



# From Physics to Building a Cloud Data Warehouse

Fabian Springer  
8-2-2019



→ Why Study Physics!

→ Searching for Jobs

→ Business Intelligence

→ Big Data

→ Data Science

→ Data Warehousing

→ Physics in my life



→ Why Study Physics!

→ Searching for Jobs

→ Business Intelligence

→ Big Data

→ Data Science

→ Data Warehousing

→ Physics in my life

# Why studying Physics?

Challenging

Interesting

The urge to know how things work and how we can make predictions

Mathematics

The image is a dense collage of physics equations and diagrams. It includes:

- Equations:**
  - $F = \frac{q_1 q_2}{4\pi\epsilon_0 r^2}$
  - $\Phi = \int B \cos \alpha ds$
  - $f = \frac{v_m}{\lambda}$
  - $\lambda = R z^2 \left( \frac{1}{m^2} - \frac{1}{n^2} \right)$
  - $h = 6,63 \cdot 10^{-34} \text{ Дж} \cdot \text{с}$
  - $E = mc^2$
  - $E_n = \frac{h^2}{8mL^2} n^2$
  - $\lambda = \frac{h}{p}$
  - $\lambda = \frac{h}{m v}$
  - $\lambda = \frac{h}{m_0 v} \sqrt{1 - \frac{v^2}{c^2}}$
  - $E = h\nu = h \frac{c}{\lambda}$
  - $E_{cl} = \Delta mc^2$
  - $\lambda = \frac{h}{p}$
  - $\lambda_K = \frac{hc}{A}$
  - $\sigma = en(u_n + u_p)$
  - $\beta_1 = \frac{3}{2} \cdot \hbar \omega (n=1)$
  - $R_x = \frac{3\hbar}{8} \frac{r}{ne}$
  - $\Delta = m\lambda_0, m = 0, 1, 2, \dots$
  - $\Delta = S_2 - S_1, v = \cos 2\theta$
  - $\langle v \rangle = \frac{\Delta S}{\Delta t}$
  - $A = f \cdot \lambda \cdot e^{-\beta t}$
  - $A = p(V_2 - V_1) A = \frac{p \cdot \pi r^2 \Delta r}{\lambda}$
  - $Q = \Delta U + A$
  - $c = \frac{\Delta l}{\Delta t}$
  - $C = c \cdot \mu$
  - $S_2 - S_1 = \int \frac{dQ}{T}$
  - $\Delta N = N \frac{4}{\sqrt{\pi}} e^{-u^2} \Delta u$
  - $\Delta m = Z m_p + N m_n - m$
  - $\langle z \rangle = \sqrt{2\pi} d^2 n \langle v \rangle$
  - $n = \frac{N}{q_0}$
  - $f(v) = 4\pi \left[ \frac{2\pi k T}{m_0} \right]^{3/2} v^2 e^{-\frac{mv^2}{2kT}}$
  - $\Delta u = \frac{\Delta v}{\sqrt{v_0}}$
  - $\Delta u = \frac{\Delta v}{v_0}$
  - $F_{sp} = N \hbar$
  - $W = mgh$
  - $\frac{1}{\rho L T}$
  - $\frac{1}{\rho D T}$
- Diagrams:**
  - A sine wave with a dashed vertical line.
  - A Bohr-style atomic model with a central nucleus and three elliptical electron orbits.
  - A Bohr-style atomic model with a central nucleus and two concentric circular electron orbits.
  - A diagram of a curved surface with a grid of lines, possibly representing a lens or a wavefront.
  - A diagram of a curved surface with a grid of lines, possibly representing a lens or a wavefront.
  - A diagram of a curved surface with a grid of lines, possibly representing a lens or a wavefront.

# Why studying Physics?

Challenging

Interesting

The urge to know how things work and how we can make predictions

Mathematics

I'LL BE HONEST: WE PHYSICISTS TALK A BIG GAME ABOUT THE THEORY OF EVERYTHING, BUT THE TRUTH IS, WE DON'T REALLY UNDERSTAND WHY ICE SKATES WORK, HOW SAND FLOWS, OR WHERE THE STATIC CHARGE COMES FROM WHEN YOU RUB YOUR HAIR WITH A BALLOON.

The blackboard contains the following elements:

- Text:** A speech bubble from a stick figure stating: "I'LL BE HONEST: WE PHYSICISTS TALK A BIG GAME ABOUT THE THEORY OF EVERYTHING, BUT THE TRUTH IS, WE DON'T REALLY UNDERSTAND WHY ICE SKATES WORK, HOW SAND FLOWS, OR WHERE THE STATIC CHARGE COMES FROM WHEN YOU RUB YOUR HAIR WITH A BALLOON."
- Cartoon:** Three stick figures are shown. The first figure on the left is speaking.
- Equations and Formulas:**
  - $R = \frac{1}{\Delta \lambda} = mN$ ,  $I = \frac{U}{R}$ ,  $\langle D \rangle = \frac{p_2 - p_1}{\lambda_1 - \lambda_2}$ ,  $\vec{a} = \vec{a}_n + \vec{a}_t$ ,  $\langle v \rangle = \frac{\Delta S}{\Delta t}$ ,  $\Delta S = S_2 - S_1$ ,  $v = \cos 16^\circ$ ,  $A = A_0 e^{-\beta t}$ ,  $A = p(V_2 - V_1)$ ,  $A = \frac{1}{2} \rho v A v^2$ ,  $Q = \Delta U + A$ ,  $c = \frac{\Delta \Phi}{\Delta t}$ ,  $C = c \cdot \mu$ ,  $S_2 - S_1 = \int \frac{dQ}{T}$ ,  $h = 6,63 \cdot 10^{-34} \text{ Дж} \cdot \text{с}$ ,  $\lambda = h \frac{A(t)}{A(t+\tau)}$ ,  $v_k = \frac{A}{h}$ ,  $\sin \frac{\pi \bar{h} x}{\lambda}$ ,  $\omega = \sqrt{\omega_0^2 - \beta^2}$ ,  $h\nu = A + \frac{mv_{ma}^2}{2}$ ,  $\Delta m > 0$ ,  $\Delta m < 0$ ,  $C = c \cdot \mu$ ,  $p = \frac{mv}{\sqrt{1 - \frac{v}{c}}}$ ,  $m_0 = -$ ,  $\langle \lambda \rangle = (\sqrt{2\pi d^2 n})^{-1}$ ,  $E = h\nu = h \frac{c}{\lambda}$ ,  $R = \frac{W}{t \cdot S}$ ,  $\rho = \frac{W}{t \cdot S \cdot c} = \frac{1}{c}$ ,  $u = \frac{v}{V_0}$ ,  $\beta = \frac{v}{2m}$ ,  $\Delta N = N \frac{4}{\sqrt{\pi}} e^{-u^2} \Delta u$ ,  $\rho = \frac{1}{c} \sqrt{W_x(W_x + 2E_0)}$ ,  $\Delta m = Zm_p + Nm_n - m$ ,  $\langle z \rangle = \sqrt{2\pi d^2 n} \langle v \rangle$ ,  $E_{cl} = \Delta mc^2$ ,  $\omega = \sqrt{\omega_0^2 - 2\beta^2}$ ,  $\lambda = \frac{h}{p}$ ,  $n = \frac{N}{V}$ ,  $\varphi = \frac{W}{Q_0}$ ,  $f(v) = 4\pi \left(\frac{2\pi kT}{m_0}\right)^{3/2} v^2 e^{-\frac{mv^2}{2kT}}$ ,  $\Delta u = \frac{\Delta v}{V_0}$ ,  $\lambda_K = \frac{hc}{A}$ ,  $\vec{E} = \frac{\vec{F}}{q_0}$ ,  $W = mgh$ ,  $F_{sp} = NH$ ,  $\sigma = en(u_n + u_p)$ ,  $G_2 = \frac{5}{2} \cdot \hbar \omega (n=2)$ ,  $G_1 = \frac{3}{2} \cdot \hbar \omega (n=1)$ ,  $R_x = \frac{3\hbar}{8} \frac{r}{ne}$ ,  $q = \frac{\Delta \Phi}{\sigma}$ ,  $A = 1 \Delta \Phi$ ,  $U = \frac{1}{2} \frac{Q^2}{\epsilon_0 A}$ ,  $\frac{dV}{T} = \frac{p}{m} R \cdot 831$ ,  $v = \frac{u}{n_A} \cdot \frac{Q}{F}$ ,  $\eta = \frac{1}{3} \rho \langle v \rangle \langle \lambda \rangle$ ,  $\vec{\Phi}(x)$ ,  $\vec{E} = \frac{\vec{F}}{q_0}$ ,  $\vec{E} = \frac{\vec{F}}{q_0}$ ,  $\vec{E} = \frac{\vec{F}}{q_0}$
- Diagrams:**
  - A Bohr-style atomic model with a central nucleus and three elliptical electron orbits.
  - A grid diagram representing a curved surface or spacetime curvature.
  - A diagram of a wave packet or interference pattern.
  - A diagram of a particle with a central dot and two concentric circles.



→ Why Study Physics!

→ Searching for Jobs

→ Business Intelligence

→ Big Data

→ Data Science

→ Data Warehousing

→ Physics in my life

# Searching for Jobs

Engineering

Risk Management

Technical Project Management

Data Analytics



# Searching for Jobs

Start looking around as soon as possible

For Phd but also for jobs in industry

What do you like?





# Traineeship in Business Intelligence / Big Data

What is a database

Programming (Python)


SQL

ETL

What does a business expect to get from the data

What can you actually get out of it?





# Working at YoungCapital (Uitzendbureau)

Payrolling is very complicated

Communicating your analysis to people with absolutely no technical background

You deal with a lot of different rules due to different customers

Freedom and a relaxed working environment

Lot of young people

Take your own initiatives



**YOUNG**  
**CAPITAL**<sup>TM</sup>



→ Why Study Physics!

→ Searching for Jobs

→ **Business Intelligence**

→ Big Data

→ Data Science

→ Data Warehousing

→ Physics in my life

# What is Business Intelligence?



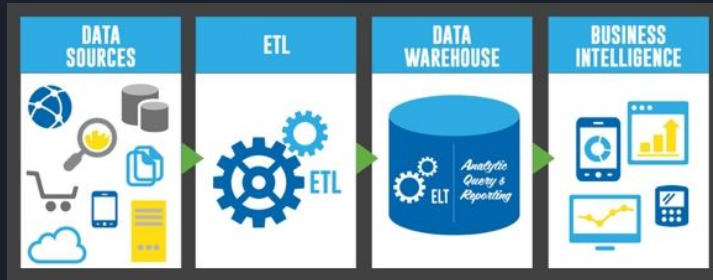
# What is Business Intelligence?

Providing information to the organisation

Reports for end users

Analysis...

Margin / Revenue / Profit



# What is Business Intelligence?





→ Why Study Physics!

→ Searching for Jobs

→ Business Intelligence

→ **Big Data**

→ Data Science

→ Data Warehousing

→ Physics in my life

# Big Data





# Big Data

Large amounts (TB's)

Unstructured

Challenging to process

4 V's : Volume, Variety, Velocity, Veracity









→ Why Study Physics!

→ Searching for Jobs

→ Business Intelligence

→ Big Data

→ **Data Science**

→ Data Warehousing

→ Physics in my life

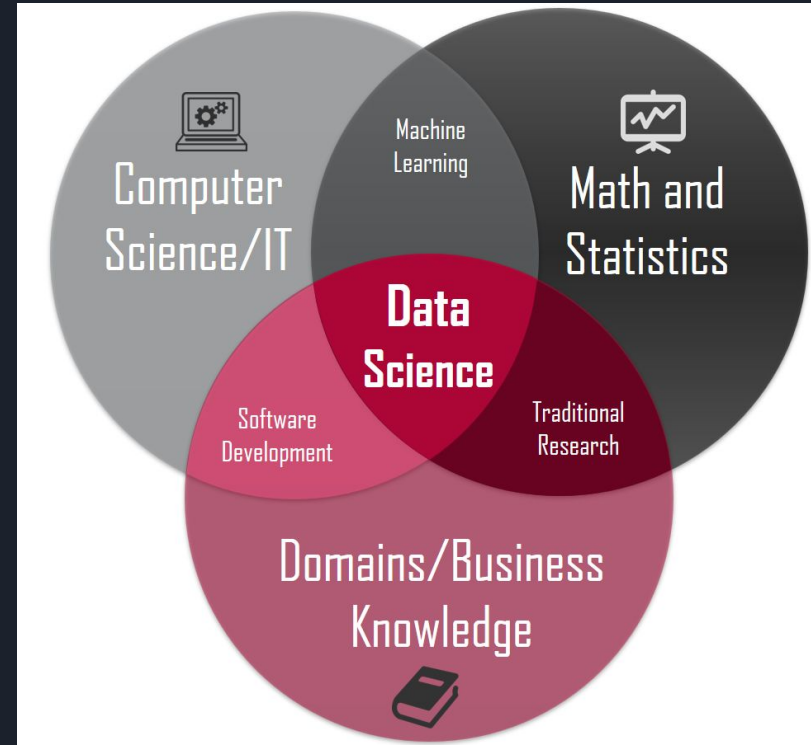
# Data Science

Best link to physics

Battling unstructured data to gain insights

Find hidden treasure (data)

Making your analysis understandable for others



# Data Science

Best link to physics

Battling unstructured data to gain insights

Find hidden treasure (data)

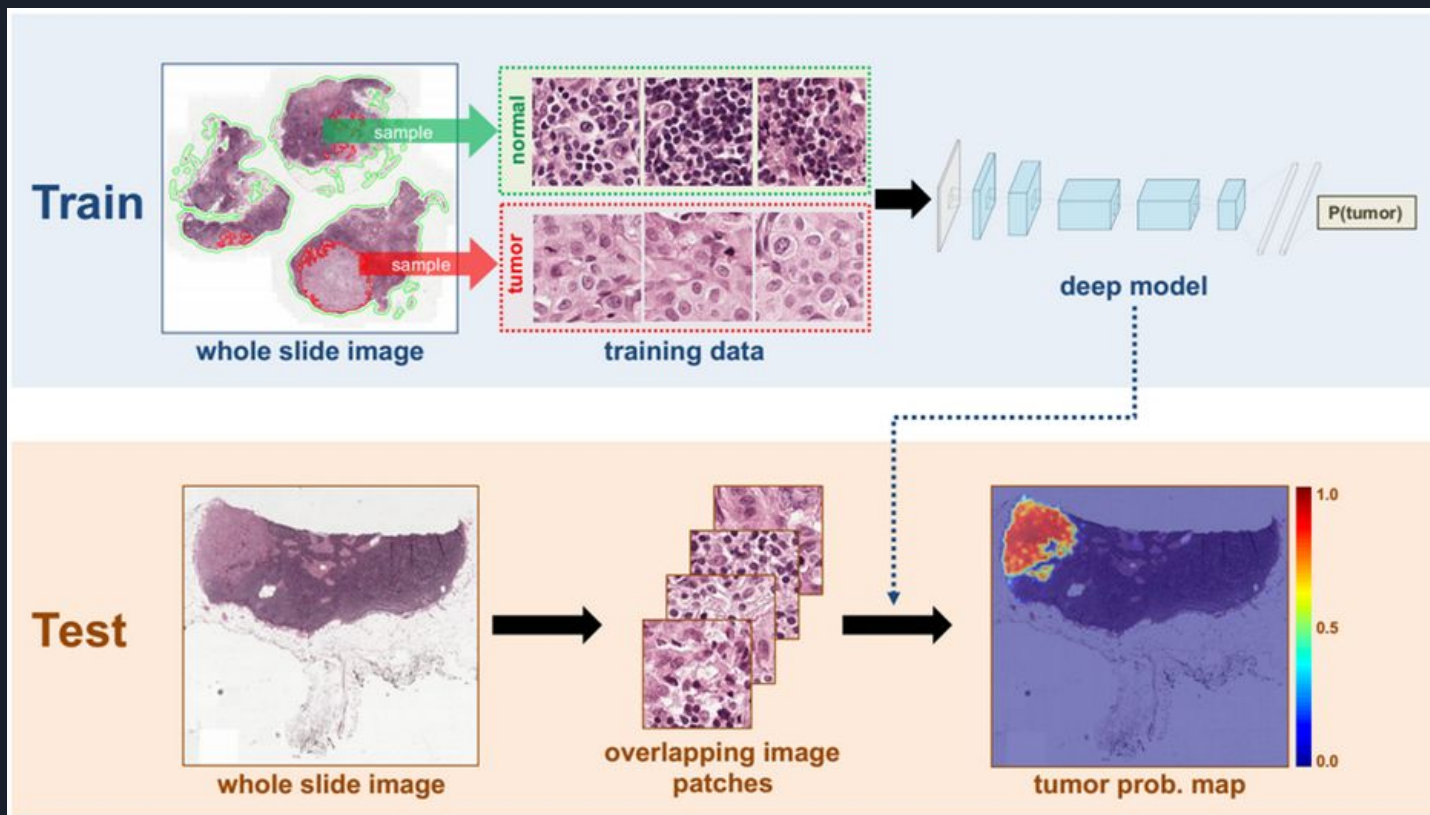
Making your analysis understandable for others

```
252 document.getElementById( cell ) {
253 }
254
255 function updatePhotoDescription() {
256   if (descriptions.length > (page * 9) + (currentImage.substring(0, 3)))
257     document.getElementById( bigImageDesc ).innerHTML = description[page * 9 + currentImage.substring(0, 3)];
258 }
259
260
261 function updateAllImages() {
262   var i = 1;
263   while (i < 10) {
264     var elementId = 'foto' + i;
265     var elementIdBig = 'bigImage' + i;
266     if (page * 9 + i - 1 < photos.length) {
267       document.getElementById( elementId ).src = 'images/' + photos[page * 9 + i - 1];
268       document.getElementById( elementIdBig ).src = 'images/' + photos[page * 9 + i - 1];
269     } else {
270       document.getElementById( elementId ).src = '';
271     }
272   }
273 }
```

**TOP TOOLS OF DATA SCIENCE**



# Data Science / Big Data



# Top 10 Use Cases for Data Science & Machine Learning



**HEALTHCARE:**  
Patient Diagnosis



**FINANCE:**  
Fraud Detection



**MANUFACTURING:**  
Anomaly Detection



**RETAIL:**  
Inventory Optimization



**GOVERNMENT:**  
Smarter Services



**TRANSPORTATION:**  
Demand Forecasting



**NETWORKS:**  
Intrusion Detection



**E-COMMERCE:**  
Recommender Systems



**MEDIA:**  
Interaction & Speed



**EDUCATION:**  
Research Insight





→ Why Study Physics!

→ Searching for Jobs

→ Business Intelligence

→ Big Data

→ Data Science

→ **Data Warehousing**

→ Physics in my life

# Data Warehousing

Adding structure

Combining different sources

Combining different data types





→ Why Study Physics!

→ Searching for Jobs

→ Business Intelligence

→ Big Data

→ Data Science

→ Data Warehousing

→ Physics in my life

# Is Physics still visible in my job / life ??

Programming

Statistics

Physics mindset helps me interpret problems

CERN is also struggling with a large data issue

Still a huge interest / hobby



What's in the future?



WHY DO WHALES JUMP  
WHY ARE WITCHES GREEN  
WHY ARE THERE MIRRORS ABOVE BEDS  
WHY DO I SAY UH

WHY IS SEA SALT BETTER  
WHY ARE THERE TREES IN THE MIDDLE OF FIELDS  
WHY IS THERE NOT A POKEMON MMO  
WHY IS THERE LAUGHING IN TV SHOWS  
WHY ARE THERE DOORS ON THE FREEWAY  
WHY ARE THERE SO MANY SNOGOSTEDIE RUNNING  
WHY AREN'T THERE ANY COUNTRIES IN ANTARCTICA  
WHY ARE THERE SCARY SOUNDS IN MINECRAFT  
WHY IS THERE KICKING IN MY STOMACH  
WHY ARE THERE TWO SLASHES AFTER HTTP

WHY ARE THERE CELEBRITIES  
WHY DO SNAKES EXIST  
WHY DO OYSTERS HAVE PEARLS  
WHY ARE DUCKS CALLED DUCKS  
WHY DO THEY CALL IT THE CLAP  
WHY ARE KYLE AND CARTMAN FRIENDS  
WHY IS THERE AN ARROW ON PANG'S HEAD  
WHY ARE TEXT MESSAGES BLUE  
WHY ARE THERE MUSTACHES ON CLOTHES  
WHY ARE THERE MUSTACHES ON CARS  
WHY ARE THERE MUSTACHES EVERYWHERE  
WHY ARE THERE SO MANY BIRDS IN OHIO  
WHY IS THERE SO MUCH RAIN IN OHIO  
WHY IS OHIO WEATHER SO WEIRD

WHY ARE THERE MALE AND FEMALE BIKES  
WHY ARE THERE BRIDESMAIDS  
WHY DO DYING PEOPLE REACH UP  
WHY AREN'T THERE WARRIORS FIGHTING  
WHY ARE OLD FUNKS DIFFERENT

WHY ARE THERE SPIDERS IN MY HOUSE  
WHY ARE THERE HUGE SPIDERS IN MY HOUSE  
WHY ARE THERE LOTS OF SPIDERS IN MY HOUSE  
WHY ARE THERE SPIDERS IN MY ROOM  
WHY ARE THERE SO MANY SPIDERS IN MY ROOM  
WHY DO SPIDER BITES ITCH  
WHY IS DYING SO SCARY

WHY ARE THERE SQUIRRELS



WHY IS PROGRAMMING SO HARD  
WHY IS THERE A 0 ON A REDBULL  
WHY DO PATRONS HAVE WHITE SOCCER  
WHY DO RAINBOWS SOUND GOOD  
WHY DO TREES DIE  
WHY IS THERE NO SOUND ON OWN  
WHY AREN'T POKEMON REAL  
WHY AREN'T BULLETS SHARP  
WHY DO DREAMS SEEM SO REAL

WHY DO TESTICLES MOVE  
WHY ARE THERE PSYCHICS  
WHY ARE HATS SO EXPENSIVE  
WHY IS THERE COFFINE IN MY SHAPPOO  
WHY DO YOUR BOOBS HURT

WHY DO ISLANDS DIE  
WHY AREN'T ECONOMISTS RICH  
WHY DO AMERICANS CALL IT SOCCER  
WHY ARE MY EARS RINGING  
WHY ARE THERE SO MANY AVENGERS  
WHY ARE THE AVENGERS FIGHTING THE X MEN  
WHY IS WOLVERINE NOT IN THE AVENGERS

WHY AREN'T THERE DINOSAUR GHOSTS  
WHY IS EARTH TILTED  
WHY IS SPACE BLACK  
WHY IS OUTER SPACE SO COLD  
WHY ARE THERE PYRAMIDS ON THE MOON  
WHY IS NASA SHUTTING DOWN

WHY ARE THERE GHOSTS

WHY ARE THERE FEMALE MR NIMES  
WHY IS MT VESUVIUS THERE  
WHY DO THEY SAY T MINUS  
WHY ARE THERE OBELISKS  
WHY ARE WRESTLERS ALWAYS WET  
WHY ARE OCEANS BECOMING MORE ACIDIC  
WHY IS ARWEN DYING  
WHY AREN'T MY QUAIL LAYING EGGS  
WHY AREN'T MY QUAIL EGGS HATCHING  
WHY AREN'T THERE ANY FOREIGN MILITARY BASES IN AMERICA

WHY IS SEX SO IMPORTANT



WHY ARE THERE SLAVES IN THE BIBLE  
WHY DO TWINS HAVE DIFFERENT FINGERPRINTS  
WHY ARE AMERICANS AFRAID OF DRAGONS

WHY IS HTTPS CROSSED OUT IN RED  
WHY IS THERE A LINE THROUGH HTTPS  
WHY IS THERE A RED LINE THROUGH HTTPS ON FACEBOOK  
WHY IS HTTPS IMPORTANT

WHY AREN'T MY ARMS GROWING  
WHY ARE THERE SO MANY CROWS IN ROCHESTER  
WHY IS PSYCHIC WEAK TO BUG  
WHY DO CHILDREN GET CANCER  
WHY IS POSEIDON ANGRY WITH ODYSSEUS  
WHY IS THERE ICE IN SPACE

WHY ARE THERE ANTS IN MY LAPTOP  
WHY IS THERE AN OWL IN MY BACKYARD  
WHY IS THERE AN OWL OUTSIDE MY WINDOW  
WHY IS THERE AN OWL ON THE DOLLAR BILL  
WHY DO OWLS ATTACK PEOPLE  
WHY ARE AK 47s SO EXPENSIVE  
WHY ARE THERE HELICOPTERS CIRCLING MY HOUSE  
WHY ARE THERE GODS  
WHY ARE THERE TWO SPOOKS

WHY ARE THERE TINY SPIDERS IN MY HOUSE

WHY IS LIFE SO BORING

WHY AREN'T THERE GUNS IN HARRY POTTER

WHY ARE ULTRASOUNDS IMPORTANT  
WHY ARE ULTRASOUND PROXIMED FOREIGNERS  
WHY IS STEALING WRONG

WHY ARE THERE SLAVES IN THE BIBLE  
WHY DO TWINS HAVE DIFFERENT FINGERPRINTS  
WHY ARE AMERICANS AFRAID OF DRAGONS

WHY ARE THERE SLAVES IN THE BIBLE  
WHY DO TWINS HAVE DIFFERENT FINGERPRINTS  
WHY ARE AMERICANS AFRAID OF DRAGONS

WHY IS HTTPS CROSSED OUT IN RED  
WHY IS THERE A LINE THROUGH HTTPS  
WHY IS THERE A RED LINE THROUGH HTTPS ON FACEBOOK  
WHY IS HTTPS IMPORTANT

WHY AREN'T MY ARMS GROWING  
WHY ARE THERE SO MANY CROWS IN ROCHESTER  
WHY IS PSYCHIC WEAK TO BUG  
WHY DO CHILDREN GET CANCER  
WHY IS POSEIDON ANGRY WITH ODYSSEUS  
WHY IS THERE ICE IN SPACE

WHY ARE THERE ANTS IN MY LAPTOP  
WHY IS THERE AN OWL IN MY BACKYARD  
WHY IS THERE AN OWL OUTSIDE MY WINDOW  
WHY IS THERE AN OWL ON THE DOLLAR BILL  
WHY DO OWLS ATTACK PEOPLE  
WHY ARE AK 47s SO EXPENSIVE  
WHY ARE THERE HELICOPTERS CIRCLING MY HOUSE  
WHY ARE THERE GODS  
WHY ARE THERE TWO SPOOKS

WHY ARE THERE TINY SPIDERS IN MY HOUSE

WHY IS LIFE SO BORING

WHY AREN'T THERE GUNS IN HARRY POTTER

WHY ARE ULTRASOUNDS IMPORTANT  
WHY ARE ULTRASOUND PROXIMED FOREIGNERS  
WHY IS STEALING WRONG

WHY ARE THERE SLAVES IN THE BIBLE  
WHY DO TWINS HAVE DIFFERENT FINGERPRINTS  
WHY ARE AMERICANS AFRAID OF DRAGONS

# QUESTIONS FOUND IN GOOGLE AUTOCOMPLETE



WHY ARE THERE LIES IN THE NEWS  
WHY DO I FEEL DIZZY  
WHY DO I FEEL DIZZY

WHY ARE THERE LIES IN THE NEWS  
WHY DO I FEEL DIZZY  
WHY DO I FEEL DIZZY

WHY ARE THERE LIES IN THE NEWS  
WHY DO I FEEL DIZZY  
WHY DO I FEEL DIZZY

WHY ARE THERE LIES IN THE NEWS  
WHY DO I FEEL DIZZY  
WHY DO I FEEL DIZZY

WHY ARE THERE LIES IN THE NEWS  
WHY DO I FEEL DIZZY  
WHY DO I FEEL DIZZY

WHY ARE THERE LIES IN THE NEWS  
WHY DO I FEEL DIZZY  
WHY DO I FEEL DIZZY

WHY ARE THERE LIES IN THE NEWS  
WHY DO I FEEL DIZZY  
WHY DO I FEEL DIZZY