

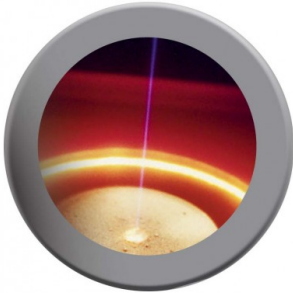
A talk about nothing

Sébastien Bourdauducq, Stewart Mackenzie

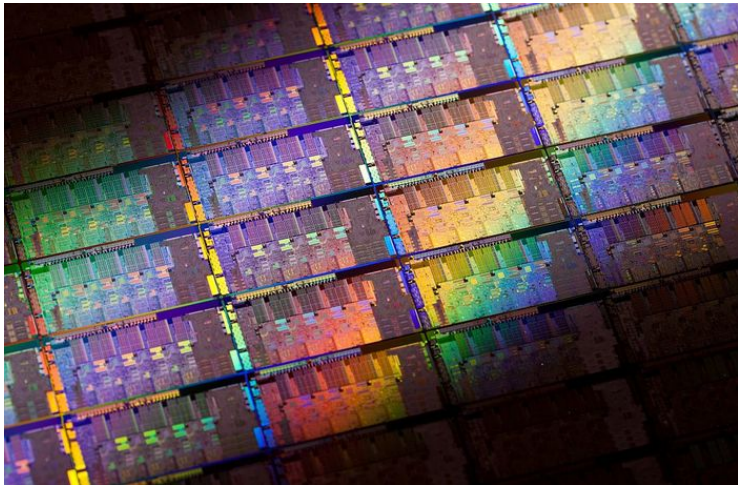
Institute of Experimental Physics for Morons, Hong Kong



Why create a vacuum?



Why create a vacuum?



Why create a vacuum?



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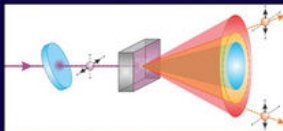


Why create a vacuum?



Why create a vacuum?

Exploring Quantum Physics through Hands-on Projects



DAVID PRUTCHI • SHANNI R. PRUTCHI

 WILEY

Why create a vacuum?

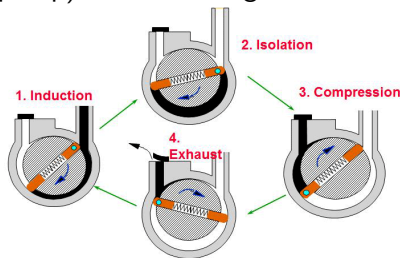
approximately 20% of the global economy is related in some way or another to chemical catalysis: that is, to the initially purely academic question of how bonds in molecules are made and broken. Also, does Schrödinger's famous equation from 1926 (equation 1), which was formulated to describe the wave nature of electrons and represents basic theoretical physics research in its purest form, serve any use? According to estimates that about 20% of gross domestic product is based on applications of quantum mechanics, the answer would be a resounding 'yes' (Ref. 5). Indeed, the list is endless. So let us be in no doubt: basic research that, sooner or later, enables further discoveries or inventions and spawns applications that benefit society is a public good. As far as funding is concerned, it must remain an essentially public matter; it must not be subjected to economic rules of quick profit maximization or politically opportunistic considerations.

$$i\hbar \frac{\partial}{\partial t} \psi(\mathbf{r}, t) = \hat{H} \psi(\mathbf{r}, t) \quad (1)$$

"On the usefulness of useless knowledge" – Helmut Schwarz

Let's get started

The first step: oil-sealed rotary vane pump, the most common and cheapest type of pump. Creates a vacuum around 10^{-2} to 10^{-3} mbar from atmosphere. This vacuum can be used to start other pumps (e.g. turbomolecular pump, diffusion pump, ion pump) that reach higher vacuums, if needed.



Sounds simple enough?

Let's get started

Kurt J. Lesker
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Leybold-D8B-220 Volt Only

Description



Remanufactured Leybold D8B, Standard series rotary vane TRIVAC B-series vacuum pump, 6.9 CFM pumping speed, rated for 220 volt ONLY, 50/60Hz, 1-phase operation, prepared for hydrocarbon oil. 12 Month Warranty. CE marked.

Part Number: **LH-898905-R**

Pump Model: **LH-91255-2**

Price New: **\$3,250.00**

Reman Price: **\$1,950.00**

40% Savings

+ Add to Cart

Edwards-E2M1.5

Description



Remanufactured Edwards E2M1.5, Standard series rotary vane vacuum pump, 1.2 CFM pumping speed, 220 volt, 50/60 Hz, 1-phase operation, prepared for hydrocarbon oil. 12 Month Warranty. CE and CSA marked

Part Number: **ED-A37122919-RP**

Pump Model: **ED-A37122919**

Price New: **\$2,265.00**

Reman Price: **\$1,350.00**

40% Savings

+ Add to Cart

Alcatel -2033C2

Description



Remanufactured Alcatel/Adixen 2033C2 Chemical Series rotary vane vacuum pump, 27 CFM pumping speed, wired for 230/460-220/380V, 50/60Hz, 3-phase operation, prepared for PFPE(Fomblin) fluid. 12 Month Warranty. CSA and CE marked.

Part Number: **233C2T2LWNNX-R**

Pump Model: **233C2T2LWNNX**

Price New: **\$11,137.00**

Reman Price: **\$5,750.00**

48% Savings

+ Add to Cart

Welch -SW1376

Description



Remanufactured Welch 1376, Standard series belt drive vacuum pump, 10.6 CFM pumping speed, wired for 115/230V, 50/60Hz, 1-phase operation, prepared for hydrocarbon oil. 12 Month Warranty.

Part Number: **SW1376B-01-R**

Pump Model: **SW1376B-01**

Price New: **\$4,110.00**

Reman Price: **\$2,950.00**

28% Savings

+ Add to Cart

Let's get started

Wait

Let's get started

Vacuum companies are bullshitting you.

Vacuum company bullshit

4UHV Power Cable,3M,220VAC

V9699957

\$44.00



Vacuum company bullshit



Vacuum company bullshit



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鑫飛源數碼專營店

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長度

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98.5% markup! Now that's good business!

Vacuum company bullshit



PTFE同轴射频线 SFF-50-1.5-2/50欧姆同轴

成交记录 0 | 累计评价 0

价格 **¥ 6.80** (约AUD 1.33 ?)

运至 上海 至 香港香港岛中西区 ▼

卖家直送 ▼ 中国大陆境内包邮 (3) 联

颜色分类

桔色

透明

数量

—

1

+

件

(库存 446658 件)

\$791.00



立即购买

Solutions?

- Be skeptical of vacuum businesses
- Do not use overly fancy items ("good enough")
- When you do need fancy, shop around
 - MDC Vacuum, Highlight Tech Corp, Fil-Tech, Duniway Stockroom, ...
- Look for mass markets
- Build your own
- Taobao
- Dumpster diving
- eBay

Rotary vane pump

- Do not use overly fancy items
- Look for mass markets: those pumps are also used for servicing AC
- Taobao



飞越1升2/4L真空泵 空调维修安装 实验抽滤真空泵 R410真空包装泵

成交记录 200 | 累计评价 65 | 近3个月卖过澳大利亚

促销

¥265.00 (约AUD 51.87)

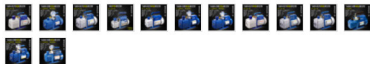
¥-270.00- 品牌钜惠

运至

上海 至 香港香港岛中西区

卖家直送 中国大陆境内包邮 (联系卖家, 确认卖家直寄境外运费)

颜色分类



数量

1 件 (库存 10087 件)

立即购买

加入购物车

Vacuum hardware

- Look for mass markets: used in semiconductor processes, making bags of potato chips, ...
- Taobao

KF真空三通

精准尺寸



固德管阀
SUDEGUANFA

变径三通

镜面抛光 快速发货

304不锈钢KF真空变径三通异径法兰

成交记录 97 | 累计评价 3 | 近3个月

价格 **¥ 42.00 - 88.00** (含运费)

运至 广东广州 至 香港香港岛中西区 ▼

卖家直送 ▼ 中国大陆境内包邮 (含运费)

颜色分类 非标订做 KF50*KF40变径三通

KF50*KF16变径三通

KF40*KF

KF25*KF16变径三通

数量 件 (库存 549)

立即购买

Vacuum gauge

- Look for mass markets
- Taobao
- Build your own (electronics)



正品包邮假一赔十成都睿宝真空规管ZJ-27/ZJ-52T

成交记录 18 | 累计评价 0

价格 **¥ 70.00 - 75.00** (约AUD 13.70 - 14.68)

运至 河北邢台 至 香港香港岛中西区 ▼

卖家直送 ▼ 中国大陆境内包邮 (联系卖家, 确认)

颜色分类



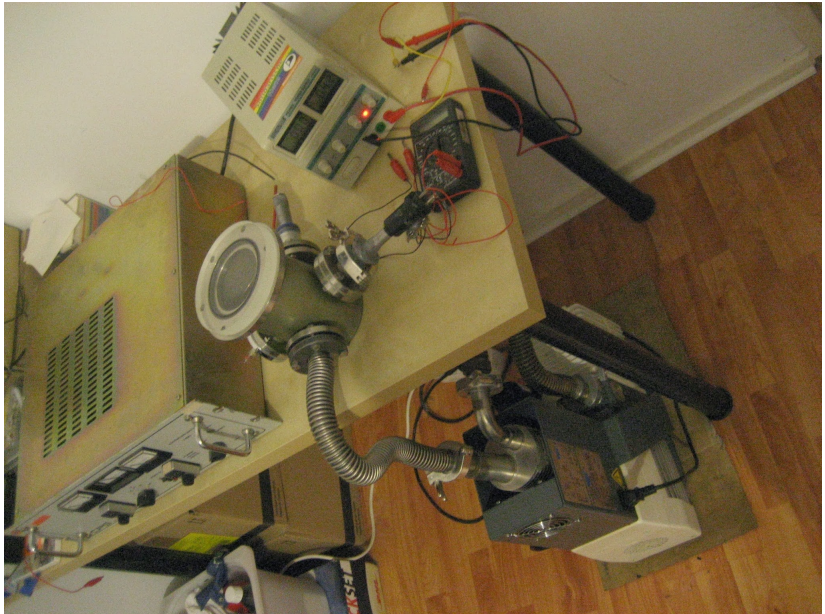
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My first vacuum system (Berlin 2013)

Dumpster diving + Build your own



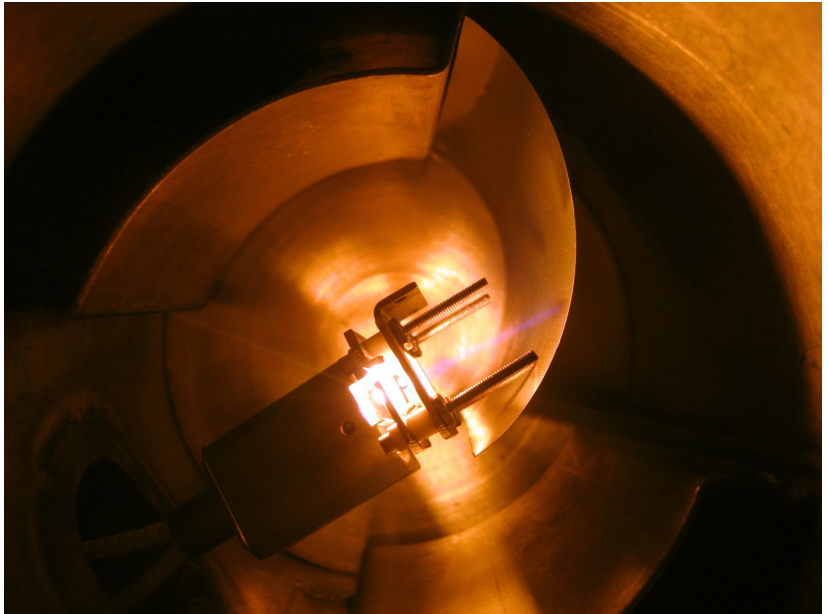
My first vacuum system (Berlin 2013)



First plasma



Electron beam



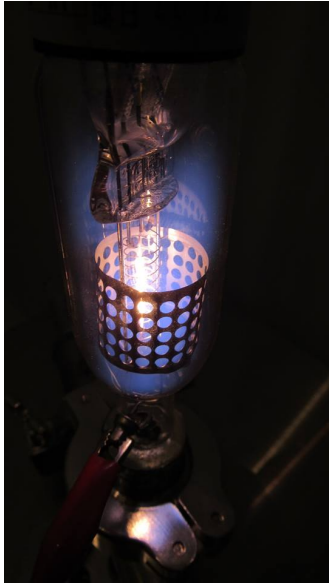
Evaporator (Hong Kong 2015)



Evaporator (Hong Kong 2015)



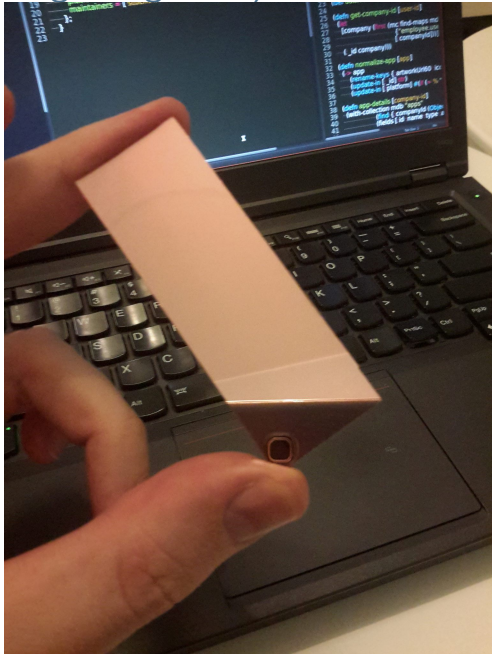
Evaporator (Hong Kong 2015)



Evaporator (Hong Kong 2015)

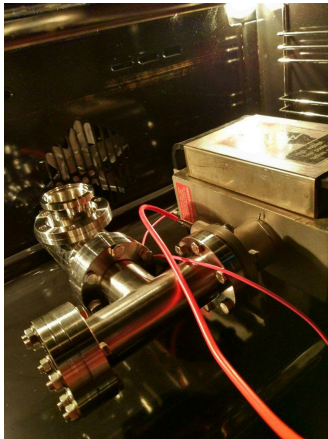


Evaporator (Hong Kong 2015)



Ultra-high vacuum system (Hong Kong 2015–)

- Very challenging
- Three types of pumps (scroll, turbomolecular, ion)
- Needs bake-out and very clean parts
- Maybe one day do single-atom (ion trap) experiments



Ultra-high vacuum system (Hong Kong 2015–)



Ultra-high vacuum system (Hong Kong 2015–)



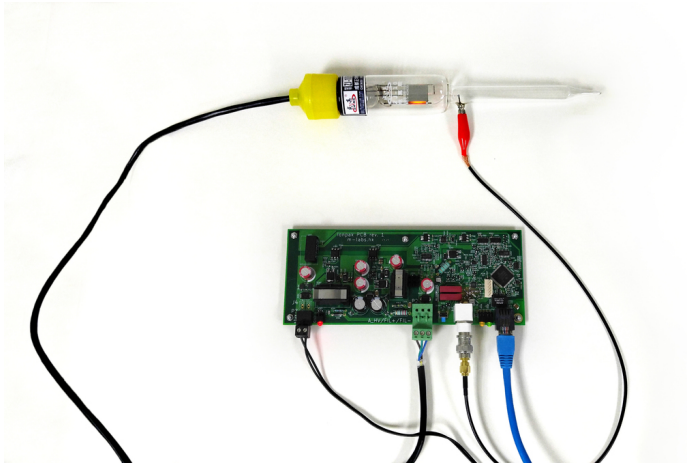
Creating UHV: Ion pump power supply

- Do not use overly fancy items
- Build your own
- Taobao

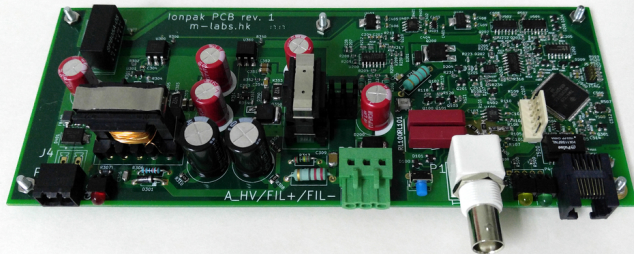


Measuring UHV: Ionpak

- Build your own
- OSHW - github.com/m-labs/ionpak



Measuring UHV: Ionpak



The next step: Spectropak

- Controller for quadrupole mass spectrometers
- Also OSHW
- Quite complex – high frequency, high voltage, high dynamic
- Very useful for UHV diagnostics and troubleshooting

Thank you and happy hacking!

Made:

technology on affluent leisure time

The Most
Useless
Machine!
page 94 »



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