



SciLifeLab

- Forskningsinfrastruktur och stark forskningsmiljö

Ulf Landegren

Vice director, SciLifeLab i Uppsala

Science for Life Laboratory

Develops, provides access to, and applies advanced technologies for molecular biosciences, with a focus on health and the environment

Molecular techniques



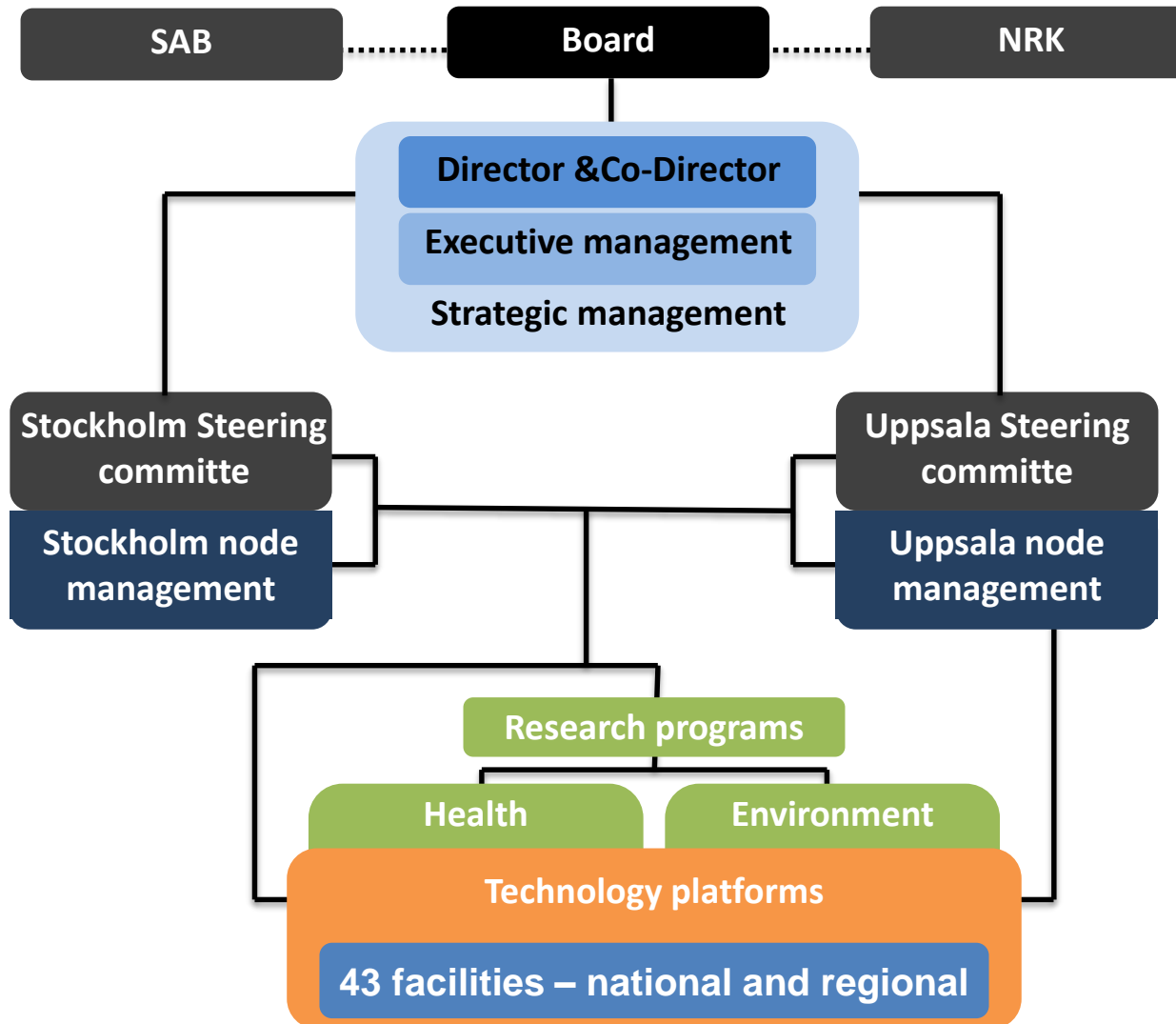
Medical problems

Biobanks

SciLifeLab in Uppsala and Stockholm



SciLifeLab organization



Directors



Director
Mathias Uhlén



Co-director
Kerstin Lindblad-Toh

Executive management



Strategic management

National board

Chairperson: Göran Sandberg

Industry representative: Margareta Olsson Birgersson

From host universities:

- Sophia Hober (KTH)
- Stellan Sandler (UU)
- Hans Adolfsson (SU)
- Hans-Gustaf Ljunggren (KI)

From other universities:

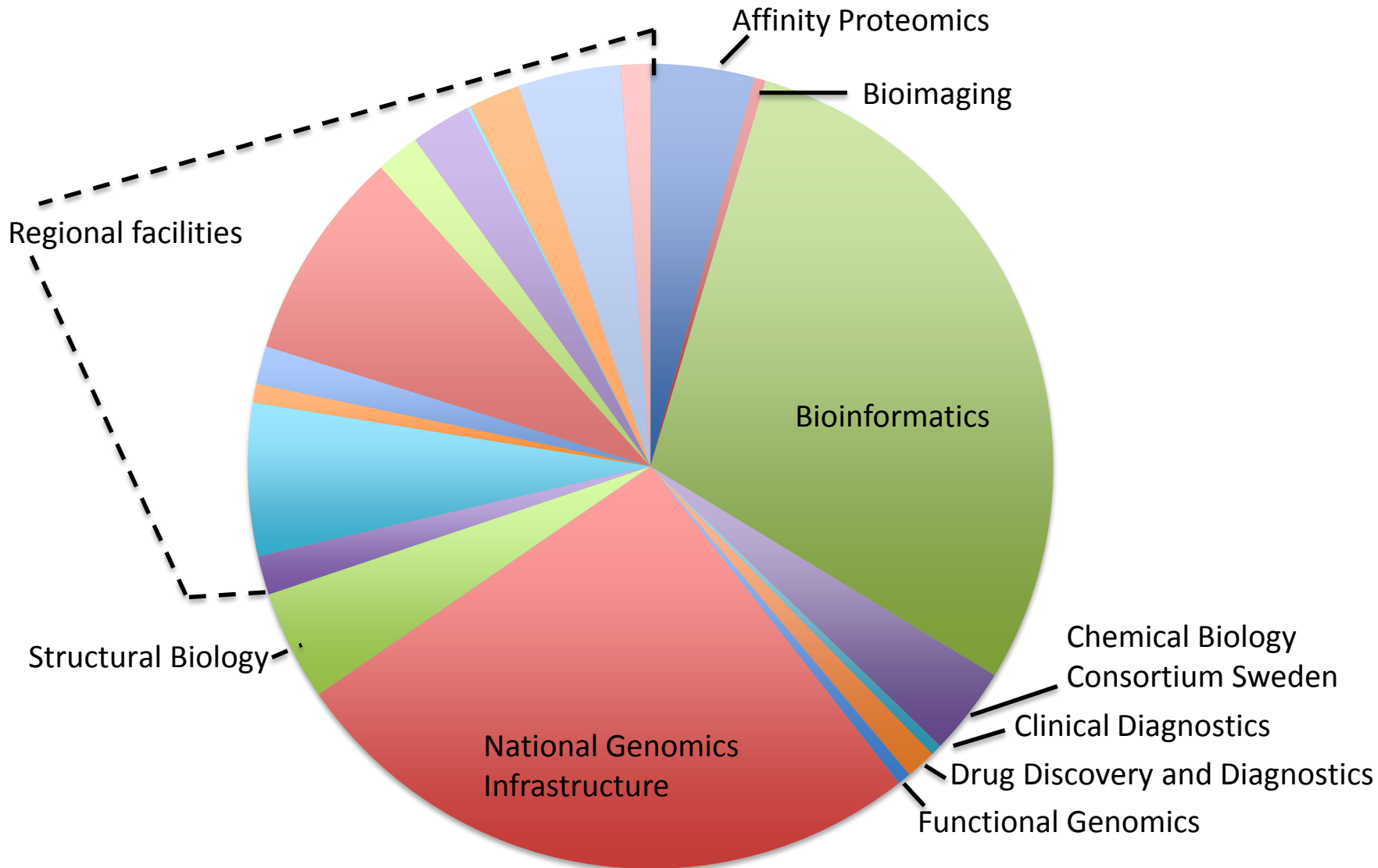
- Maria Anvret (GU)
- Gunilla Westergren-Thorsson (LU)
- Karl-Eric Magnusson (LiU)



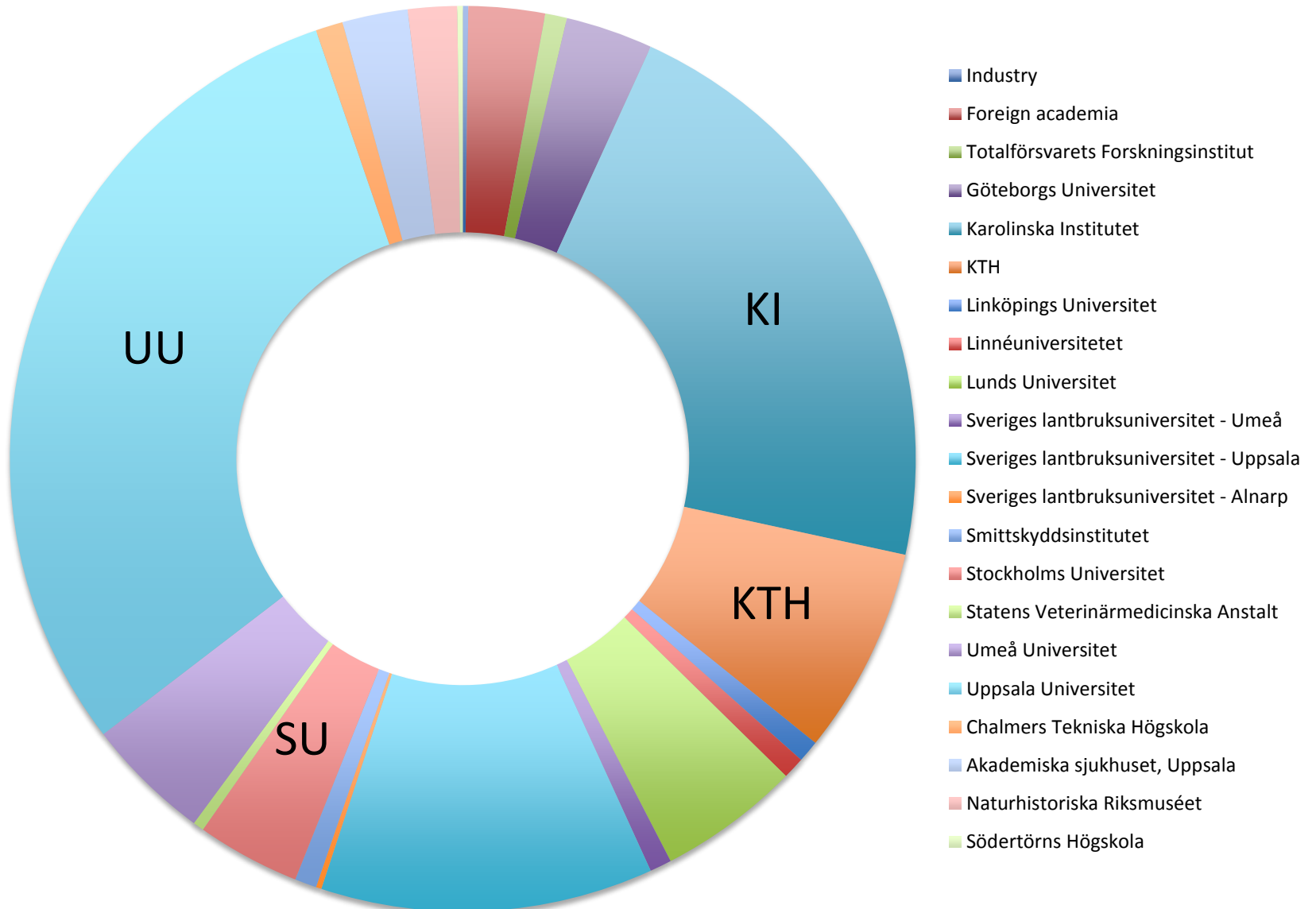
Nine national technology platforms

Platform	Description
Affinity Proteomics	Analysis of tissues, cells and body fluids
Bioimaging	Advanced bioimaging (super resolution)
Bioinformatics	Advanced bioinformatics support & compute and storage
Chemical Biology	High-throughput screening using chemical libraries
Clinical Diagnostics	Clinical Sequencing and Biomarker analysis
Drug Discovery & Development	Chemical and biological therapeutics
Functional Genomics	High-throughput analysis of genetic variation
Genomics	Sequencing and genotyping with advanced bioinformatics support
Structural Biology	Protein expression for structural determination

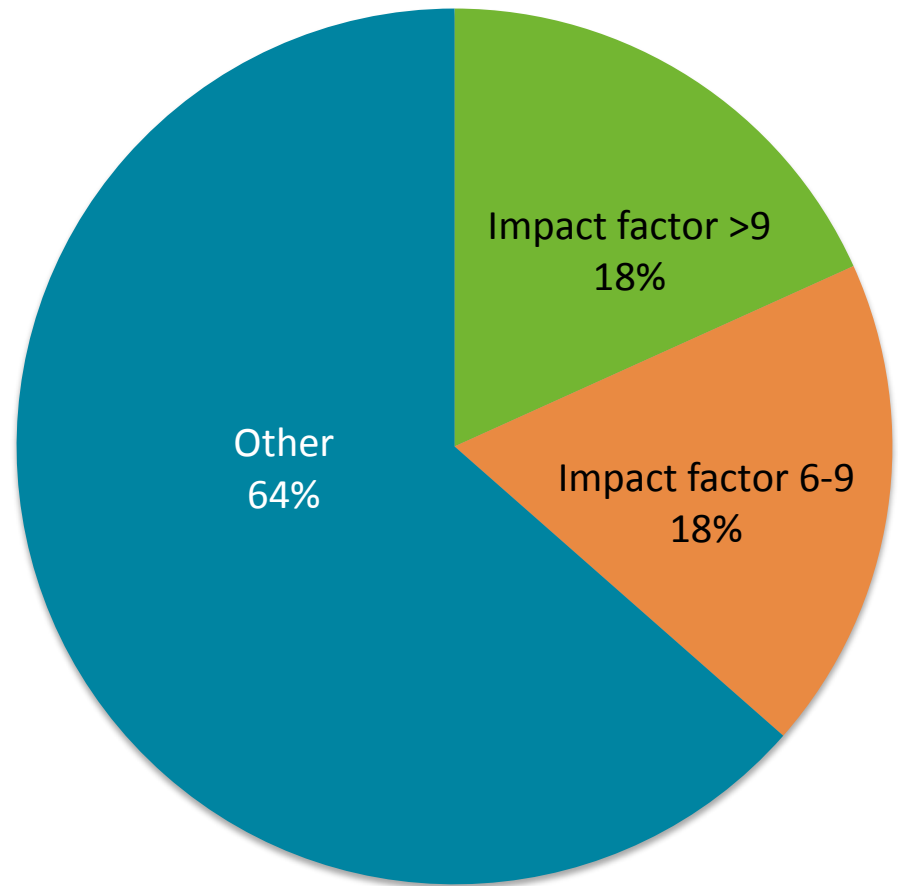
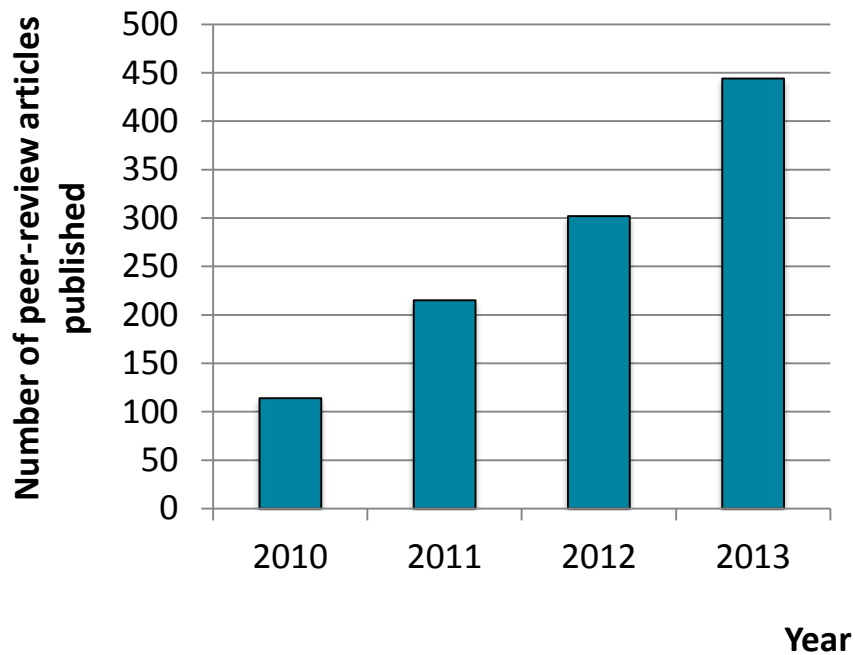
During 2013 2235 projects were analyzed by SciLifeLab facilities



The National Genomics Infrastructure (NGI) supports projects from all of Sweden



Publications



SciLifeLab in international media

Science 328,805 (14 May 2010)

Sweden Bets on New Lab to Spruce Up Its Bioscience Future

The new brain the name of a neighbor—Norway appear (I've also about)—that this center is central to Sweden's health. It took the nation's largest number of institutions and by some estimates is economically the country's most important species, for a wasn't surprising when the Sweden-based Knut and Alice Wallenberg Foundation last year announced it would provide about \$1 billion for the expansion of the Norway agency's genome that what is unexpected — or at least it would have been a year ago — that this sequencing will largely happen in Sweden rather than being farmed out to other countries. Next week, officials in Stockholm will inaugurate a new building with cutting-edge DNA-sequencing machines that by 2013 should produce a rough draft of the genome of the "Chimpanzee" man.

For Sweden, this building represents the most that a single research project. It's the most visible evidence to date of the Science for Life Laboratory (SciLifeLab), an essential research organization and two sites, one in Stockholm and the other in nearby Uppsala. Rather than spread its money to as many scientific disciplines, as it has traditionally done, the Swedish government will spend more than \$75 million setting up SciLifeLab with the hope that it will become a technology-driven national life sciences center, comparable to organizations such as the Broad Institute in Cambridge, Massachusetts. "We want to make sure the latest technologies are available to all of Sweden, it's a deliberate decision to do things differently," says professor Kerstin Lindahl Eriksson, who is the director of SciLifeLab's Uppsala effort and has a position with the Broad Institute.

The dream of creating a national research center in biology has been discussed for years by officials at the Karolinska Institute, Stockholm University, and the Royal Institute of Technology (KTH), all in Stockholm. But it only became a reality when the Swedish government recently offered major strategic research grants for several life sciences fields. The three institutions banded together last year to win the lion's share of the "molecular biosciences" money and then joined with Uppsala University, another major science, to form SciLifeLab. By 2011, the building in Stockholm

should house more than 200 researchers. Aside from sequencing the Norway species, SciLifeLab intends to help Sweden take advantage of its tremendous genomics database and bioinformatics, such as the recently launched LifeTime project, which aims to gather tissue samples and track the molecular histories of more than 700,000 Swedes. SciLifeLab "is what we really need to be competitive with other places and to realize our own data," Lindahl Eriksson says.

In a sign, Sweden will create one of Europe's biggest genome centers. There are much larger centers around the world—

SciLifeLab's DNA sequencing output will be only about 40% of that of the Wellcome Trust's larger Institute in Hinxton, U.K., for example. And Sweden is counting on an unprecedented marriage of genomics with proteomics to set it apart. Uppsala University and the Royal Institute of Technology are already better to a project, the Human Protein Atlas, that by 2014 intends to create antibodies to nearly every human protein. SciLifeLab "will be the only lab with antibodies to all human proteins and the ability to sequence human genomes. It's a unique niche," says KTH's Fredrik Lindberg. Scientists say they will now scrutinize from the Human Protein Atlas to examine subcellular locations of human proteins. For example, And there are plans to analyze the Batini bio-assembly, notes KTH's Mattias Uhlen, who heads the Human Protein Atlas and Stockholm's SciLifeLab. Lindahl Eriksson says the Uppsala site will add its strengths in comparative genomics and evolutionary biology to the mix.



Nature 484, 171 (12 April, 2012)

Swedish bioscience Sweden's government said on 3 April that the Science for Life Laboratory (SciLifeLab), an existing bioscience collaboration between four universities, will in 2013 expand into a national research institute for molecular biosciences and bioinformatics in Stockholm. It will eventually employ 1,000 scientists. The centre — which currently employs 300 scientists in Stockholm and Uppsala — is to receive 220 million Swedish kronor (US\$32.9 million) from the private Knut and Alice Wallenberg Foundation in Stockholm, and between \$25 million and \$50 million from pharmaceutical firm AstraZeneca. The government's contribution will be announced this autumn.

Science 336, 136 (13 April, 2012)

AROUND THE WORLD



EUROPE

Swedish success story

Institutions shake off rivalries to build scientific collaborations and hire world-class talent.

BY PAUL SMAGLIK

Since the global financial crisis, Sweden has lived in an alternative universe of science funding. While austerity policies have kept research funding levels flat in much of Europe since 2008, Sweden's public science budget has increased by 5 billion Swedish kronor (US\$786 million) over the past 5 years with a rise of another 4 billion kronor to come over the next 5 years. And, as seemingly endless government budget battles have slowed US infrastructure investment, Sweden has seen a building boom. The country has constructed a national high-throughput life-sciences laboratory; begun building new clinical-research laboratories and a hospital; and broken ground on a powerful synchrotron light source and a neutron source.

Now Sweden is increasing international recruitment, backed by public and private money, to fill its facilities and fulfil ambitious research agendas. The Knut and Alice Wallenberg Foundation in Stockholm has been the biggest non-government player in infrastructure investment and international science hiring. Last year, the foundation introduced the Wallenberg Academy Fellows programme to recruit and fund 300 young scientists over 10 years, aiming for 30–50% of the fellows to come from outside Sweden.

The region, however, is adjusting to big changes at pharmaceutical giant AstraZeneca, a long-time presence in Sweden. Since 2010, the company has cut close to 2,000 jobs as it seeks to consolidate all its Swedish research into one facility in Mölndal. But that has provided an incentive for other institutions to take up the

mantle of clinical studies. Former AstraZeneca researchers have translational skills, and Sweden has good databases of individual health records with ample data that are useful in clinical medicine. AstraZeneca's restructuring "gave us an important signal," says Stefan Hansson, vice-dean for medicine at Lund University. "We now maybe need to work more on clinical research. How do we integrate that with our hospitals? How will clinicians add research?"

BOUNCING BACK

Sweden had its own financial struggles in the 1990s, which stymied big growth until the late 2000s. The country must attract world-class scientists from beyond its borders to remain globally competitive, says Göran Sandberg, executive director of the Wallenberg foundation. "We don't have enough bright people ▶

Stockholm 2

Life Science Lab Gets Fresh Funding

A groundbreaking Swedish life science research initiative will add lab space and nearly triple its ranks to 1000 investigators, thanks to newly announced infusions of funds. The private Knut and Alice Wallenberg Foundation will donate \$33.4 million, and pharmaceutical company AstraZeneca will add between \$5 million and \$10 million annually over the next 5 years, to Sweden's Science for Life Laboratory (SciLifeLab). The Swedish government later this year will also inject more money into the 2-year-old collaboration between four of the country's universities, according to Jan Björklund, Sweden's minister for education. In a strategic bid to create a national life sciences powerhouse.

Science & SciLifeLab Prize for Young Scientists



- Annual prize started in 2013
- Four areas in life science
- Prize winners selected by Science editorial board
- Winners essay published in Science

Want to win a rather special prize in Stockholm, Sweden this December?

Science & SciLifeLab PRIZE FOR YOUNG SCIENTISTS

Winner's paper published in the journal *Science*
\$25,000 dollars grand prize
Awards held in Stockholm in December

This December a rather special prize will be awarded in Stockholm, Sweden. The journal *Science* and SciLifeLab have come together to recognize and celebrate excellence in PhD research. The *Science* and SciLifeLab Prize has been established to support young scientists at the start of their career.

"Science has never been more exciting and, as leaders in science, we need to support and encourage young researchers today and tomorrow. This prize is a way of doing just that."
Professor Matsias Uhlén, Director SciLifeLab

The grand prize winner of this major global award will have their paper published in the journal *Science* and receive \$25,000. Three runners up will receive a combined total of an additional \$10,000 in prize money. The prizes will be presented in Stockholm, Sweden in the middle of December 2013.

To enter
You must be a recent Ph.D. graduate (awarded between January 1, 2011 and December 31, 2012). Submissions must be in the form of a 1000 word essay in English, on your thesis, highlighting the significance of its contribution and overall implications in the field. The four submission areas for this prize are (1) Genetics / Proteomics / Systems Biology (2) Developmental Biology (3) Molecular and Cellular Biology (4) Environmental Life Science.

The deadline for submission is August 2, 2013. The overall winning essay will be published in *Science*. For further details and to enter, please go to: www.bit.ly/SciLifeLabPrize

For over 130 years the journal *Science* has been the world's leading journal of original research, global news and commentary.

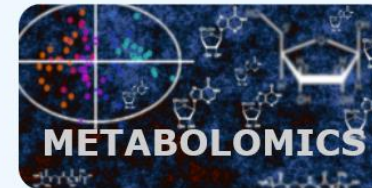
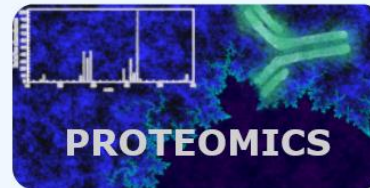
SciLifeLab is a collaboration between five universities in Stockholm and Uppsala, Sweden, and is a pioneering center for large-scale bioscience with a focus on health and environmental research.

With the kind support of the Peter and Alice Hedberg Foundation.

Just as Alice Wallenberg Stiftelsen Science AAAS SciLifeLab



Connecting researchers with molecular analysis technologies



News

BARC - The Catalogue

BARC is a freely available web resource, providing expertise and molecular resource capabilities available at research centres and biotech companies in Europe.
2014-10-03

NMR-based metabolomics

SciLifeLab, Department of Chemistry, SLU Uppsala
2014-10-03

How have you used BARC?

Please share your story how you have used BARC, to find a resource, how BARC solved a challenge you faced, or how BARC brought attention to your resource. Share Your Story!
2014-10-03

ICAT/iTRAQ/SILAC HPLC-MS experiments and data analysis

SCIBLU Proteomics, Lund University
2014-10-03

To resource providers

If you provide a resource relevant to BARC you are invited to participate in the catalogue. You can provide information of your resources by filling out a questionnaire.
2014-10-03

Immunohistochemistry

Tissue Profiling Center, SciLifeLab, Uppsala University
2014-10-03

Find protocols

All methods

All activities

Free text search...

Find protocols

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New Protocol

Make your presence known and help others by sharing methods that may help other scientists.

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A look around the corner for biobanks

New types of studies

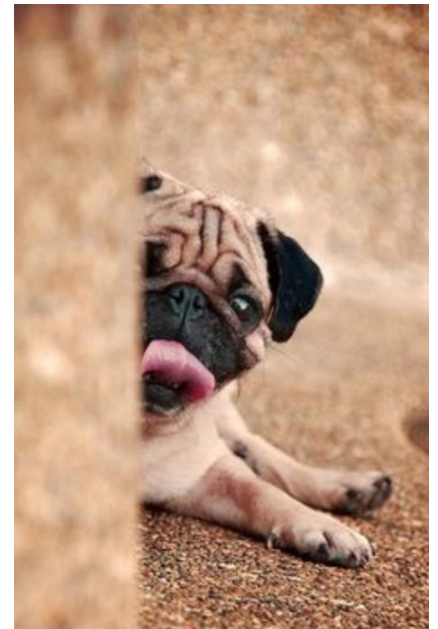
- Massively parallel protein measurements
- Ultrasensitive protein measurements
- Rare mutations

New types of samples

- Single cells
- Cell free DNA & CTC – liquid biopsy
- Filter paper

New research strategies

- Wellness
- Multiparametric measurements
- Time series



Molecular tools, disclosures

Oligonucleotide ligation assay (OLA) —

Padlock probes -> Molecular inversion probes —

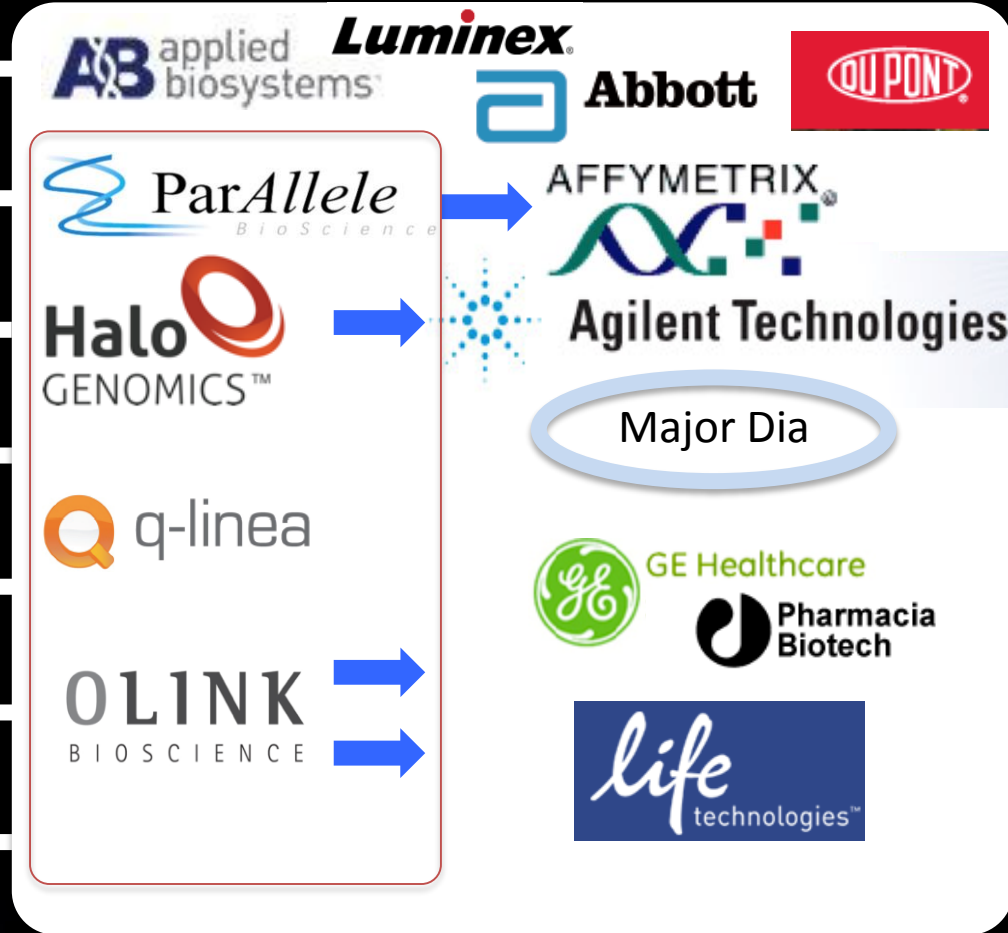
Selector probes -> Haloplex probes —

Circle to circle amplification (C2CA) —

In situ proximity ligation assays -> Duolink —

Proximity ligation assay -> TaqMan protein assays —

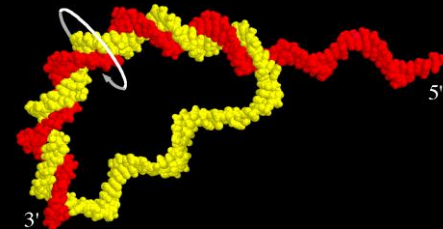
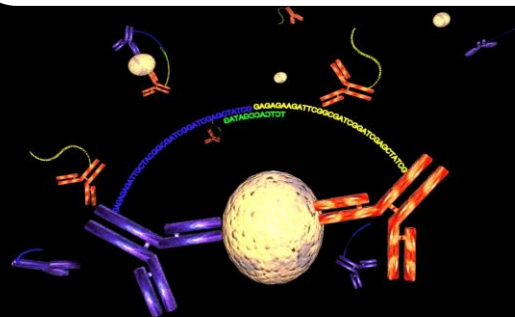
Proximity extension assay -> Proseek —



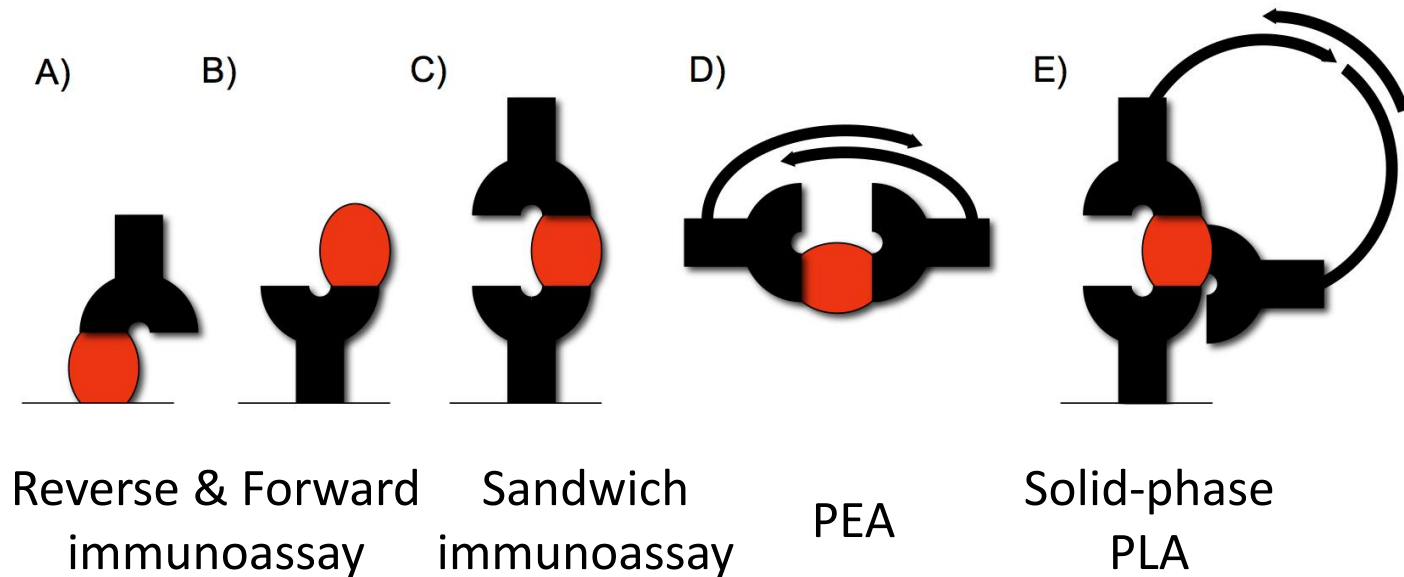
superRCA

nFold probes

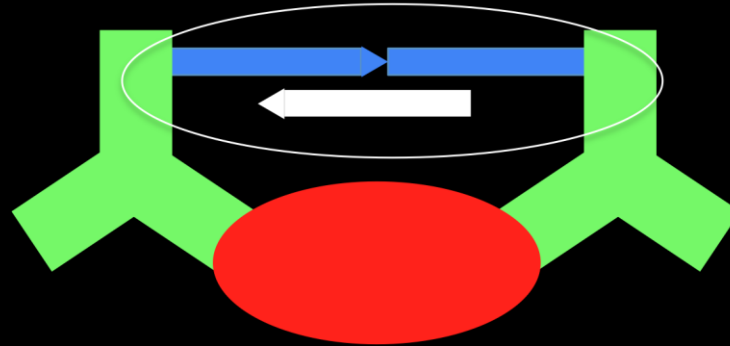
ExCirc & CutLig probes



Assay architectures for protein measurement in solution

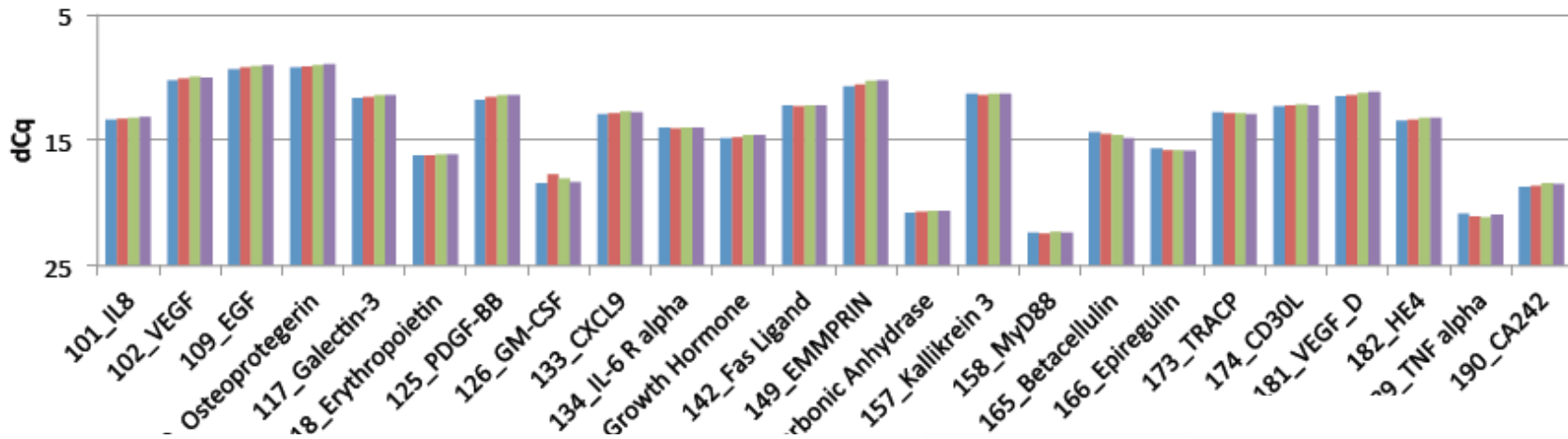
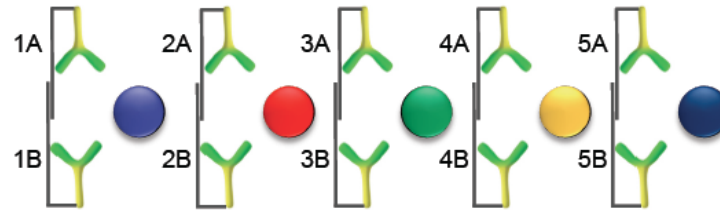
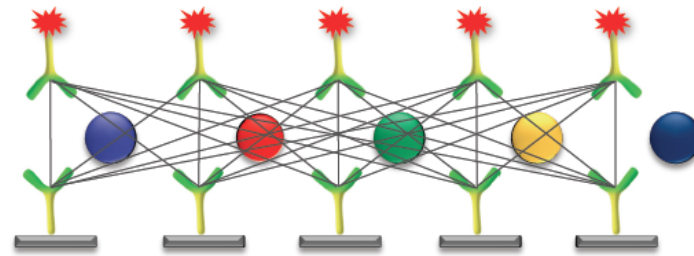


Properties of proximity ligation/extension assays



- High specificity because of two or more recognition events
- High sensitivity via DNA amplified detection
- Low background due to requirement for coincident binding
- Detection either in situ or in solution phase
- Excellent multiplexing
- Suitable for digital detection

Multiplexing without increasing crossreactivity



Proseek®

Proseek, reagent product for protein quantification in fluids (plasma) and (single) cells

Single and multiplex Proximity Extension Assays (PEA)

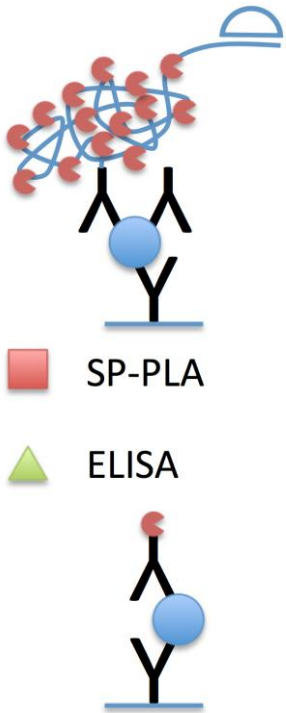
1 µL - 92 proteins and 4 controls

For biobanks and cell biology



Seq	Biomarker	Seq	Biomarker	Seq	Biomarker	Seq	Biomarker
101	IL-8	125		149	Renin	173	Galanin
102	VEGF	126	Cathepsin S	150	IL-6 R alpha	174	AgRP
103	Adrenomedullin	127	CX3CL1	151	ST2	175	Catalase
104	GFP	128	FGF basic	152	TIM-1	176	CD40
105	CD40L	129		153	beta-NGF	177	tPA
106	GDF15	130	IL-2	154	TNF-alpha	178	M-CSF
107	PIGF	131	FGF-23	155	TRANCE	179	Prolactin
108	E-selectin	132		156	RAGE	180	Growth Hormone
109	EGF	133	IL-1 alpha	157	Caveolin-1	181	Fas
110	Osteoprotegerin	134	IL-1 beta	158		182	LIGHT
111	IFNg	135	IL-10	159	Thrombomodulin	183	F-Spondin
112	IL-1ra	136	MMP-3	160	TGFb3	184	HGF
113	IL-6	137	FABP4	161	MMP-10	185	NT-pro-BNP
114	Cystatin B	138	IL-4	162	PLA2G7	186	Trop I
115	MCP-1	139		163	CCL4	187	ECP
116	Kallikrein 6	140	Myeloperoxidase	164	Cathepsin D	188	BNP
117	Galectin-3	141	IL-18	165	TNF RII	189	D-dimer
118	Erythropoietin	142	MMP-1	166	CCL3	190	Insulin
119	Extension Control	143	Resistin	167	MMP-7	191	CA125
120	TGFb1	144	PDGF-BB	168	EPCR	192	TFPI
121		145	PLA2G2A	169	gp130	193	Follistatin
122	Tie-2	146	PE	170	CXCL16	194	CD31
123	Tissue Factor	147	Oligo-Ref	171	DKK-1	195	
124	TNF RI	148	PIGF	172	IL-17	196	

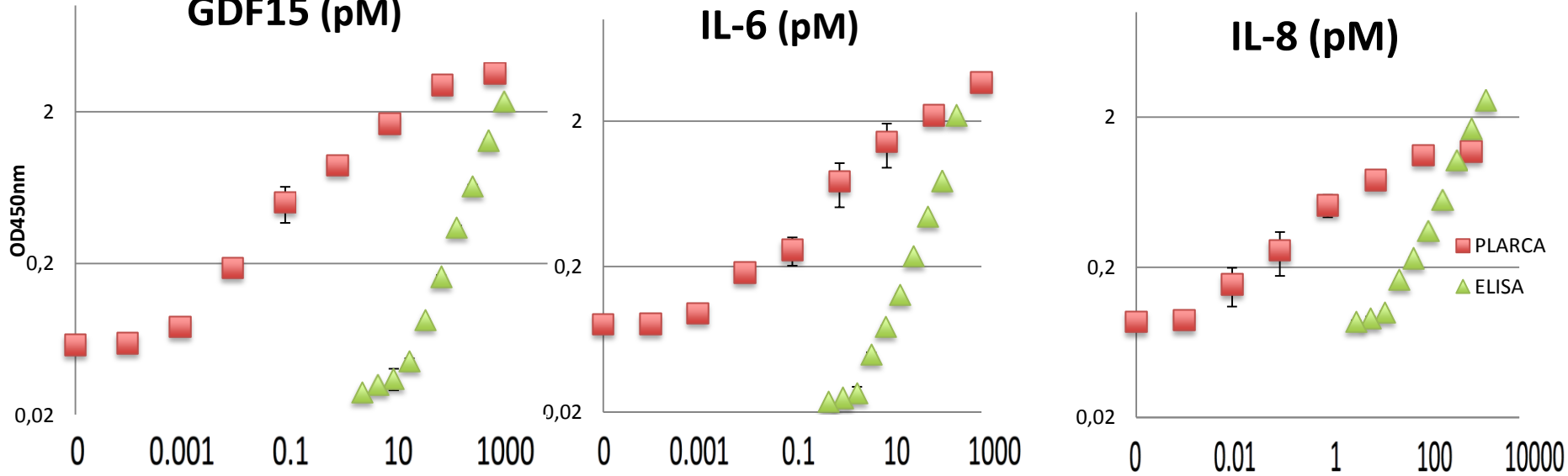
Ultrasensitive protein detection via PLARCA



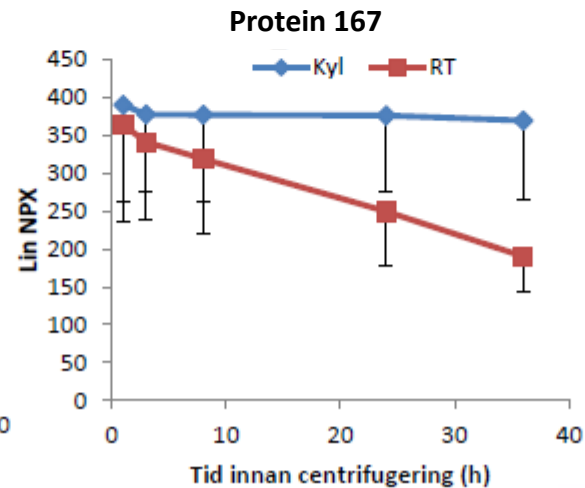
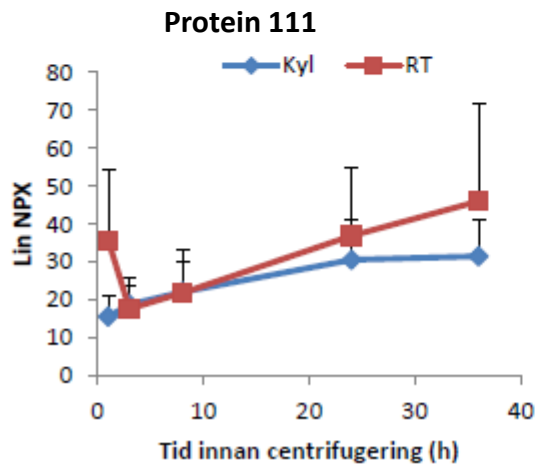
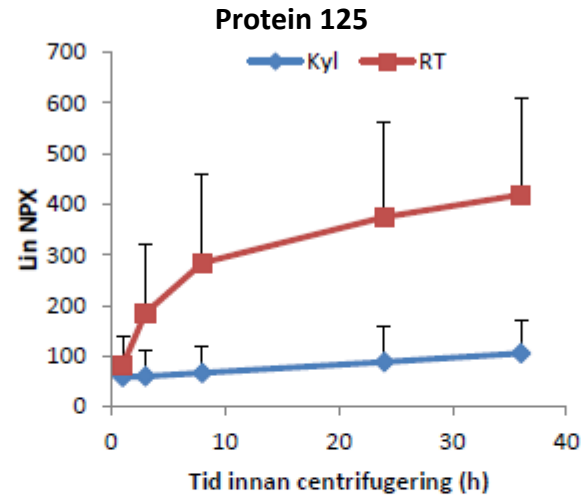
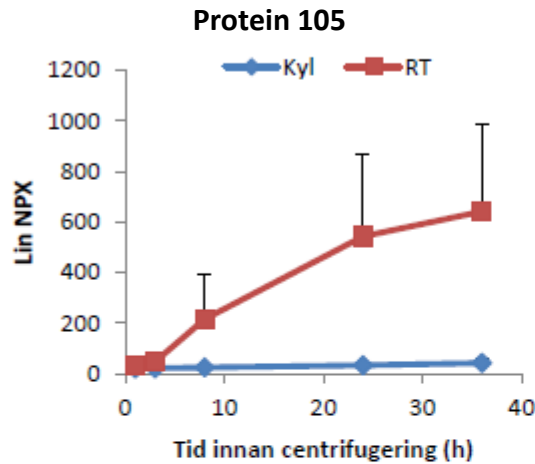
GDF15 (pM)

IL-6 (pM)

IL-8 (pM)



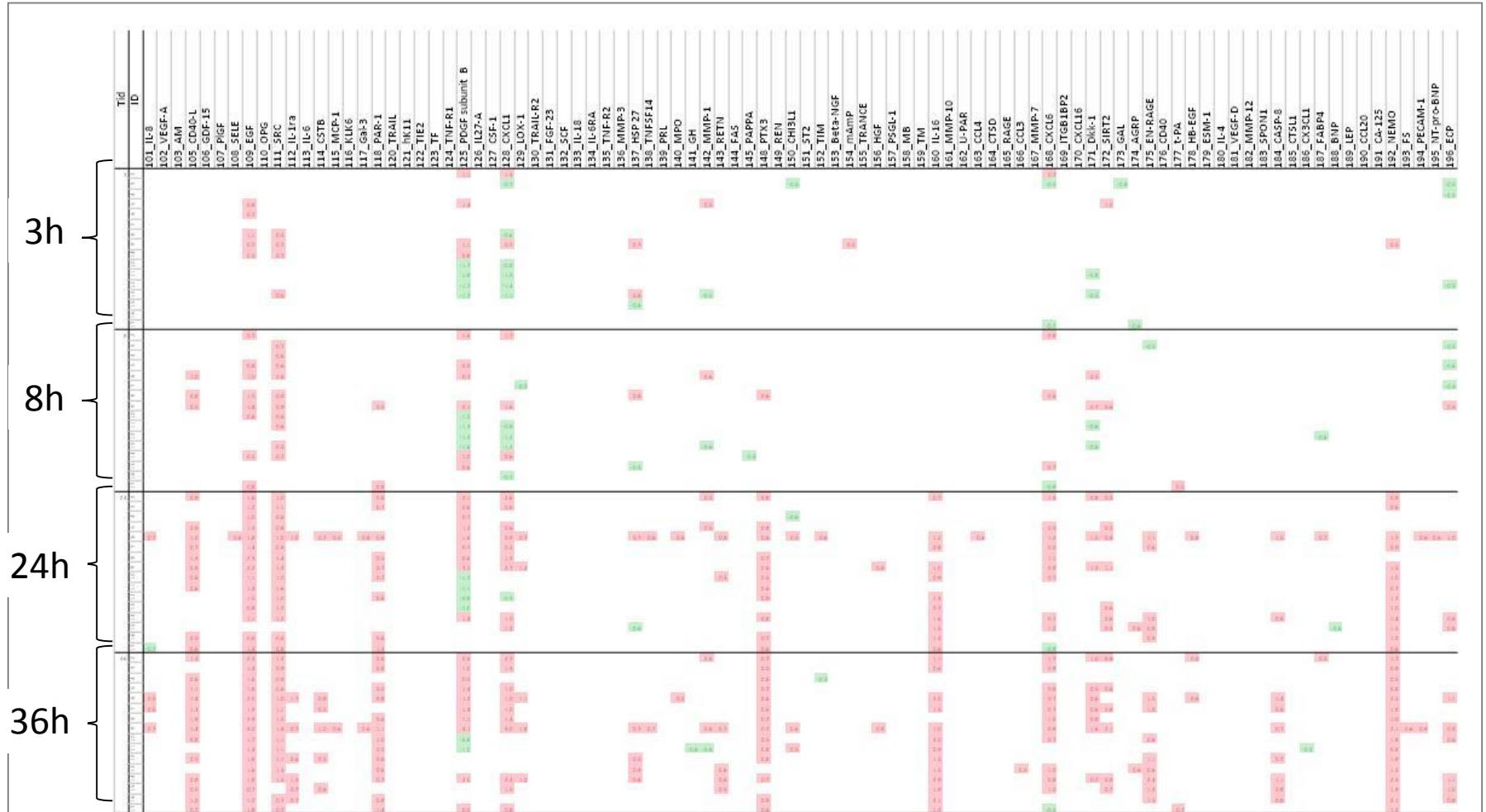
Examples of proteins affected by pre-centrifugation delay



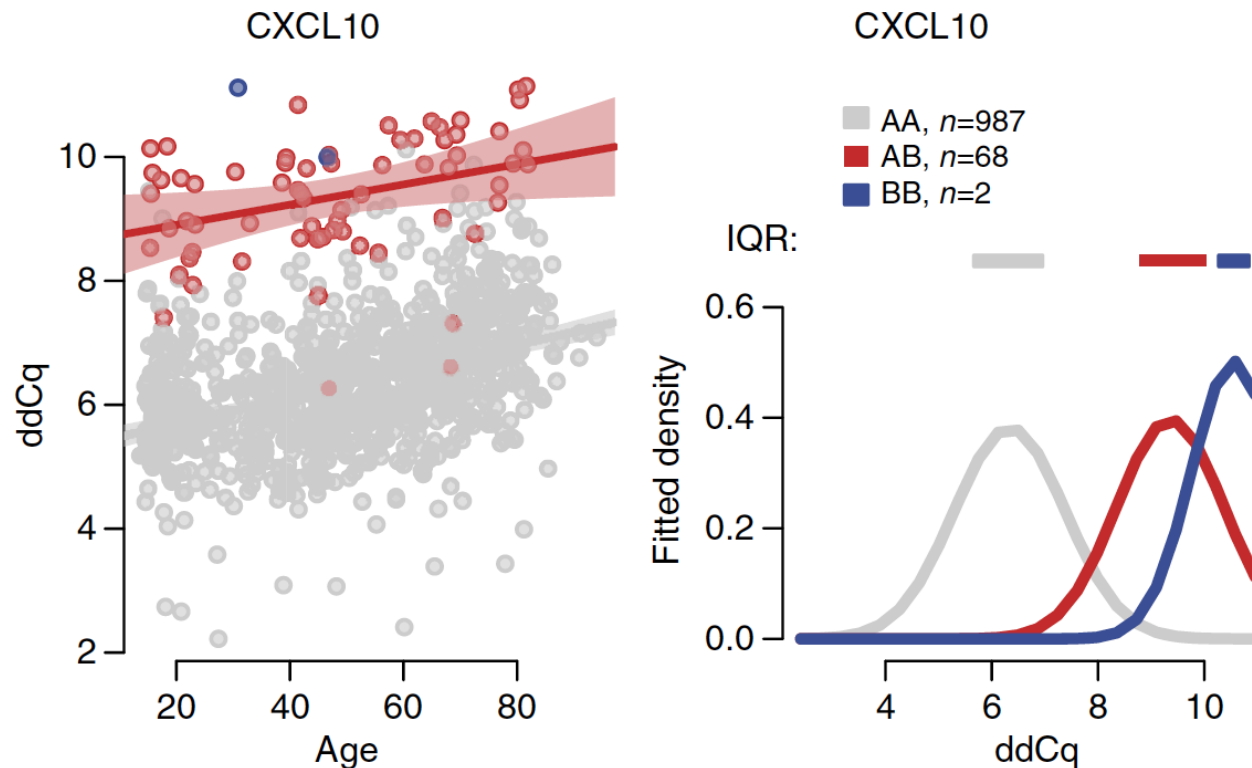
Heatmap for samples stored at RT

Protein levels in EDTA plasma for 16 individuals; time range 1-36 hrs pre-centrifugation delay

Red indicate increased levels green indicated decreased levels



Age and genotype dependence



Received 12 Mar 2014 | Accepted 14 Jul 2014 | Published 22 Aug 2014

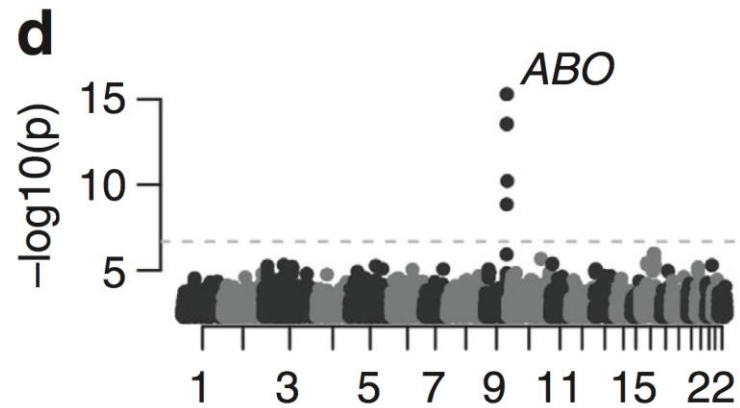
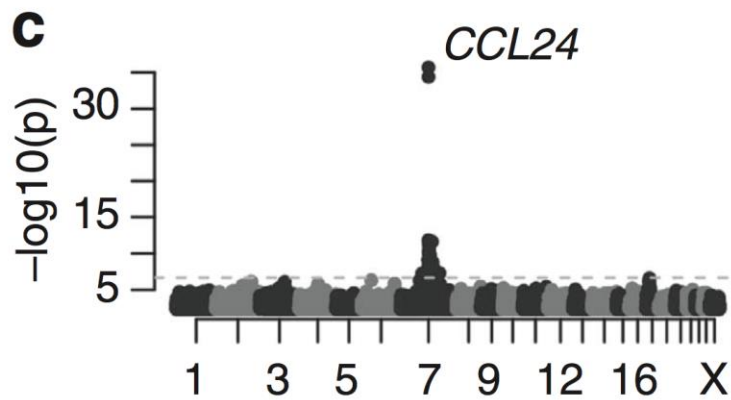
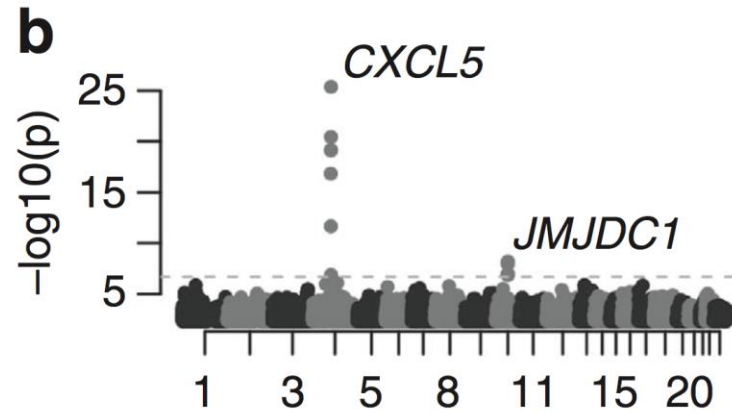
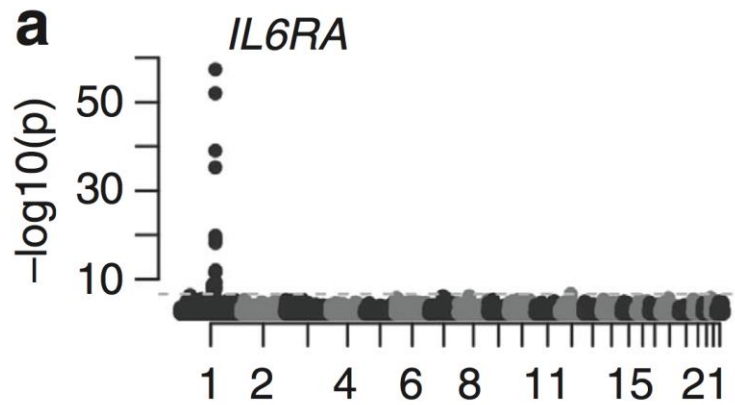
DOI: 10.1038/ncomms5684

OPEN

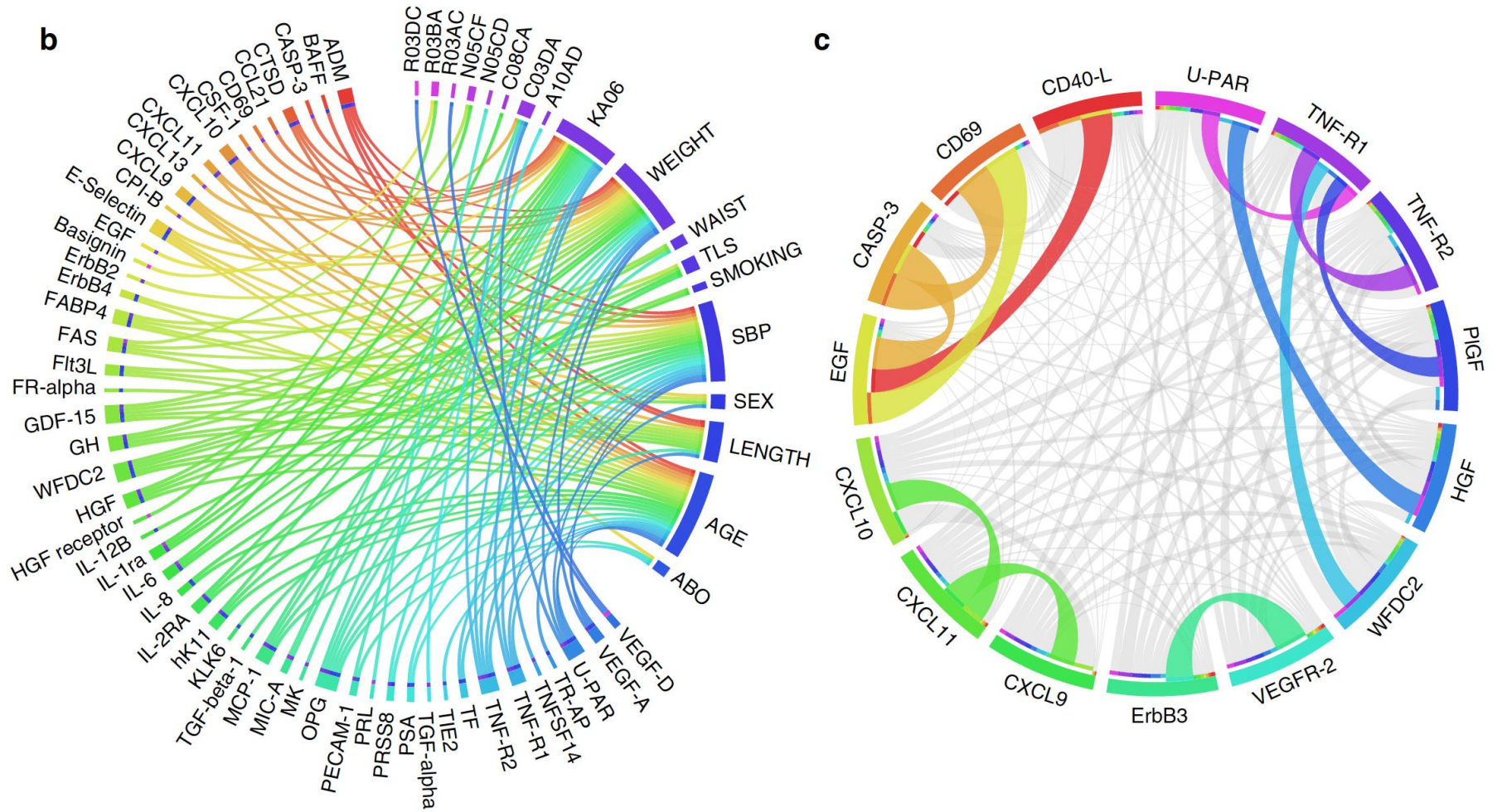
Strong effects of genetic and lifestyle factors on biomarker variation and use of personalized cutoffs

Stefan Enroth¹, Åsa Johansson^{1,2}, Sofia Bosdotter Enroth³ & Ulf Gyllenstein¹

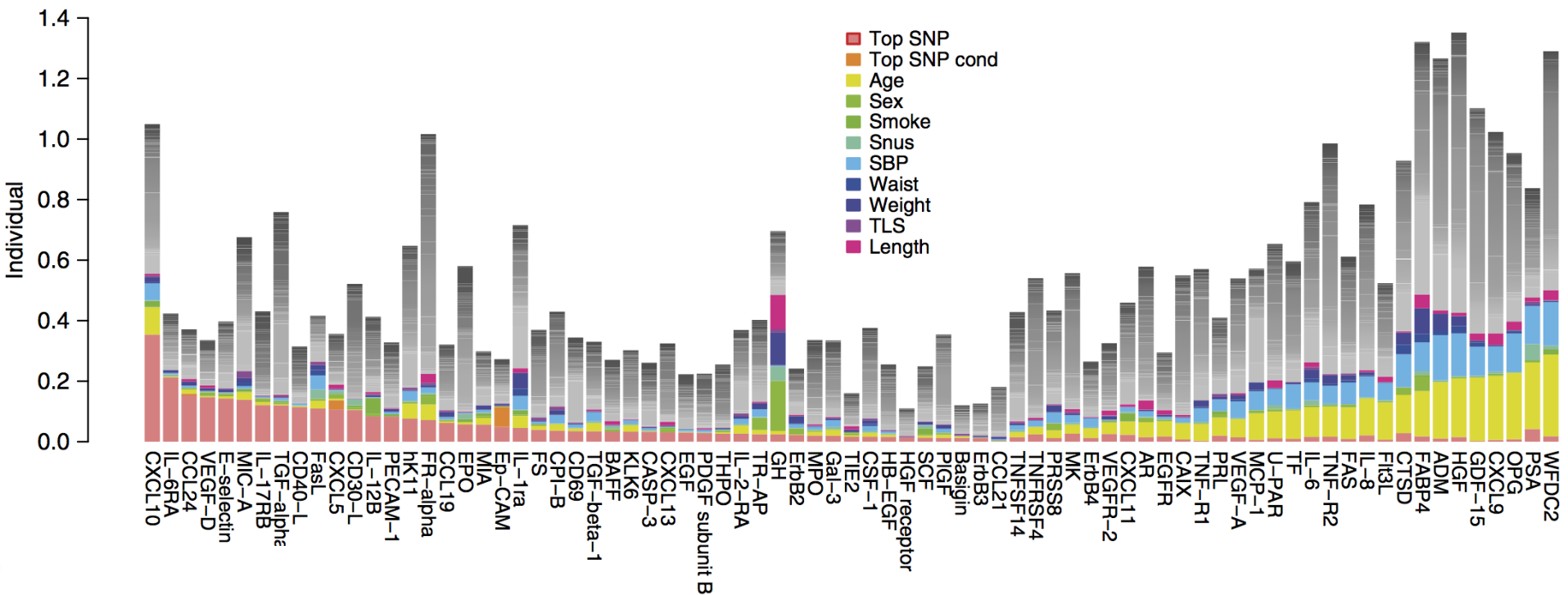
Protein markers linked to their loci



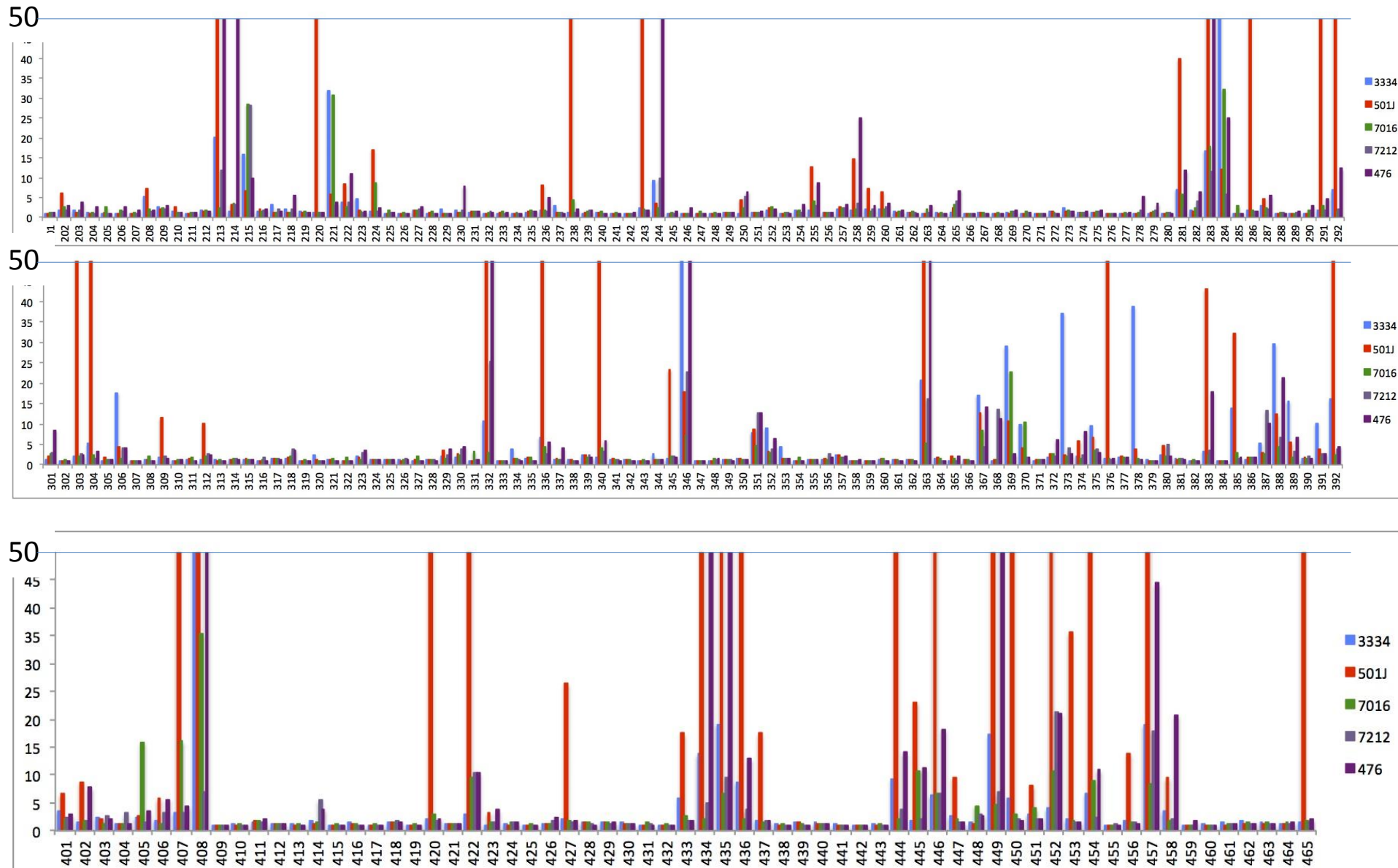
Relation to patient data and markers



Factors that influence protein levels

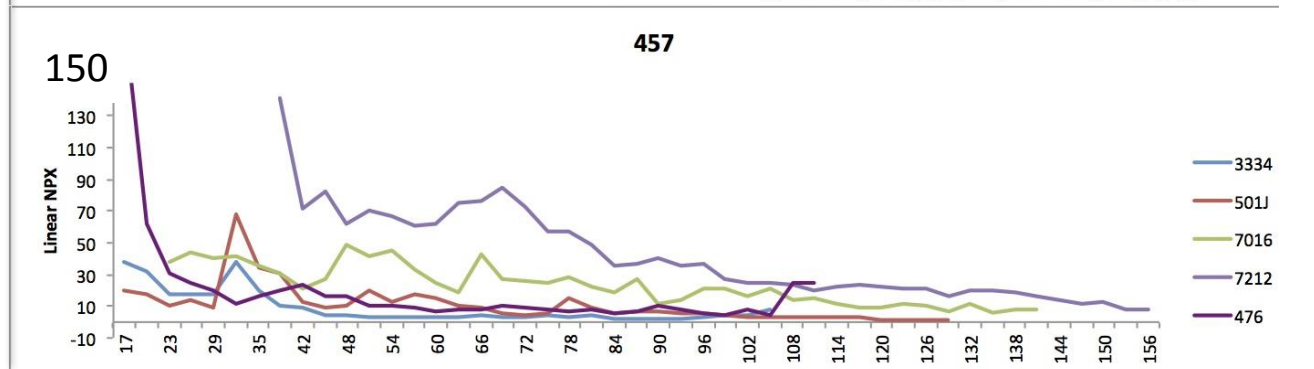
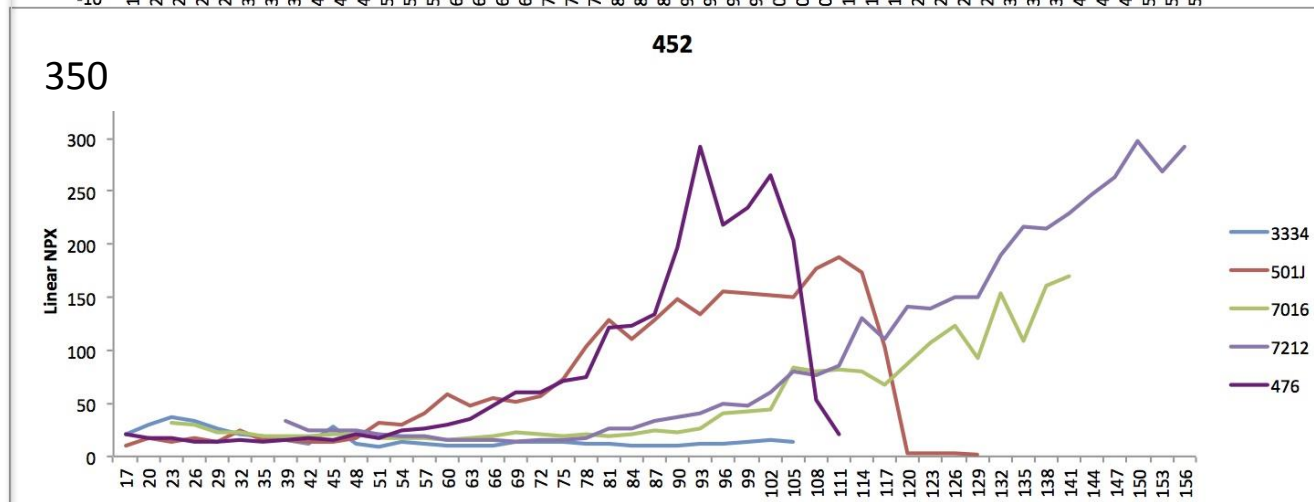
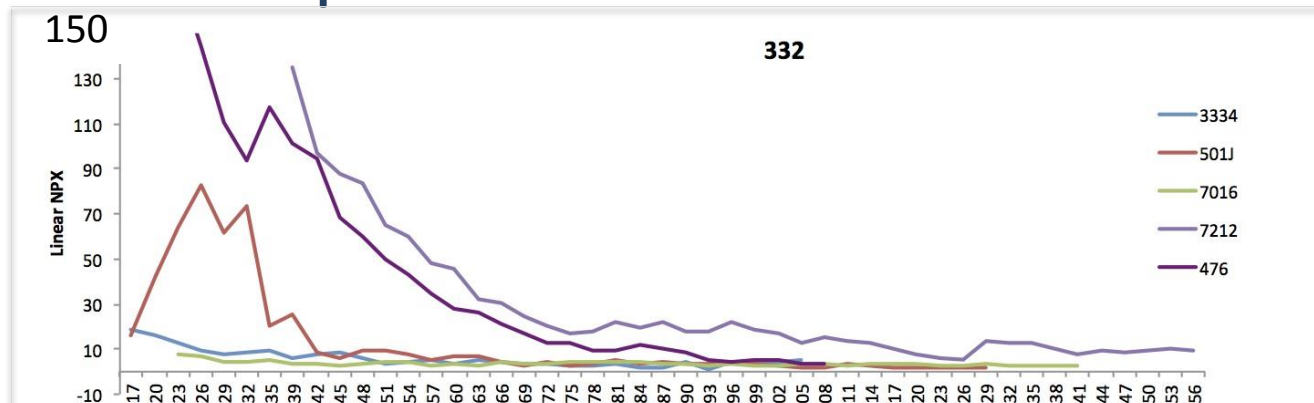


Protein screen in microdialysis samples from patients with traumatic brain injury



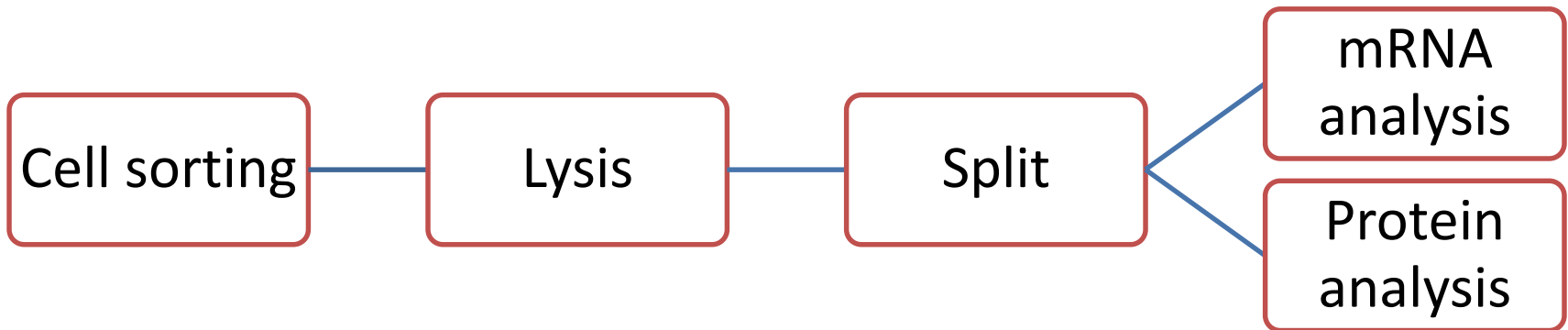
Lotta Wik, Lars Hillered, Masood Kamali Moghaddam, in progress

Kinetics of three proteins in samples from patients with brain trauma

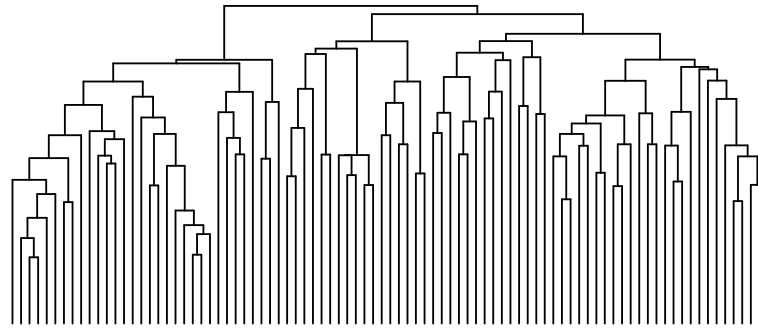
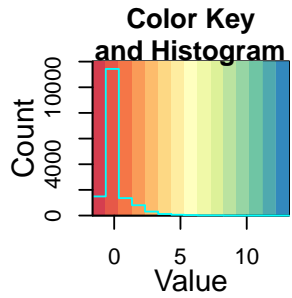


Single cell analyses, glioma cultures

- **RNA:** 94 TaqMan Gene Expression Assays
- **Protein:** 90 Proximity-Extension Assays
 - Assays designed to capture BMP4 pathways, differentiation, proliferation and viability
 - 24 targets with overlapping RNA-Protein assays



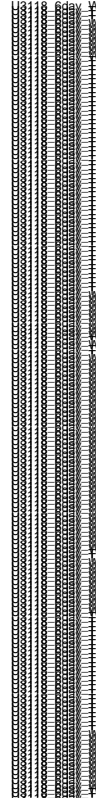
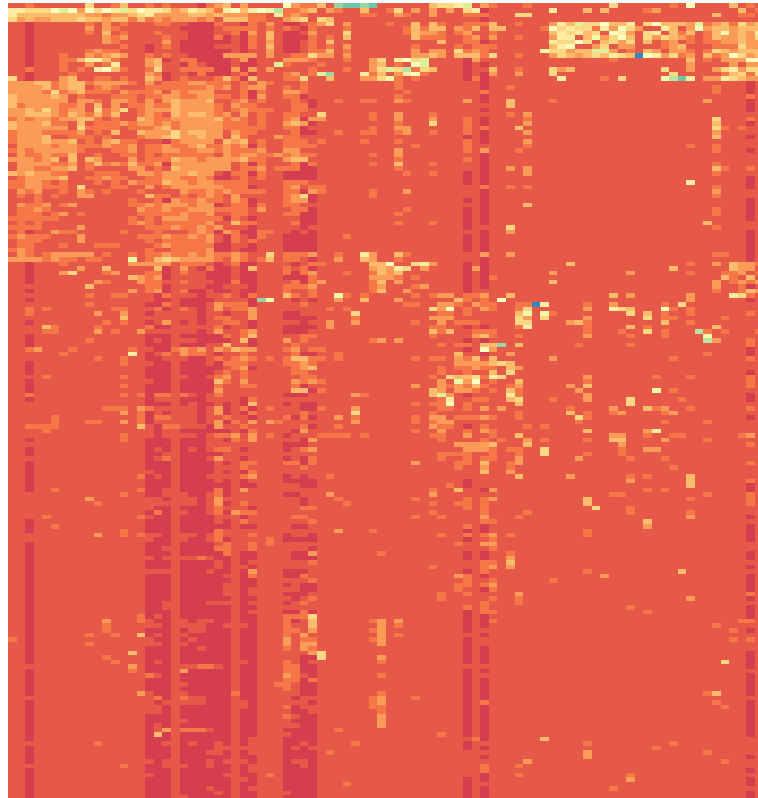
All proteins, day 6



Treated



Untreated



X176 SMAD3
X185 CD44
X186 CD44
X187 CD44
X188 CD44
X189 CD44
X190 CD44
X191 CD44
X192 CD44
X193 CD44
X194 CD44
X195 CD44
X196 CD44
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