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How Scientific Paradigms Relate

Journal written by [Alien54 \(180860\)](#) and posted by kdawson on Tue Mar 20, 2007 09:29 PM from the connections dept.

Here is a [giant chart mapping relationships among scientific paradigms](#), as published in the journal Nature. This [map](#) was constructed by [sorting roughly 800,000 published papers into 776 different scientific paradigms](#) (shown as pale circular nodes) based on how often the papers were cited together by authors of other papers. Information Esthetics, an organization founded by map co-creator [W. Bradford Paley](#), is [giving away 25" x 24" prints of the Map of Science](#) (you pay postage and handling via PayPal). There are also links to a 3000+ pixel wide jpg of the chart. It would be all one long spectrum except for Computer Science, which makes the connection (via AI) between the hard sciences and the soft sciences.



[+] [science](#), [toy](#) (*tagging beta*)

- >

[Cool \(Score:5, Funny\)](#)

by [pembo13 \(770295\)](#) on Tuesday March 20 2007, @09:34PM ([#18423917](#)) [Homepage](#)
 Geek porn

- [Uh oh... \(Score:5, Funny\)](#)

by [Null Nihils \(965047\)](#) on Tuesday March 20 2007, @09:38PM ([#18423963](#)) [Journal](#)

There are also links to a 3000+ pixel wide jpg of the chart.

Soon to be links to a 3000+ degree lump of molten webserver. :)

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- **Re: (Score:2)**

by [Alien54 \(180860\)](#)
 3000+ degree of molten webserver ?

Not this late at night. They still have a chance to crank up the refrigeration for the server room. Moscow is just waking up, and the US won't come online for another 8- 10 hours. So they have something of a prayer.

The beeper of the webmaster should be going off in Australia just about now, and we can all imagine the panicked cursing as he realizes that he won't be able to make it to the beach because he's going to be busy arranging co-location services for the rest of t

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- **So sad... (Score:3, Interesting)**

by [Slipgrid \(938571\)](#) on Tuesday March 20 2007, @09:42PM ([#18423993](#)) [Homepage Journal](#)
 That show a problem with the way people think about science. Read E. O. Wilson's [Consilience: The Unity of Knowledge](#) [amazon.com] on why we should apply the scientific method to all field, even humanities, and why we should try to speak about all fields with a common language.

For instance, an example of applying science to humanities, would be writing about history in a scientific way. May not seem important if you view the people on Earth in as the only society, but if you were trying to compare the history of peoples on many different planets, then it would be very important.

People with a computer science background should know the importance of having a common language to speak, or speaking in the simplest terms. If someone throws acronyms at you, they likely don't know what they are talking about. All field, psychology, history, and cs are related. They should use common terms, or so Wilson would have you believe.

A truly liberal education would show you that all fields relate, and depend on one another.

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- **Re: (Score:2)**

by [linguizic \(806996\)](#)
 FTA:

This map was constructed by sorting roughly 800,000 published papers into 776 different scientific paradigms (shown as pale circular nodes) based on how often the papers were cited together by authors of other papers. Links (curved black lines) were made between the paradigms that shared papers, then treated as rubber bands, holding similar paradigms nearer one another when a physical simulation forced every paradigm to repel every other; thus the layout derives directly from the data.

What Wilson desc

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- **Re: (Score:2)**

by [khalow \(566160\)](#)
 It's not clear to me why there can be much less should be a common vocabulary for all of scientific knowledge. Anyone knowledgeable knows how to speak the lingo. And I don't see the point of attempting to unify vocabulary when some words have potentially dozens of meanings depending on the context.

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- [Re: \(Score:2\)](#)

by [Slipgrid \(938571\)](#)

I haven't read the book since 1999, and I haven't taken many higher level history classes, so I'm not sure how they teach it today. Though I would agree that *new knowledge* has broken the walls between field, by showing that the field relate, *many people* tend to build walls with field specific grammar.

I saw Wilson lecture on his new book, The Creation. Very interesting, but I got the feeling that he was repacking the same info for the political climate of today (ie. the culture wars). Brilliant guy tho

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- [Re: \(Score:2\)](#)

by [linguizic \(806996\)](#)

Indeed a great read.

One of the major, I mean MAJOR themes of that book was to show the importance of reductionism. To explain history it would need to be reduced to the individual psychologies of individuals and the social psychologies of the societies they belonged to.

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- [Re: \(Score:2\)](#)

by [espressojim \(224775\)](#)

You should be able to explain things in simple terms, but for those of us familiar with the intermediate/complex stuff, we just don't have the time to hear explanations from the ground up every time. If I want to work with genomic data, you don't have to explain central dogma to me every time you are going to get into the topic.

These complex words are just shortcuts to sets of related knowledge. If you don't know certain key words (not acronyms, but words), I'll have an idea of what you don't know. For

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- [I bought one.. \(Score:2, Funny\)](#)

by [QuantumG \(50515\)](#)

it'll probably show up in 6 months time and I'll be like "what the fuck is this?"

Look good on my wall though.

-

- [Re: \(Score:2\)](#)

by [behindthewall \(231520\)](#)

Were you comfortable with the purchase options / apparent security of the site? I was tempted, but dissuaded by having no information what kind of a transaction I would be required to complete and what their security measures are.

-

- [Re: \(Score:2\)](#)

by [behindthewall \(231520\)](#)

Tired. Realizing the inanity of my previous post. Of course you were comfortable. I guess what I'm asking is: What are the options?

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- **[Re: \(Score:3, Funny\)](#)**

by [behindthewall \(231520\)](#)

Argh! In the original summary -- actual useful information. PayPal. Ok.

Not only am I tired, I am blind. A good, good sign to go home before I erase Alaska here, or something.

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- **[Re:I bought one.. \(Score:4, Informative\)](#)**

by [wbpaley2 \(1078263\)](#) on Wednesday March 21 2007, @01:19AM ([#18425441](#))

I apologise profoundly for this. (I was one of the co-creators of the poster, and the Information Esthetics organization distributing the print is my responsibility.)

We are using a standard Drupal shopping module and I have received two reports of this. I am sure others have seen the problem and not reported it.

We have a Drupal guru looking at that code, and hundreds of orders have cleared fine, but for now I suggest people do exactly what gammaxy did: if someone else's information show up, wait until tomorrow.

I will remain personally responsible for any mis-charged or undelivered prints. You may find me by Google-ing "Brad Paley": e-mail addresses are available on my various Web sites.

Thank you for the interest! Sorry about the glitch.

Kind Regards, Brad

[Parent](#)

■

- **[Engineering & Computer Science \(Score:4, Interesting\)](#)**

by [negative3 \(836451\)](#) on Tuesday March 20 2007, @09:42PM ([#18424001](#))

Their "Computer Science" grouping is odd - one of the "paradigms" is "multiple antenna, selective fading, smart antenna,..." which are not computer science topics, they're EE/wireless communications topics. Some aspects of Computer Science and EE are definitely closely related, but this is kind of weird. Engineering seems under-represented - if there were a lot of engineering disciplines included (EE, Computer, mechanical, aerospace, etc.) but not under any sort of "engineering" heading, why is "applied physics" so small?

Cool chart nonetheless. This was a huge amount of info to sort through and graphically represent.

○

- **[Re:Engineering & Computer Science \(Score:5, Insightful\)](#)**

by [QuantumG \(50515\)](#) <qg@biodome.org> on Tuesday March 20 2007, @09:57PM ([#18424101](#))
[Homepage Journal](#)

Here's a hint: it's a science chart.

You might as well be complaining that they didn't include snowboarding.

Parent

- - **Re: (Score:3, Interesting)**

by [maxume \(22995\)](#)

I have a theory that some of the best engineers are scientists who think "I could know 'this' if only I could do 'that'", and some of the best scientists are engineers who think "I could do 'that' if only I knew 'this'".

- **Re: (Score:2)**

by [Alien54 \(180860\)](#)

If you look at the link to mapofscience.com [mapofscience.com], the menu widgets at the right let you highlight individual areas, including Engineering. Similar functionality is seen in the other topic areas

- **Re: (Score:2)**

by [femto \(459605\)](#)

Historically they are [Information Theory](http://wikipedia.org) [wikipedia.org] topics. Only recently, when we figured out how to build them, did they become engineering topics.

Information theorists are typically drawn from the ranks of mathematics, engineering and computer science so the positioning between computer science and mathematics is expected. The close link to control theory is also expected.

As others have pointed out the chart deals with academic papers, so it is telling you how the **theory** of each area is related. Building MIM

- **Tufte (Score:4, Insightful)**

by [Speare \(84249\)](#) on Tuesday March 20 2007, @09:43PM ([#18424013](#)) [Homepage](#)

That poster looks like Edward Tufte got sick after trying to make sense of all that information.

Joke aside, it's gorgeous in the pure organic feel of it, but not particularly informative other than illustrative.

-
- **Looks like a nebula (Score:2)**

by [Alien54 \(180860\)](#)

and it could probably be colorized that way....

I can just imagine a UFO abductee seeing a similar chart of knowledge or biology or something on the wall of the starship, and think it was a map of the home nebula/star cluster.

Could be useful as some sort of directory if the interface were appropriately interactive.

-
- [Where is the icon?](#) (Score:3, Funny)

by [140Mandak262Jamuna \(970587\)](#) on Tuesday March 20 2007, @09:48PM (#18424049) [Journal](#)
That says "you are here"? Is it supported by any of the GPS devices being sold?

-
- [sounds like a totally new paradigm to me.](#) (Score:2)

by [porky_pig_jr \(129948\)](#)
By the way, what *is* paradigm anyway?

-
- [Re:](#) (Score:2)

by [flynt \(248848\)](#)

If you don't have time to Read Thomas Kuhn's Structure of Scientific Revolutions, make time!

- [paradigm](#) (Score:2)

by [camperdave \(969942\)](#)

A paradigm... A paradigm makes, um, twenty cents, no?

- [Re:](#) (Score:2)

by [Bender0x7D1 \(536254\)](#)

A paradigm is a model or pattern or maybe a framework. It is the general way of looking at or approaching things.

We can see examples of different paradigms in software - procedural programming, functional programming, object oriented can all be considered paradigms. OO is a general way of doing things and breaks all the rules of functional programming - but it isn't wrong it is just a way of doing things. Within that paradigm we can come up with rules about what is good or allowed or bad, and it only ap

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- [Great example of CS / hard science crossover](#) (Score:2)

by [greg_barton \(5551\)](#) *

At the last [GECCO conference](#) [sigevo.org] I saw a paper presented on the use of a genetic algorithm to speed up the simulation of certain chemical reactions:

[linky](#) [uiuc.edu]

[Google cache](#) [209.85.165.104] because the link is to a power point...

Basically, a multiobjective GA was used to find parameter sets for chemical simulation equations that increased the speed of those simulations by a factor of 10x-103x. (And were more accurate, to boot.) That enables the reaction models to be more complex and, as the presentation stated, "lead potentially to

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- [If...](#) (Score:2)

by [jd \(1658\)](#)

...I overlay the map of the Internet on top of the map of science, will I end up with a flow-chart of Windows?

-
- [Paradigm != field of study](#) (Score:5, Insightful)

by [kurisuto \(165784\)](#) on Tuesday March 20 2007, @ 10:15PM ([#18424243](#)) [Homepage](#)
I think that this is a misuse of the word "paradigm."

To closely quote Wikipedia, a paradigm is the set of practices that define a scientific discipline during a particular period of time. A paradigm is defined by science historian Thomas Kuhn to comprise the following:

- what is to be observed and scrutinized,
- the kind of questions that are supposed to be asked and probed for answers in relation to this subject,
- how these questions are to be structured,
- how the results of scientific investigations should be interpreted.

It looks to me as if this chart does not show connectedness among "paradigms". It simply shows connectedness among various areas of study (as measured in terms of clusterings of bibliography citations).

A paradigm change is something that happens **within a single area of study**, such as geology or linguistics. To look at connectedness among "paradigms", you'd have to look at the history of single fields, not the current interconnectedness among different fields.

-
- [Re: \(Score:2\)](#)

by [dbIII \(701233\)](#)

I think that this is a misuse of the word "paradigm."

True - it does not resemble ten cents in any way whatsoever.

■
● [ordering problems \(Score:2\)](#)

by [man ls \(248470\)](#)

I just tried to order a few of these.

It took 3 tries to make the quantity and price function correctly.

Then two more tries later, I had different people's names and addresses instead of my own.

Then, I finally got to PayPal with my information, did the PayPal bit successfully, and then it told me "access denied" on returning to the merchant.

confused

-
- [Torrent \(Score:2, Informative\)](#)

by [Ankur Dave \(929048\)](#)

The server is just asking to be Slashdotted, with a 5.3MB file, so here's a [torrent](#) [homelinux.com].

-
- [In a sliiiightly shameless plug... \(Score:2, Interesting\)](#)

by [morner \(1078219\)](#)

I've been investigating a similar mapping technique to the one these people used, nearly identical in fact, as applied to social networks. I've modelled people as antigravitationally interacting points, with friendships represented as springs.

You can see [an early render](#) [deviantart.com] (deviantart.org), or one using the same data but with [a slightly more sophisticated physics simulation](#) [deviantart.com] (deviantart.org).

-
- **[It's terribly biased](#) (Score:2)**

by [Flavio \(12072\)](#)

I was about to buy 3 of these, but when I actually looked closely at the graph I realised how biased it is toward the biomedical/health sciences. Math is a puny cluster of small dots, there's no area labeled Engineering and Chemistry looks like it has more lines than all the hard sciences put together.

Their site actually lets you highlight the portions that they consider Engineering, and the result is pretty weird: you get computer science, math, a lot of astrophysics, fluid mechanics, materials, applied ph

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- **[Re: \(Score:3, Insightful\)](#)**

by [morner \(1078219\)](#)

It's just generated directly from what's been published. It's not biased; this is just what people are working on.

-
- **[Re: \(Score:2\)](#)**

by [Flavio \(12072\)](#)

It's just generated directly from what's been published. It's not biased; this is just what people are working on.

Yes, but published where? They didn't say.

Their bad categorization of Engineering reinforces my belief that there really is a bias.

-
- **[Re:It's terribly biased](#) (Score:5, Insightful)**

by [TapeCutter \(624760\)](#) on Tuesday March 20 2007, @ 11:48PM ([#18424879](#)) [Journal](#)
"Their bad categorization of Engineering reinforces my belief that there really is a bias."

Engineering is not science, so yes it is biased against engineering in the same way as it is biased against architecture, sport, art, politics, and everything else that it is not trying to map.

[Parent](#)

-
- **[Re: \(Score:3, Insightful\)](#)**

by [Goldsmith \(561202\)](#)

If I remember the original Nature article correctly, it's based primarily on what journal research is published in. Thus if a journal claims to be focused on engineering, then articles published in that journal are in the subject of engineering. Links were made by citations between journal articles. They do say what journals they look at. They're selected by Thomson Scientific, who runs Web of Science, and I know they include IEEE journals.

I always laugh at people who try to re-define other people's pro

■

- **Re: (Score:3, Informative)**

by [timeOday \(582209\)](#)

I was about to buy 3 of these, but when I actually looked closely at the graph I realised how biased it is toward the biomedical/health sciences. Math is a puny cluster of small dots, there's no area labeled Engineering and Chemistry looks like it has more lines than all the hard sciences put together.

What are your expectations based on? The chart is based on scientific publications, and IME it is representative. [Federal research budget](#) [usatoday.com] in 2004:

Life Sciences: 54%

Engineering: 17%

Physical Sciences: 10%

-
- **Kevin Bacon (Score:4, Funny)**

by [Feileung \(1078225\)](#) on Tuesday March 20 2007, @ 10:48PM (#18424471)

What's really weird is that I can't seem to find Kevin Bacon anywhere on that map.

-
- **776 is a few too many for me! (Score:2)**

by [danny \(2658\)](#)

I've been trying to improve [the subject/category classification of my book reviews](#) [dannyreviews.com], but that currently has 150 categories (including fiction genres) and expanding it to 700 isn't practical.

So I'd love to see a similar chart with 100 categories - then one could conceivably try to read a book about each of them!

Danny.

-
- **If you squint just right... (Score:4, Funny)**

by [TrebleJunkie \(208060\)](#) <ezahurakNO@SPAMatlanticbb.net> on Tuesday March 20 2007, @ 11:40PM (#18424837) [Homepage Journal](#)

If you squint just right, ignore the dots and just look at the lines of text... ... it kinda looks like a face... ... it kinda looks like THE FACE OF GOD!!!! ... or maybe Hemmingway. Or Einstein. I'm not really sure.

-
- **Rather useful... (Score:3, Insightful)**

by [PeterPiper \(167721\)](#) on Wednesday March 21 2007, @ 12:48PM (#18430479) [Homepage](#)

I am thinking that this chart could be extremely useful for someone planning the layout for a university campus.

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- **Re: (Score:2)**

by [Alien54 \(180860\)](#)

Social Science is next door neighbor to Computer Science?? Give me a break! Somebody jumped the April Fool's gun.

That's the link via the Artificial Intelligence papers. Otherwise the loop is pretty much broken.

■
○ **Re: (Score:3, Interesting)**

by [i kan reed \(749298\)](#)

Yeah, there's no way there's any overlap in terms of areas like

1. Information theory(99% of computer science)
2. psychology(AI)
3. human response(GUIs)

Computer science is closer to social sciences than it is to cell biology in terms of what paradigm actually means. Other than mathematics, I can see nothing on that page that better matches computer science in terms of what kind of questions are asked, how they are posed, and how research is interpreted.

■
○ **Re: (Score:3, Informative)**

by [be-fan \(61476\)](#)

There are lots of links. For example, there are lots of connections between the development of syntax and grammars in linguistics and the work on syntax and grammar in computer languages.

■
○ **Map is itself an example of CS & social science (Score:5, Informative)**

by [Geof \(153857\)](#) on Tuesday March 20 2007, @ 11:56PM ([#18424921](#)) [Homepage](#)

So an algorithm generates this map from journal articles, then lays it out as a network - and I see people on here arguing about whether the categories are biased. What more proof do you need?

Or, take a close look at social science - there's economics in there. I see asset allocation; I'm sure game theory is there too (Prisoner's Dilemma, Tragedy of the Commons, public goods theory).

What's really surprising here is not the strength of the connection between computer science and the social sciences; it's the scarcity of connections elsewhere. Where are the connections between ecology and social science, ecology and computer science? I see infectious diseases - where are the links to network theory? What about the social and communication basis for physics and the other hard sciences?

Habermas has a fascinating analysis of this. He argues that science depends on a prior consensus about how the validity of evidence is evaluated. That consensus cannot itself be scientific. In other words, scientists can't agree about the value of each other's work until they first achieve a certain level of agreement on a social and communicative level.

If that sounds suspect to you, remember that the use of the word "paradigm" debated elsewhere in this discussion originates from Thomas Kuhn's *The Structure of Scientific Revolutions*, which is about the (significantly nonrational) process by which science is conducted, and is grounded in philosophy, history, and social science.

Perhaps the biggest missing links here are philosophy (including mathematics) and history. But then, they aren't sciences. At least not now: there have been scientific theories of history; science itself was once a branch of philosophy. Hurrah for computer science closing the circle, but the circle shouldn't be in need of closing.

Parent

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 - [Re:Where's Creationism? \(Score:5, Funny\)](#)

by [adisakp \(705706\)](#) on Tuesday March 20 2007, @ 10:29PM ([#18424365](#)) [Journal](#)
Where on that map do I find papers published by the Creationism/Intelligent Design

The entire map itself implies Creationism and Intelligent Design. Did anyone notice how much the graph with the flowing lines for labels looks suprisingly like the Flying Spaghetti Monster? Even as we search to explain the world with science his very form appears every from within the heart of cold scientific diagrams to a nice Italian dinner.

[Parent](#)

- -
 - [Re: \(Score:2\)](#)
- [Oh, that's easy. \(Score:4, Funny\)](#)

by [flyingsquid \(813711\)](#)
You're right- and the multicolored circles must be the meatballs!

by [jpellino \(202698\)](#) on Tuesday March 20 2007, @ 11:08PM ([#18424607](#))
When you get your print, turn it over - they put everything you need to know about creation science on the other side.

[Parent](#)

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Conversation, n.: A vocal competition in which the one who is catching his breath is called the listener.

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