

Bibliometric Analysis of the Output of German Technological Universities by Means of the J Factor

Dr. Bernhard Mittermaier

One ranking after the other

Abbildung 1: Anteil forschungsstarker Fakultäten je Hochschule

SCI SCIENCE CITATION INDEX

Wissdex: Das bdw-Wissenschaftsranking

DIE DEUTSCHEN SPITZENUNIVERSITÄTEN
Die besten deutschen Universitäten liegen überwiegend in Baden-Württemberg und Bayern, Berlin ist der einzige Leuchtturm im Osten: das **FOCUS-Ranking** im Gesamtüberblick

CHE RANKING

THE TIMES HIGHER EDUCATION SUPPLEMENT

Antworten der Personalleiter, in Prozent

| | |
|-------------------------|------|
| Betriebswirte | 26,3 |
| Wirtschaftsingenieure | |
| Maschinenbauer | |
| Wirtschaftsinformatiker | |
| Volkswirte | |
| Elektroniker | |

Mehrfachnennungen möglich. Quelle: Capital-Umfrage.

Academics strike back at spurious rankings

Alan Gilbert, president and vice-chancellor of the University of Manchester in Britain:

“All current university rankings are flawed to some extent; most, fundamentally. But rankings are here to stay, and it is therefore worth the time and effort to get them right.”

NATURE, vol. 447, pp. 514-515, 31 May 2007

Overview

Basics

- what?
- why?
- how?

Normalization

- J factor
- application to TU9
- comparison with Leiden

What is bibliometrics?

“Therefore it is suggested that a better name for this subject [statistical bibliography] is bibliometrics, i.e. **the application of mathematics and statistical methods to books and other media of communication.**”

(Pritchard, 1969)

“Bibliometrics is the quantitative study of physical published units, or of bibliographic units, or of the surrogates for either.”

(Broadus, 1987)

“Bibliometrics is the quantitative study of literatures as they are reflected in bibliographies.”

(White & McCain, 1989)

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Bibliometrics as a tool for the evaluation of science

- Generation of reliable, quantifiable information on scientific achievements
- Basis for the introduction of a performance-based allocation of funds in research
- Overcoming a mass problem by processing huge volumes of digitally available bibliometric data

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Citation rate

$$CPP = \frac{C}{P}$$

the number of
publications P
depends on:

- size of the institution
- effort
- (quality)
- publication behaviour
in the subject area

the number of
citations C
depends on:

- P
- quality
- citation behaviour
in the subject area

the **citation rate CPP**
depends on:

- quality ← to be measured
- subject area ← to be normalized

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The J factor

$$J(I, R) = \sum_S \frac{cpp_I(S)}{cpp_R(S)} \cdot \frac{p_I(S)}{p_{I,ges}}$$

$J(I,R)$: J factor of institution I, in relation to the standard R

S : serial

$CPP_I(S)$: average citation rate of publications by institution I in serial S

$CPP_B(S)$: average citation rate of publications by standard R I in serial S

$p_I(S)$: number of publications by institution I in serial S

$p_{I,ges}$: total number of publications by institution I

The J factor

| Serial | Publications Germany | Citations Germany | Citation rate Germany | Publications Aachen | Citations Aachen | Citation rate Aachen | Relative citation rate Aachen | Weighting factor | Incremental J factor |
|-----------------------------|----------------------|-------------------|-----------------------|---------------------|------------------|----------------------|-------------------------------|--------------------|----------------------|
| S | $P_R(S)$ | $C_R(S)$ | $CPP_R(S)$ | $P_I(S)$ | $C_I(S)$ | $CPP_I(S)$ | $CPP_I(S)/CPP_R(S)$ | $P_I(S)/P_{I,ges}$ | $J(I,R)incr.$ |
| European Heart Journal | 2,499 | 8,040 | 3.22 | 120 | 300 | 2.50 | 78 % | 1.0 % | 0.8 % |
| Physics Letters B | 944 | 17,599 | 18.64 | 117 | 1,357 | 11.60 | 62 % | 1.0 % | 0.6 % |
| Physical Review B | 4,846 | 45,971 | 9.49 | 102 | 1,099 | 10.77 | 114 % | 0.9 % | 1.0 % |
| European Physical Journal c | 544 | 6,427 | 11.81 | 100 | 1,493 | 14.93 | 126 % | 0.9 % | 1.1 % |
| (Total) | | | | 11,443 | 78,369 | 6.85 | | 100.0% | 105.3 % |

$$J(I, R) = \sum_S \frac{cpp_I(S)}{cpp_R(S)} \cdot \frac{p_I(S)}{p_{I,ges}}$$

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TU9 - Nine major universities of technology

“Excellence in engineering and the sciences made in Germany”

RWTH Aachen

TU Berlin

TU Braunschweig

TU Darmstadt

TU Dresden

Leibniz Universität Hannover

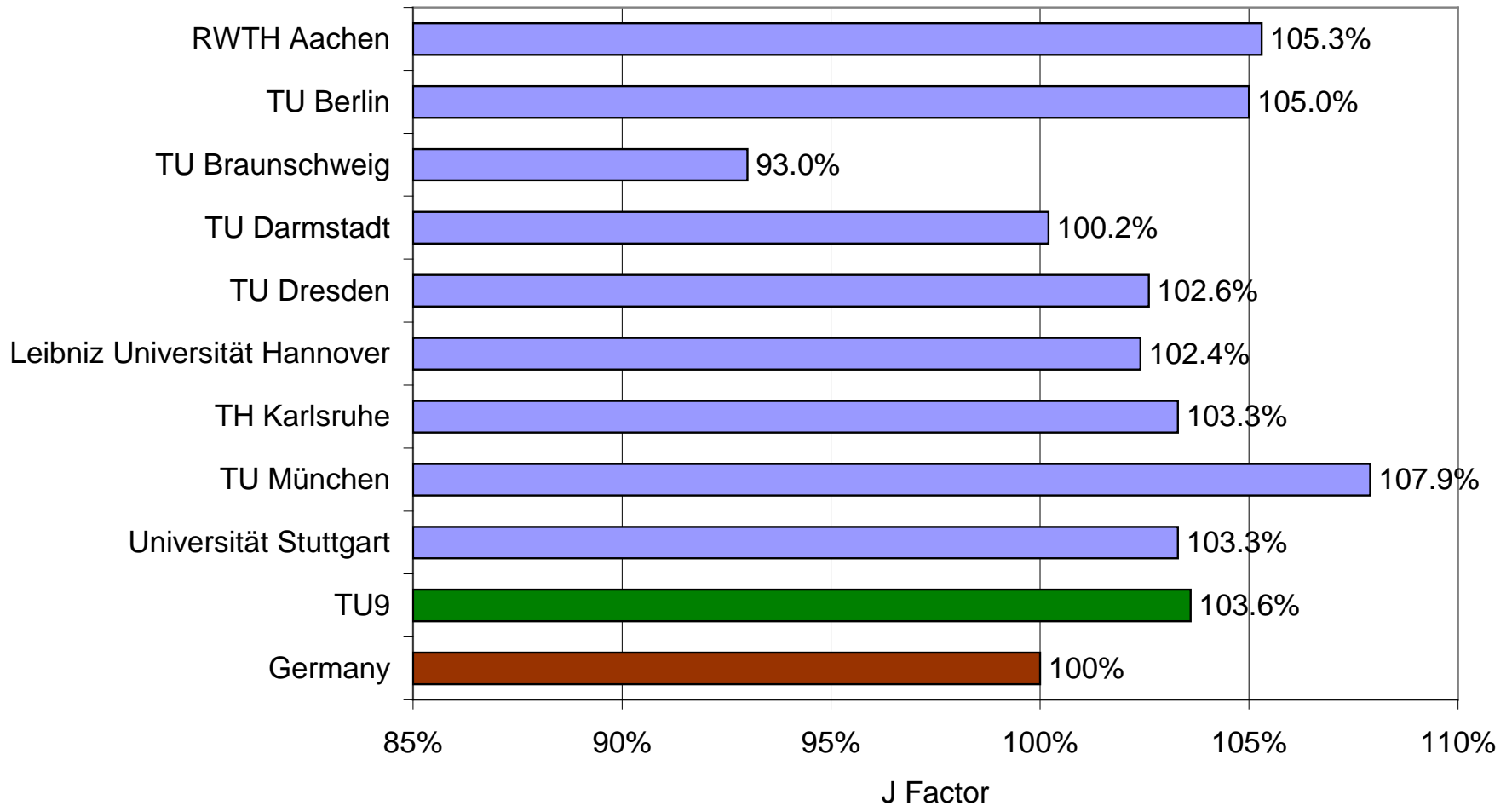
Universität Karlsruhe (TH)

TU München

Universität Stuttgart

<http://www.tu9.de>

J Factor of TU9



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TU9 in various rankings

| | Performance ranking | Shanghai ranking | Leiden CPP | Jülich CPP | Leiden CPP/FCSm | Jülich J factor |
|------------------------------|---------------------|------------------|------------|------------|-----------------|-----------------|
| RWTH Aachen | 2 | 2-5 | 2 | 3 | 5 | 2 |
| TU Berlin | 7 | 2-5 | 6 | 7 | 3 | 3 |
| TU Braunschweig | 9 | 6-8 | 8 | 8 | 9 | 9 |
| TU Darmstadt | 6 | 6-8 | 9 | 9 | 8 | 8 |
| TU Dresden | 3 | 6-8 | 4 | 4 | 7 | 6 |
| Leibniz Universität Hannover | 8 | 9 | 7 | 6 | 6 | 7 |
| TH Karlsruhe | 5 | 2-5 | 3 | 2 | 2 | 4 |
| TU München | 1 | 1 | 1 | 1 | 1 | 1 |
| Universität Stuttgart | 4 | 2-5 | 5 | 5 | 4 | 5 |

Leiden CPP compared to Jülich CPP

P

- more databases (?)
- not all types of documents
- larger publication period

C

- no self-citations
- moving average

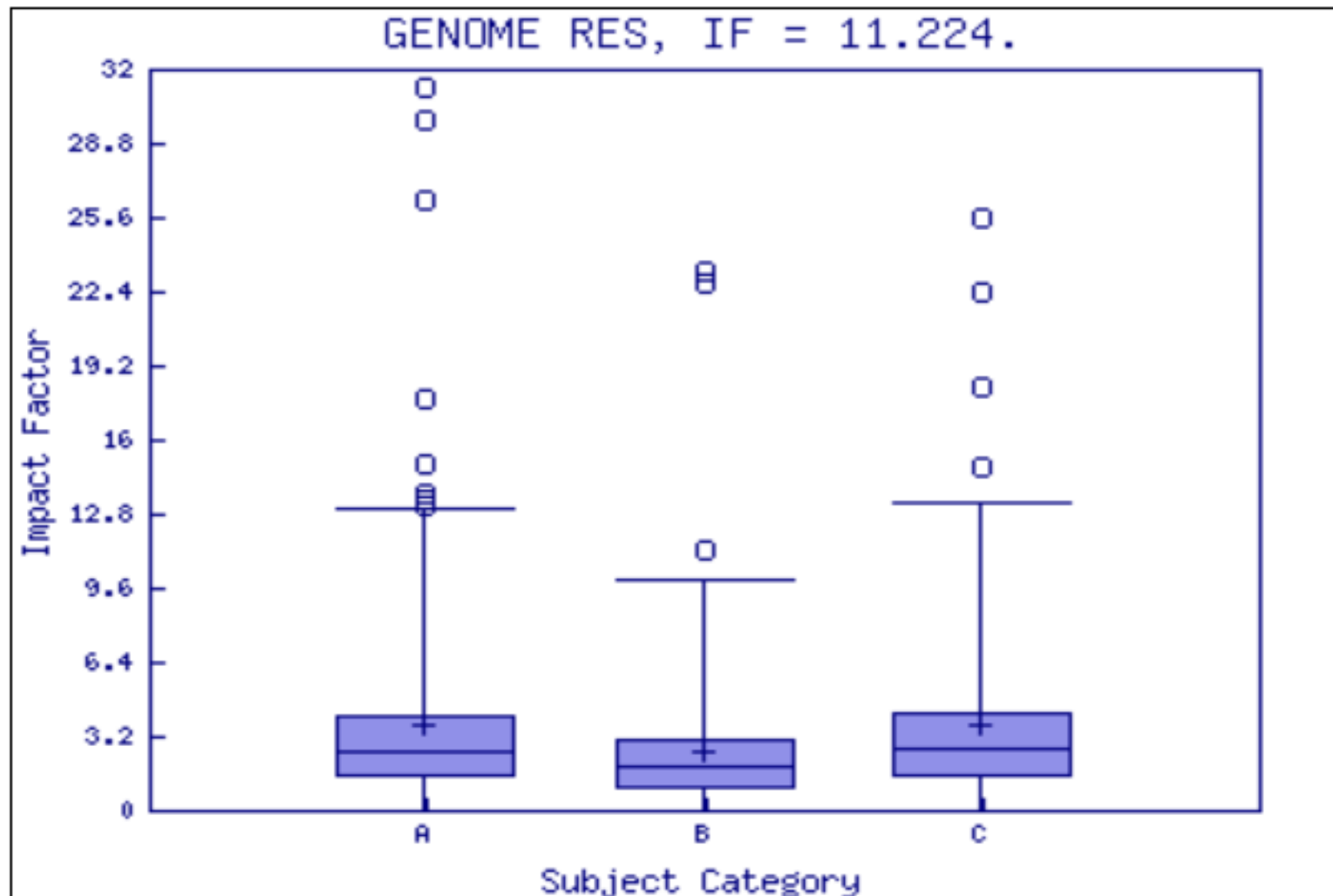
Leiden FCS / FCSm

“world average in a specific field / specific combination of fields” (subject category SC)

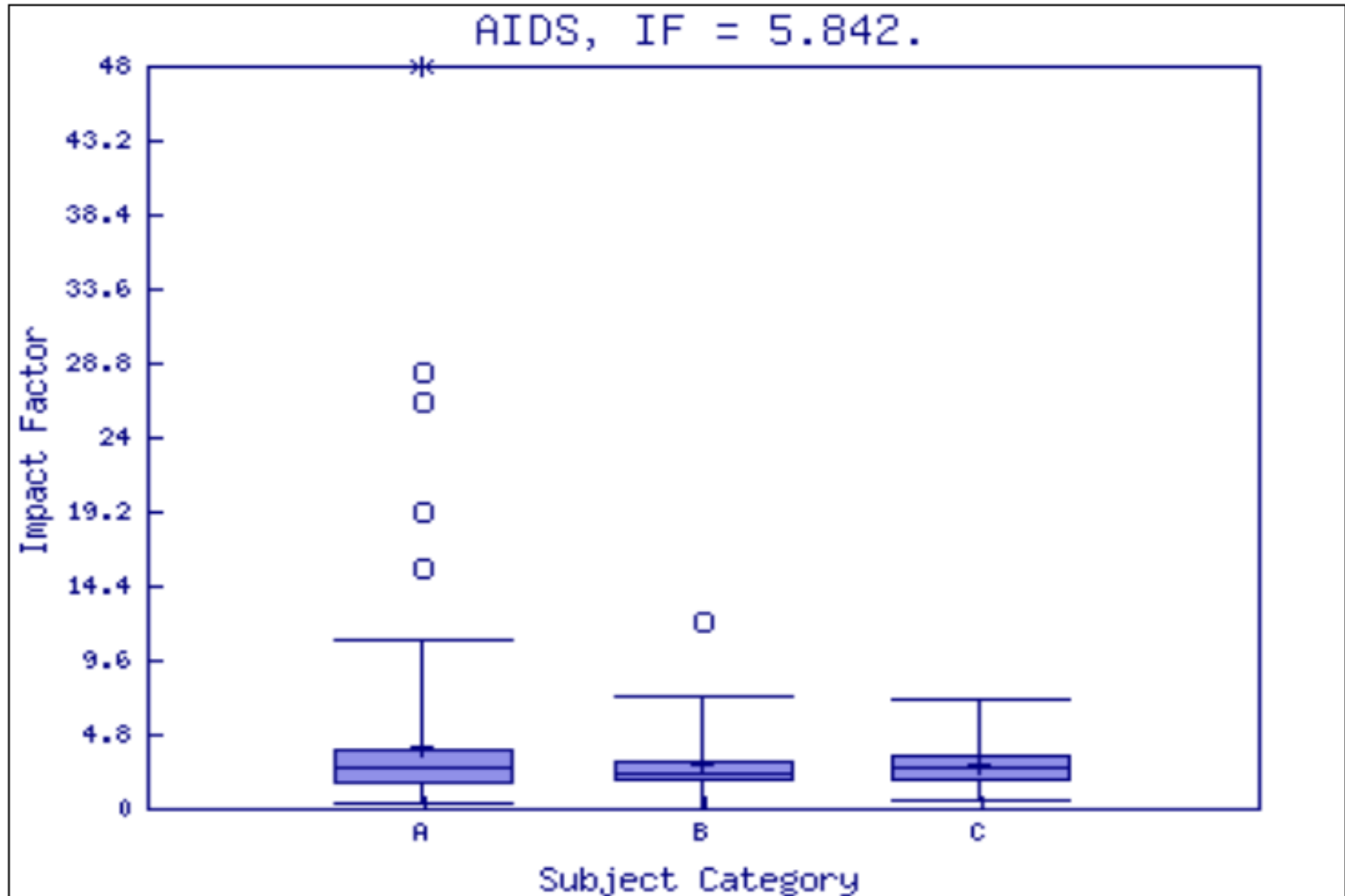
means: CPP of all journals in the SC is assigned to a given journal

- disputable assignment of journals
- theoretical and experimental journals mixed
- journals in one SC do not only differ in impact
- articles counted more than once

- A - BIOCHEMISTRY & MOLECULAR BIOLOGY
- B - BIOTECHNOLOGY & APPLIED MICROBIOLOGY
- C - GENETICS & HEREDITY

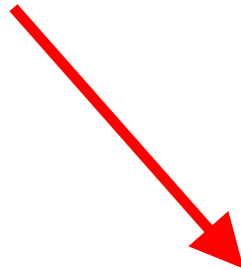


- A - IMMUNOLOGY
- B - INFECTIOUS DISEASES
- C - VIROLOGY



Bibliometrics to go

- Take extreme caution when analyzing the publications of individuals.
- Do not compare across disciplines without normalization



J Factor

Dr. Bernhard Mittermaier
Central Library
Forschungszentrum Jülich
D-52425 Jülich
Germany

Email: b.mittermaier@fz-juelich.de

Thank you!