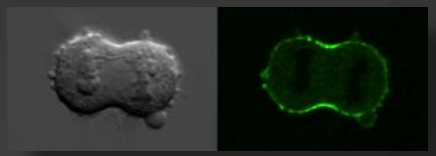
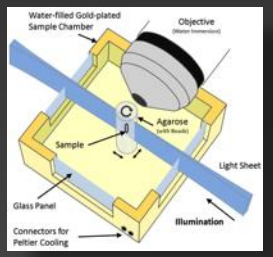
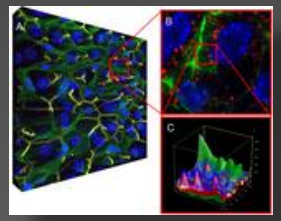
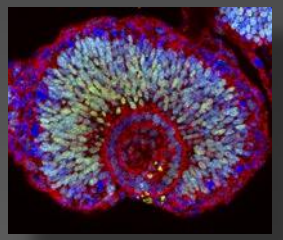
Technology Development Studio (TDS)
MPI-CBG, Dresden, Germany





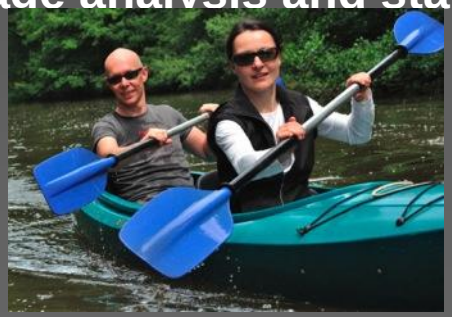




Marc Bickle
HT-TDS, MPI-CBG

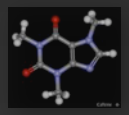
TDS: Core Screening Facility

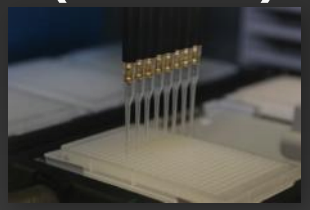
- Core Screening facility of the MPI-CBG specialized in high content imaging (es 2003)
- Recharge model, cost neutral (no budget allocated)
- Accept internal and external clients (academic and industrial)
- Currently 9 employees
- Develop custom cell based assays
- Chemical and RNAi screening
- Offer courses in HCS, image analysis and statistics



http://www.mpi-cbg.de/facilities/profiles/ht-tds.html

The High Throughput Technology Development Studio (HT-TDS)

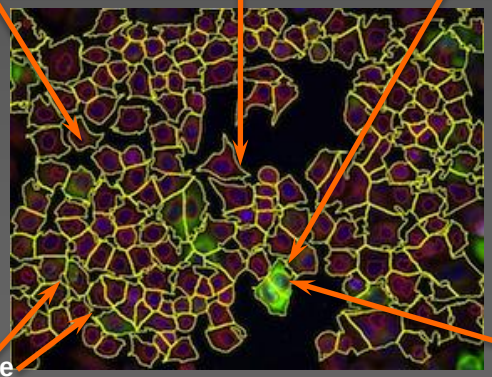




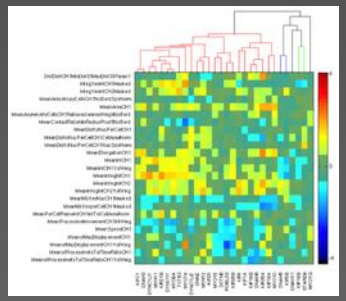
Mission: provide cell-based screening services

Automated microscopy and automated image analysis
- **High spatio-temporal resolution on a cell-by-cell basis (Often high magnification lenses)**
- **Quantitative measurement of many cellular parameters (intensity, sub cellular localization) allow finely resolved phenotypic classification**
- **System biology readouts of chemogenomic screens (genome-wide RNAi screens + chemical scr**
- **Clustering of RNAi and chemical phenotypes for mode-of-action identification (170.000 cpds, GW**

Automated Confocal Microscopy
- **high resolution**
- **high throughput**



Automated Image Analysis
- **multiple parameters**
- **high definition of phenotypes**



Profiling/clustering
- **advanced statistics**
- **identify target of compounds**

MAX-PLANCK-GESELLSCHAFT

CBG Max Planck Institute of Molecular Cell Biology and Genetics

Service Types

The TDS offers two types of services:

1. **DYO: we support users to use liquid handling platforms and automated microscopes -> recharge depreciation and support time only**

2. **Full service: users transfer their assay into the laboratory (headache), miniaturize the assay, develop a image analysis and statistic pipeline -> recharge depreciation, support/work time and consumables**

Problem: recharging only consumables amounts to subsidizing a service with state funds. This service is offered by companies and thus subsidizing facilities is illegal.

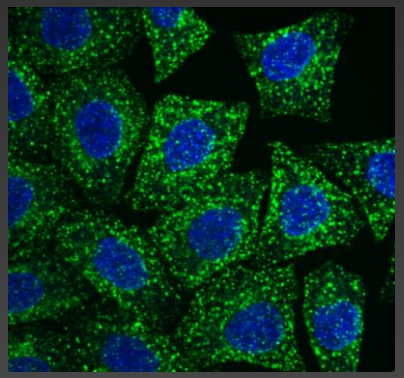
MAX-PLANCK-GESELLSCHAFT

TDS Technology Development Studio

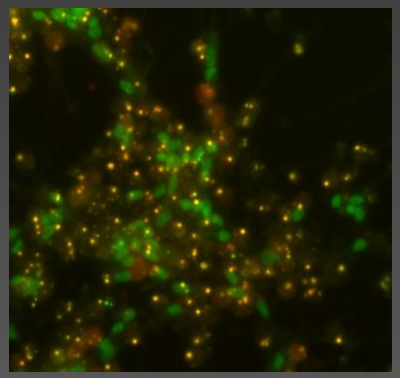
CBG Max Planck Institute of Molecular Cell Biology and Genetics

Mammalian Cell Assays

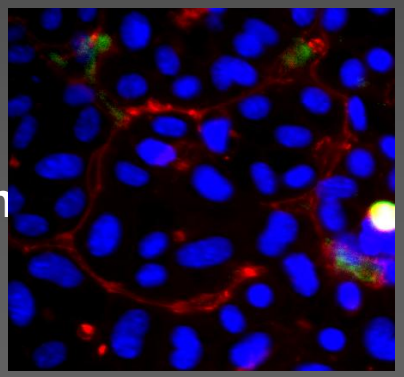
Simple systems
(HeLa, U2OS etc)



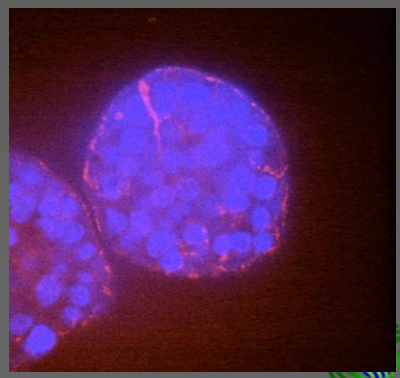
Complex systems
(Neurons, tube formation etc)



Primary cells
(macrophages, hepatocytes, neutroph



3D cell systems
(hepatocytes, beta islet cells etc)



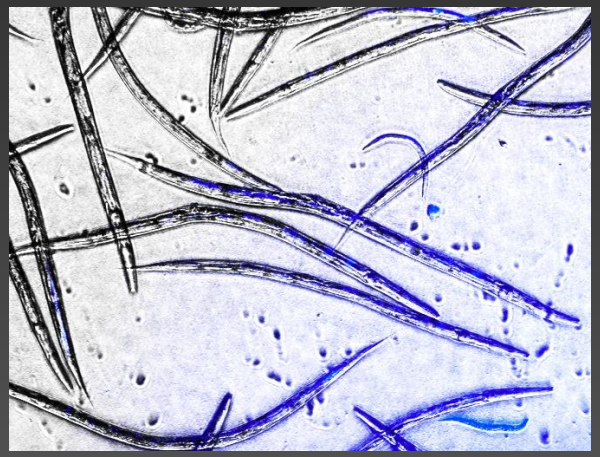
MAX-PLANCK-GESELLSCHAFT

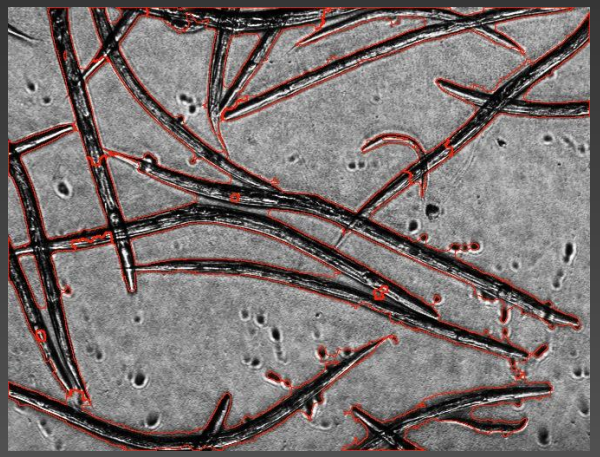
TDS Technology Development Studio

CBG Max Planck Institute of Molecular Cell Biology and Genetics

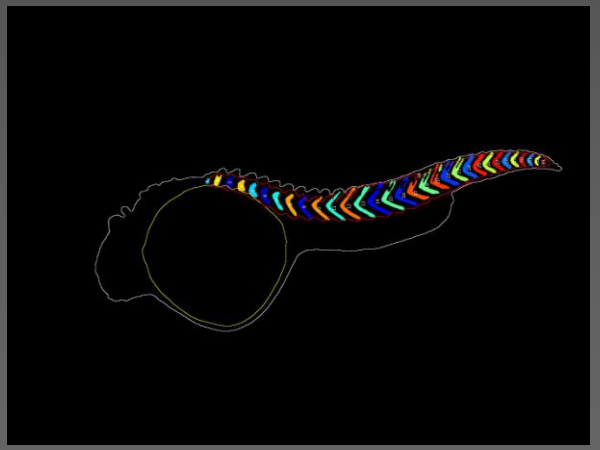
Model Organisms

C. elegans
Planarians



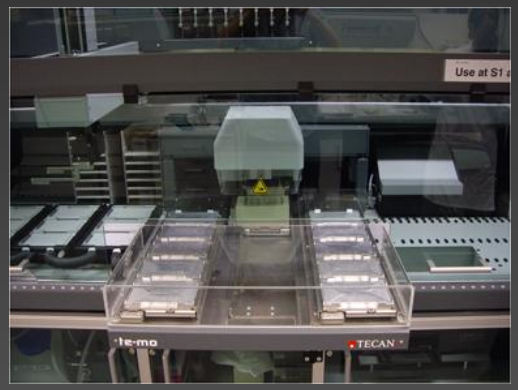


Zebra fish



Liquid handling

2 Freedom Evo 200



- Liquid handling station
- 96/384 DiTis/fixed needles
- 8 independent needles
- Connected incubators

Biotek 406 EL

- Plate washer/drop dispenser
- 96/384 well format

Biomek FX

- Liquid handling station
- 384/96 pipetting head DiTis
- 8 independent needles
- Connected incubator

Powerwasher 384

- Automated plate washer
- 96/384 well format

Dropdispensers

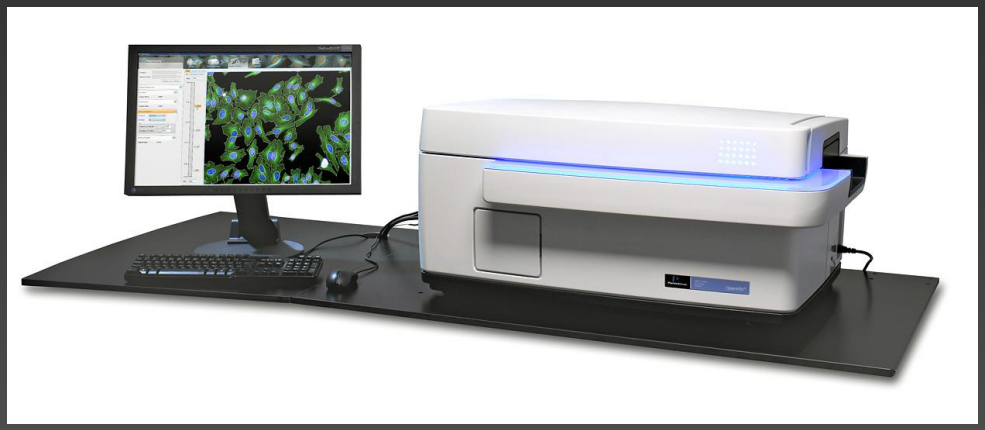
- Automated drop dispensing
- 96/384 well format

Echo

- 2.5nl drop dispenser
- 96/384/1536 well format

Imaging Equipment

Opera

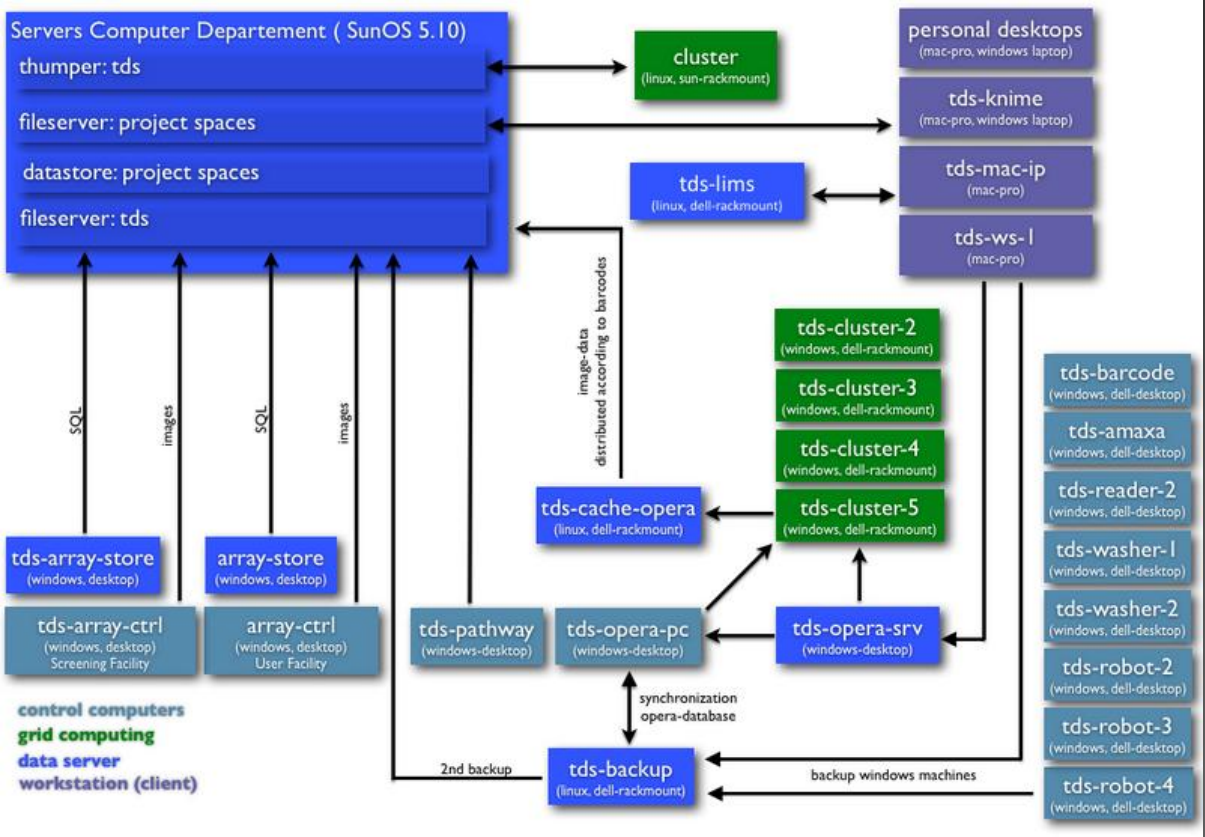


Operetta

BDPathway 855

Arrayscan

IT Infrastructure



- **In house cluster of 128 CPU and recently a 480 CPU/4028 GPU cluster**

MAX-PLANCK-GESELLSCHAFT

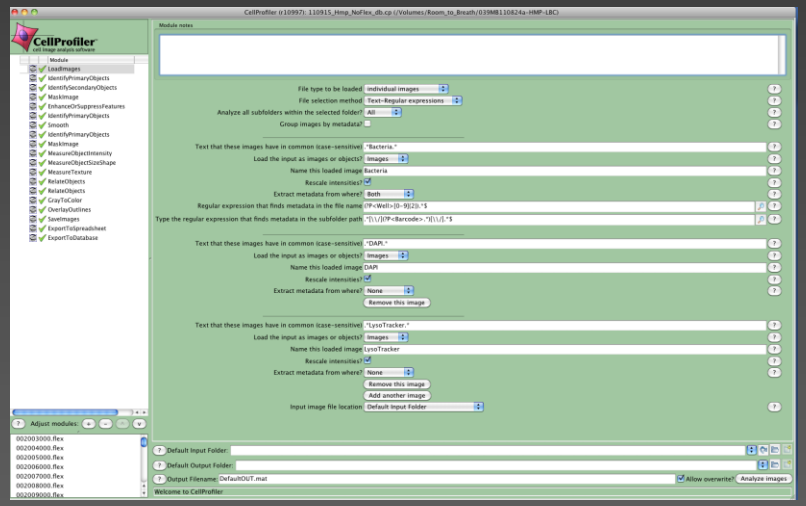
TDS Technology Development Studio

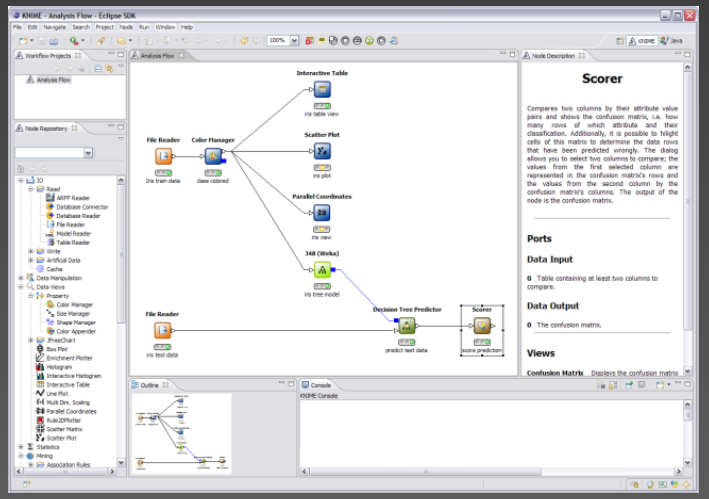
CBG Max Planck Institute of Molecular Cell Biology and Genetics

Software Solutions in the TDS

CellProfiler™
cell image analysis software

KNIME





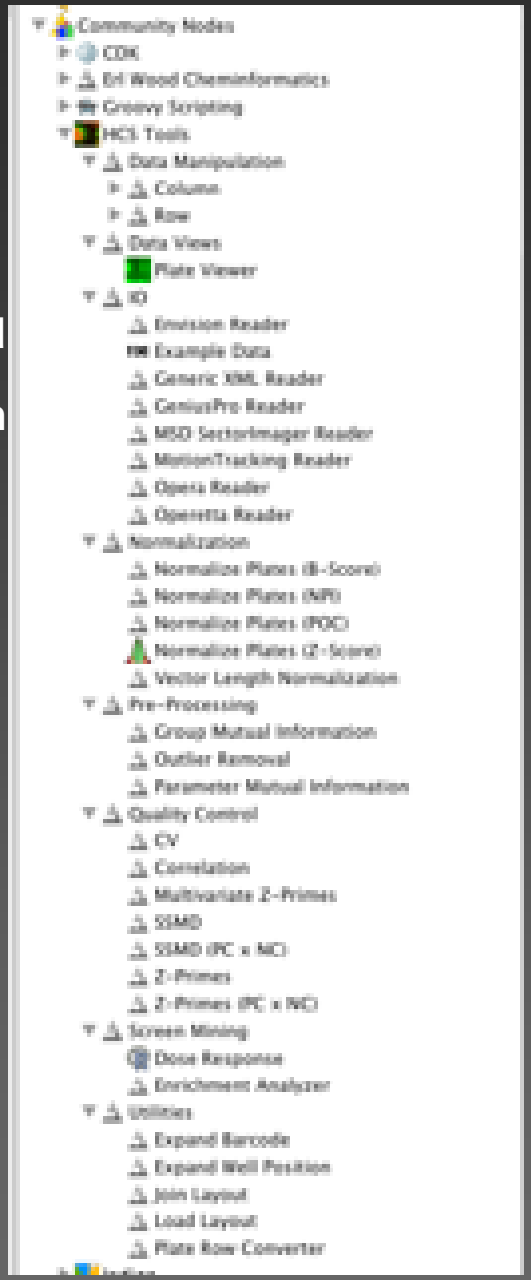
- Because of budget limitations, commercial software solutions cannot be acquired (Definiens, Matlab, Pipeline Pilot etc) ➔ use Open Source software
- Image processing software of the microscopes are not flexible and fast enough for large complicated datsets

MAX-PLANCK-GESELLSCHAFT

TDS
Technology Development Studio

CBG
Max Planck Institute of Molecular Cell Biology and Genetics

HCS Tools



- KNIME did not have any screening-specific tools implemented

  ➜ We created a set of KNIME nodes for analyzing screenin data

  1. Instrument output readers
  2. Well annotation tools, barcode tools
  3. Typical QC tools: Z' factor, SSMD, CV
  4. Typical normalization tools: Z score, Percent of Control, Normalized Percent Inhibition, B score
  5. Typical visualization tools: heatmap

MAX-PLANCK-GESELLSCHAFT

TDS Technology Development Studio

CBG Max Planck Institute of Molecular Cell Biology and Genetics

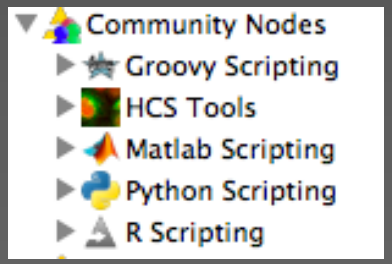
Scripting Integration

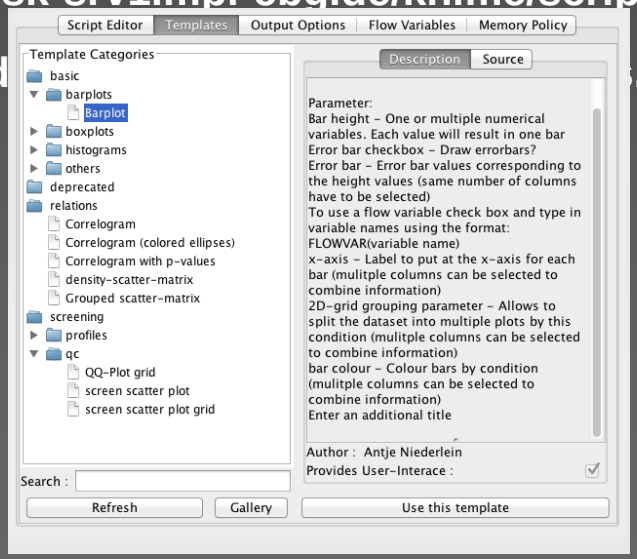
- Some methods were not implemented in KNIME nodes

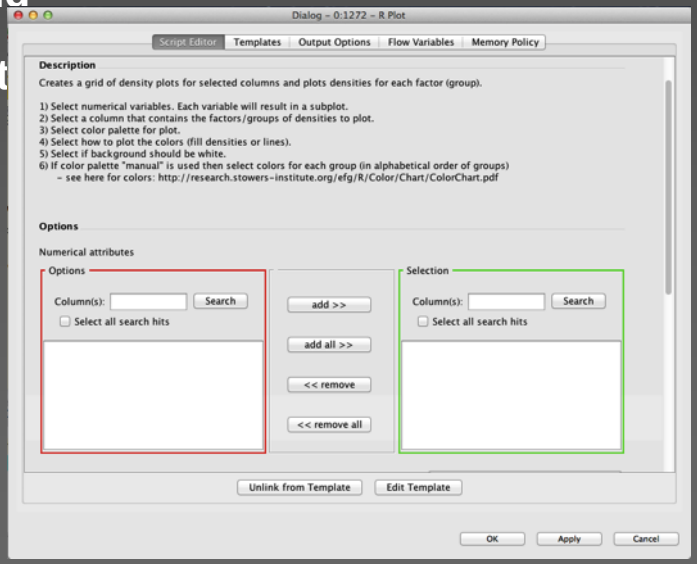
  ➜ We integrated R, Python, Groovy, Matlab (requires licensed server) scripting languages with RGG:

  - Hides script behind a GUI
  - Choose from a set of templates for methods or plots
  - Parametrization with buttons or drop boxes

  (http ://idisk-srv1.mpi-cbg.de/knime/scripting-templates_td .txt







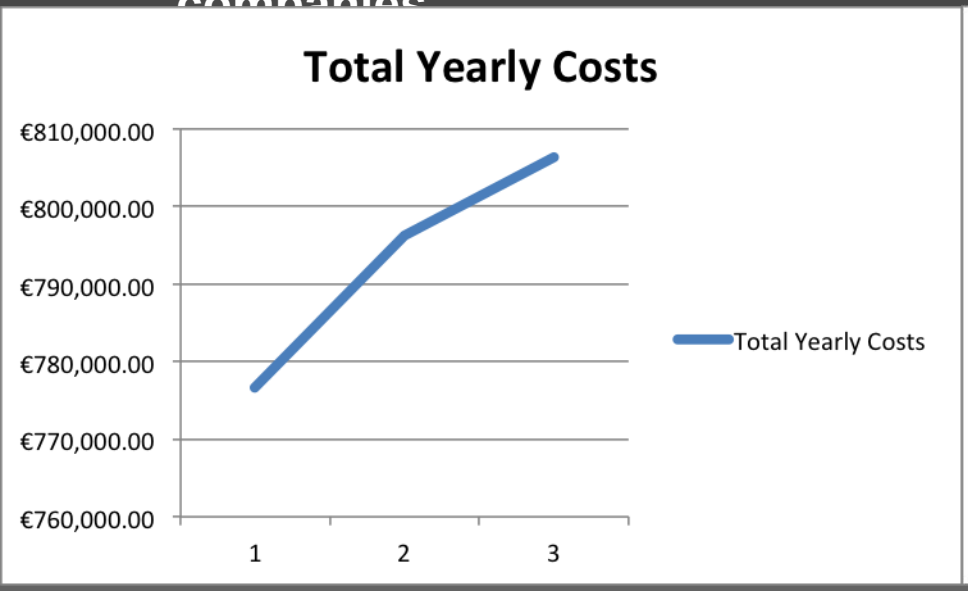
MAX-PLANCK-GESELLSCHAFT

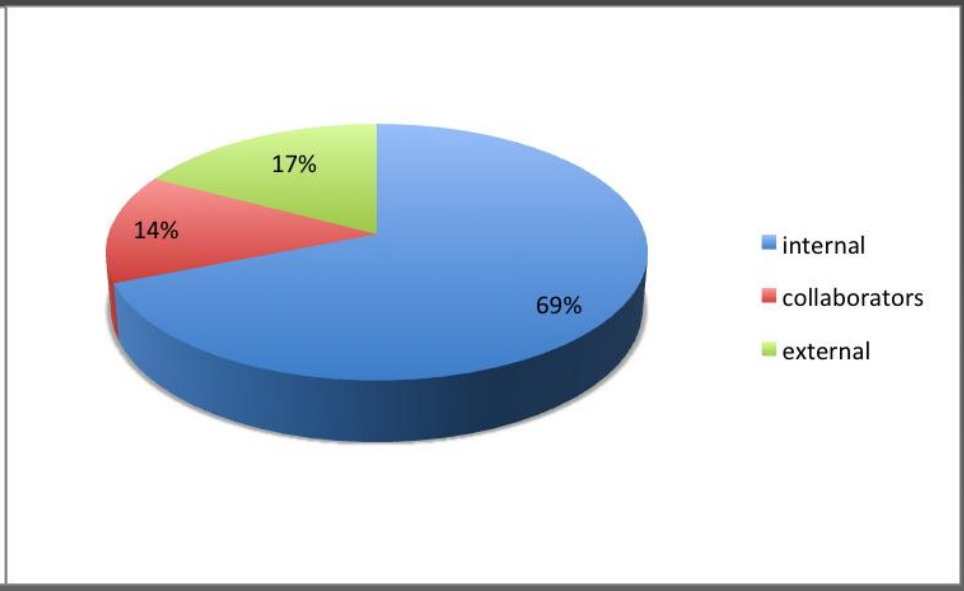
TDS Technology Development Studio

CBG Max Planck Institute of Molecular Cell Biology and Genetics

Budget

- The yearly running costs of the TDS are in the order of 800.000 EUR with an upward trend
- 70% of projects are internal, 30% are external (but can vary to 50/50)
- Sources of funding: grants, service for fee, contracts with companies





Liver slice