number one primary care medical school in the nation for 19 of the past 20 years. Family medicine and rural health have been recognized as the number one teaching program in the nation for 23 consecutive years. Other highly ranked programs include internal medicine, geriatrics, pediatrics and AIDS.
- The WWAMI program is a national model program for community-based training of new physicians for rural and medically underserved populations.
- The nationally acclaimed Colleges program creates small groups of medical students headed by a faculty mentor who teaches and guides them.
- Curriculum Pathway programs guide students interested in working in primary care with Native American, Hispanic or underserved populations, or in the world's poorest countries.
- The UW Institute for Simulation and Interprofessional Studies (ISIS) leads the nation in the use of robotic mannequins and other realistic training devices to help students improve technical and communication skills.

Programs

- **M.D. Program:** Students are selected on the basis of academic performance, motivation, maturity, personal integrity and humanitarian qualities. A curriculum renewal is focusing on teaching innovations and new technologies. The new curriculum is expected to start in autumn 2015.
- **Graduate Medical Education (GME):** Provides advanced training through 27 residency and 69 clinical fellowship accredited programs (ACGME). Other fellowship programs are approved by national specialty societies.

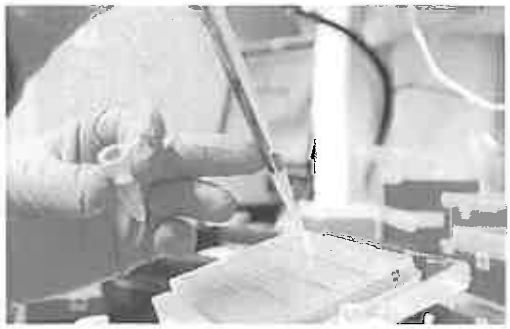
UW Medicine
UW SCHOOL OF MEDICINE

(over)

Programs (continued)

- **MEDEX Northwest:** A regional program to educate physician assistants with a focus on primary care for underserved populations.
- **Medical Scientist Training Program:** Enables highly qualified candidates to obtain both M.D. and Ph.D. degrees for careers in basic medical research.
- **Allied Health Programs:** Undergraduate and graduate training for health sciences careers.

Medical discovery



UW School of Medicine faculty receive more than $1 billion per year in grant funding for research, and have made breakthroughs in many areas, including:

- Stem cell research and regenerative medicine
- Neurosciences, including neurogenetics
- Cardiovascular disease
- Global health metrics
- Genome science and gene therapy
- Cancer, diabetes and HIV treatment and prevention

Faculty have been recognized for research with top international awards, including:

- 5 Nobel Prizes in Physiology or Medicine
- 32 elected members of the Institute of Medicine
- 33 elected members of the National Academy of Sciences
- 5 elected members of the National Academy of Engineering
- 10 Canada Gairdner Foundation International Award recipients
- 16 Howard Hughes Medical Center investigators
- 6 Lasker Foundation Award recipients

Faculty and students

Our faculty practice at Harborview Medical Center, UW Medical Center, Northwest Hospital & Medical Center, Valley Medical Center, UW Neighborhood Clinics, Seattle Children's, Seattle Cancer Care Alliance, Puget Sound Veterans Affairs Health Care System, Boise VA Medical Center and clinical sites throughout the WWAMI region.

- 2,400 full-time or part-time faculty members
- 4,700 clinical faculty
- 550 affiliate faculty at research institutions
- 4,900 students
- 30 medical school departments in clinical and basic science