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EDITORIAL
INFORMATION OVERLOAD

Dear Colleagues, members of ISSI,

Clearly our field, the field of informetrics (scientometrics, bibliometrics, webmetrics) is growing. Each month the journal Scientometrics publishes an issue of several hundreds of pages (the October issue, 85(1) contains 386 pages). Similarly JASIST published more than 200 pages a month. To this we may add the articles published in the Journal of Informetrics (JOI), the Journal of Documentation, Research Evaluation and many more scattered over a huge number of journals, including Nature and Science. To the articles published in traditional journals one may add many contributions in conference proceedings and in electronic journals such as Information Research and Cybermetrics. Can you find the time to read it all? Personally, I find that the large majority of articles published in Scientometrics fall within my sphere of interest, and those which do not use methods I should be interested in. How many hours does a day count?

However, in spite of this overload on informetric information, I would like today to draw your attention to a very special journal issue. Guest editor Subbiah Arunachalam has dedicated the September issue of Annals of Library and Information Studies to the 85th birthday of Eugene Garfield. Congratulations Gene! And, Arun, thank you for this initiative. The issue can be found at http://nopr.niscair.res.in/handle/123456789/10230. Do have a look!

When you are reading this you have in front of you a new issue of your favourite Newsletter. Remember the dynamite article published in the previous issue (Labbé 's contribution on the 'famous' scientist Ike Antkare): I hope you read it, and find the time to look at this issue too.

Ronald Rousseau, president of ISSI

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TON VAN RAAN RETIRES AS DIRECTOR OF CWTS

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The day before the 11th STI conference in Leiden from September 9-11, a special pre-Conference meeting has been held to "celebrate Ton van Raan's 65th Anniversary". But this official reason for the meeting was not the true one. On September 1 Ton van Raan retired as Director of Leiden University's Centre for Science and Technology Studies (CWTS), being succeeded by Paul Wouters. The unofficial purpose of the pre-Conference was to mark this milestone in the lives of both Ton and CWTS. Ton himself, however, considered this as anything but a cause for celebration: his retirement is quite involuntary. He has gone on record with the position that the mandatory retirement age of 65 stipulated in Dutch law and university regulations is a straightforward case of unwarranted discrimination.

Nevertheless the occasion of his retirement as director has been marked not just by the pre-Conference, where the Mayor of the City of Leiden announced that her majesty the Queen has awarded him a

Knighthood, but also by a special issue of Research Evaluation (19, 3, September 2010) to celebrate his work. For the science of Ton van Raan's scientometrics work we refer to this issue. In what follows we provide a brief overview of his professional life and his style in managing the institute.

Anthony (Ton) van Raan was born in 1945 in Breda, then a decidedly catholic city. In his youth, he was exposed to Jesuit educators who strongly influenced him. This explains his admirable quality of holding two seemingly opposed points of view at the same time; in his CWTS years Ton often convinced university administrators that they could not do without a bibliometric assessment of their institution, only to warn them at the same time that bibliometrics are no substitute for expert judgment.

He studied mathematics, physics and astronomy at the University of Utrecht, where 1999 Nobelist Martin Veltman taught him theoretical physics. Veltman is almost as famous for his intimidating sardonic comments as for his science; thus CWTS director van Raan was a bit apprehensive some decades later on, when out of the blue he got a phone-call from Veltman. Characteristically, the latter did not waste words on social niceties and reminiscences but immediately asked how CTWS dealt with multi-author papers. Ton gave his usual careful and polite explanation of the various subtle approaches used, whereupon his former professor said 'so you don't have any solution either, thanks anyway' and hang up.

In 1969 after his graduation (Msc), Ton became junior lecturer and researcher in Utrecht, and obtained his PhD in physics in 1973 with a thesis on the interaction between electrons and helium atoms; significantly, the word "impact" played a serious role in this dissertation. From 1973 to 1977 he worked as post-doctoral research fellow (assistant professor) in physics and astrophysics at the University of Bielefeld (Germany). These years allowed him to practice his command of the German language; this capability turned out to be very useful many years when it helped him significantly to obtain projects for his CWTS in Germany.

In 1977 Ton van Raan returned to the Netherlands and became a senior lecturer and research fellow in physics at Leiden University. Ton immediately fell into a life-long love-affair (next to his wife, children and dog) with this University and with the city of Leiden. Later on he became president of the Association of Leiden University Professors and in the CWTS scientometrics graduate course he invariably included a city tour guided by himself, with an emphasis on the Academic Lieux de Mémoires. No major issue in city politics escaped his attention and his advice on these issues became at the same time much sought after and feared by the City Administrators.

Until the mid 1980's Ton continued to do work in physics; in fact he (co-) authored some thirty peer reviewed articles in physics, prior to his one hundred or so in scientometrics. This happened after his field switch which began in the early nineteen eighties. Until the late nineteen seventies, Dutch universities had gone through an unprecedented period of expansion, driven jointly by rapidly expanding participation in higher education and by a historically high long term rate of economic growth. The University Administration realized that a painful transition to slow growth or even contraction was to be expected. It wanted to obtain politically robust methods of internal allocation. Thus the bright young scientist Ton van Raan was asked to look into the possibilities for what would now be called evidence based allocation.

Eventually, this led, in 1986, to the establishment of CWTS within the Faculty of Social Sciences, with Ton van Raan as its first Director and, in 1991, as its first full time professor. The institute started with just a few staff members but rapidly grew to a size of fifteen. It obtained a steady flow of funds, especially for assessment studies and at the same time produced a large number of high impact papers, as well as two Handbooks in scientometrics. Two of its staff, Ton van

Raan (1995) and Henk Moed (1999), were awarded the Derek de Solla Price Medal.

In the Dutch academic system, institutes are periodically reviewed by international committees. These reviews are generally quite tough and the independent existence of quite a number of research units has been terminated after one of these reviews. Not so at CWTS: three times in succession the institute received the very highest grades (five on a five point scale) for its quality. Eventually this also led to material recognition and in 2008 the institute, that so far had to survive on project funding, the Minister of education, Culture and Science decided to grant it an annual million and half euros of additional permanent funding to secure its academic research.

Thus Ton's retirement as Director, though involuntary, comes at time when he has both secured the scientific foundations of the institute and its long term funding. To his successor he hands over a well established and financially uncommonly sound institute. And as staff of the Institute we are very happy that though Ton retires as director, he does not retire completely. He has received a renewed appointed as a Professor at CWTS, allowing him to continue to do scientific work and supervise PhD's.

11TH INTERNATIONAL CONFERENCE ON SCIENCE AND TECHNOLOGY INDICATORS, LEIDEN

Conference report by
TON VAN RAAN, ROBERT TIJSSEN & ED NOYONS / ORGANIZING COMMITTEE

On 9-11 September 2010, the Centre for Science and Technology Studies, CWTS, hosted the S&T indicators conference. The motto of the 11th edition was 'creating value for users'. In the beautiful venue of the Leiden Concert Hall in the old city centre, CWTS hosted this conference for the 5th time.

The review process yielded 50 oral presentations and 60 poster presentations. The audience of the conference consisted of 194 participants from 32 countries, while over 80% was from Europe and over 20% from the hosting country, the Netherlands. Thirty participants were registered ISSI members.

Regarding the content, the program chair explicitly introduced a range of new themes such as innovation and public-private research linkages for the first time in this series. Keynote speakers were:

- Frans van Vught, U-Map and U-Multirank: two new transparency tools







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- Dominique Foray, Enriching the indicator base for the knowledge economy
- Stevan Harnad, Open Research metrics and the Open Access advantage
- Henry Small, "sentimental" journey through science: applying linguistic methods to study inter- and intra-disciplinary citations
- Herbert Marsh, Improving the peer-review process for arc grant applications: reliability, validity, bias, and generalisability

The new topics of this conference, represented by the keynotes, guided the STI conference into a new era in which an alliance with the ENID, the European Network of Indicator Developers (www.enid-europe.org) will be established. While the STI series has a broader, global perspective, the ENID conferences are more focused on Europe and devoted to European STI policy issues. Next year September, the first of these STI/ENID conferences will be organized in Rome. The 2012 STI conference will be held outside Europe for the first time in its history: in Montreal, Canada (further details will be announced in due course)

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On Thursday the conference diner was held at the National Museum of Antiquities, where the guests were able to visit parts of the expositions during their stay. Another highlight of the evening was the speech a standup comedian, being introduced as the candidate successor of Prof Ton van Raan at CWTS.

For the second time the best poster was awarded. This year Stefanie Haustein won a short research stay at the hosting institute CWTS for her poster Multidimensional Journal Evaluation.

PRECONFERENCE TO CELEBRATE THE 65TH BIRTHDAY OF PROF AFJ VAN RAAN

The afternoon before the conference, the CWTS hosted a symposium in the honour of Prof Ton van Raan, the founder and director for many years of CWTS. In this comprehensive symposium, 7 invited speakers presented their view on the van Raan era and CWTS. The list of speakers represented a wide range of people being associated with the work of van Raan during the past decades. Besides colleagues from the field Prof Wolfgang Glänzel (KU Leuven) and Dr Robert Braam (Rathenau), high level policy makers and university board membersfrom the Netherlands were involved: Prof Karel Luyben (TU Delft), Dr Sijbolt Noorda (VSNU), Dr Eppo Bruins (STW) and Dr Hans Chang (KNAW) as well as a representative of the European Commission, Brian Sloan.

Just as the audience was preparing for the reception, the Mayor of Leiden entered the room and honored Prof van Raan with a royal decoration 'Knight in the Order of the Dutch Lion' for his career as a scientist, the role he played for CWTS and his activities as an ambassador of the city of Leiden.

Pictures of both preconference and STI 2010 conference can be found and downloaded at: http://www.cwts.nl/sti_2010

ESSS 2010

A REVIEW OF THE INAUGURATIONAL EUROPEAN SUMMER SCHOOL FOR SCIENTOMETRICS IN BERLIN

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esss european summer school for scientometrics

The first esss (European Summer School of Scientometrics) took place at the Humboldt University in Berlin from 16 to 18 June 2010. The event was jointly organised by the University of Vienna (Austria), the Humboldt University (Germany), the Katholieke Universiteit Leuven (Belgium) and the iFQ (Institute for Research Information and Quality Assurance, Germany).

esss was launched as a response to the increasing demand for scientometric expertise in the field of bibliometric methodology and its applications, on the one hand, and to the insufficient educational opportunities on bibliometric techniques, on the other hand. The esss 2010 "pilot" started "small, but beautiful" and gave a premium foretaste of what to expect in the future.

The opening day (16 June) was dedicated to keynotes and lectures delivered by the organisers and invited international experts in this field. Wolfgang Glänzel (KU Leuven, Belgium) set the stage for the morning keynotes and provided a synopsis of the development of bibliometrics, followed by Anthony van Raan (Leiden University, the Netherlands) who shared his vast expertise on advanced bibliometric indicators for research evaluation. András Schubert (ISSRU Budapest, Hungary) then introduced the audience to the analysis of scientific networks, and Koenraad Debackere (KU Leuven, Belgium) finally presented concepts and tools driving innovation policy.

In the afternoon Wolfgang Glänzel first talked about bibliometric initiatives and the institutionalisation of the field in Europe. Henk Moed (Elsevier, the Netherlands) continued with insights in research assessment using bibliometric indicators. The evaluation topic was further pursued by Jonathan Adams who demonstrated suc-

cesses and failures of bibliometric practices in research evaluation and national science policy. Judit Bar-Ilan (Bar-Ilan University, Israel) then discussed the options and the limitations of the internet for bibliometric analyses. Social Sciences and Humanities are widely perceived as the "problem children" in bibliometrics, thus Gunnar Sivertsen (NIFU STEP, Norway) presented the Nordic approach to the creation of appropriate data sources for these research areas. The last two presentations touched on the use in and consequently the direct influence of bibliometrics on research management at universities. Ulrich Schmoch (Fraunhofer ISI, Germany) talked about the impact of new public management on the scientific performance of universities, whereas Elke Williamson (University of Münster, Germany) introduced the audience to the way bibliometrics is used in the context of formula based funding with much humour.

Last, but not least the esss was officially inaugurated at the evening dinner in the university restaurant Cum Laude by representatives of all organizing institutions.

Two thematic modules were then offered on 17 and 18 June, each with introductory talks and seminars in the mornings and practical exercises in the afternoons. Module 1 was dedicated to "Journal Impact Measures" with lectures by Juan Gorraiz, Carmen López-Illescas (SCImago, Spain), Peter Vinkler (CRC-HAS, Budapest) and Wolfgang Glänzel, whereas module 2 dealt with "h-Indices", presented by Stefan Hornbostel, Wolfgang Glänzel and Judit Bar-Ilan. The scope of module 1 was to provide an in-depth overview of the Journal Impact Factor with all pros and cons as well as to point out alternative journal impact indicators like the brand-new SNIP and SJR. In module 2 it became obvious that there is a plethora of h-indices to choose from, and that values for the same indicator depend on the data source on which the calculation is based on.

Special emphasis was placed on providing intensive the support for the participants during the hands-on sessions. The esss staff was available to answer questions or assist participants individually with the practical exercises.

In all, the first esss was a great success. The thematic modules were already fully booked 10 days after the registration had opened at the end of March with many waitlisted people. Some even wished to already register for 2011.

Around 90 participants from 13 different countries in Europe and even from overseas attended the opening day, a group of 25 (i.e. the maximum number of participants) then participated in the two thematic modules offered this year. The highly positive feedback is encouraging for all esss organizers who are busy with the successful continuation and further development of this initiative.

Moreover esss has been mentioned twice in the latest special issue "Science Metrics" of Nature. "...Setting a good example is the European Summer School for Scientometrics, ... It promises a science-based approach to tutoring on the merits and pitfalls of various metrics. ... will also help to educate those who use metrics in evaluation ..." (Assessing assessment. *Nature*, 465 (7300), 845.)

esss 2011 will be hosted by the University of Vienna and is anticipated to take place within the first half of September.

CI-SPEED: A HIRSCH-TYPE CITATION SPEED INDEX FOR A SET OF ARTICLES

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ABSTRACT

A Hirsch-type index, denote as ci-speed, is introduced for measuring the speed with which the first citation of a given set of articles occurs. Examples of its use are provided.

A. INTRODUCTION

The first time that an article is cited, especially if this is a non-selfcitation, is an important point in this article's 'life'. Consequently, over the years this event has received quite some attention in the informetric literature. Examples are Schubert & Glänzel (1986), Glänzel (1992), Rousseau (1994), Glänzel & Schoepflin (1995), Egghe (2000), Burrell (2001), Glänzel & Rousseau (2010). Recently the first citation speed has been characterized in a Hirsch-type way by Bornmann & Daniel (2010) and by Egghe, Bornmann and Guns (2010). These two approaches have, however, one problem. They do not take uncited articles into account. In this contribution we propose a Hirsch-type approach for the first-citation speed of a given set of articles (a standard example is a journal issue), leading to an index such that if any article in this group receives its first citation the group's citation speed does not decrease. The notion we define in this contribution is called the ci-speed ("ci" as in citation). As our article presents a Hirsch-type approach it is, however, possible that the group's ci-speed stays the same when a new article receives its first citation.

In the context of sources and items, the case of articles receiving a first citation is just one case of the general situation of a source that produces its first item of importance. This 'item of importance' can also be the second citation, or, in general, the nth citation (Egghe & Rao, 2001; Burrell, 2003). For simplicity we

will present our contribution in the context of a set of articles receiving their first citation. As the differences between our approach, the Egghe-Bornmann-Guns approach and the direct approach of taking the harmonic mean of the time elapsed between publication and the first citation, are rather subtle we postpone this discussion to another article.

B. THE CI-SPEED

Following the approach taken by Bornmann & Daniel (2010) and by Egghe, Bornmann and Guns (2010), we too define our new citation speed index in a Hirsch-type fashion. This implies that some advantages and disadvantages of the *h*-index also apply to the ci-speed index.

Consider a given (fixed, i.e. unchangeable) set of articles (at least two). A typical case is a journal volume or journal issue. Assume that this set consists of N papers and assume that one year is the time unit used. For each of these papers the difference between the year of publication and the year of its first citation is determined. If an article has not yet been cited at the moment of investigation then this difference is set equal to infinity. Let d be this difference plus one and set f = 1/d. This means that an article that has been cited in the same year as its publication year has an f-score equal to 1. Articles that have been cited later have an f-score strictly between 0 and 1. Articles that have not yet been cited have an f-score equal to zero. These N f-scores are ranked from largest to smallest: $f_1, f_1, \ldots, f_N$.

Consider now the points with coordinates $(i/(N-1), f_{i+1})_{i = 0, \ldots, N-1}$. These points are joined through a polygonal line. Next, determine the intersection of the diagonal and this polygonal line. This procedure is similar to the determination of the real-valued *h*-index (Rousseau, 2006; Guns & Rousseau, 2009); hence our approach is a Hirsch-type approach. Finally, the ci-speed is equal to the x-coordinate, which is equal to the y-coordinate of this intersection.

The above is a graphical description. Of course we can also provide an algebraic one. Consider the consecutive points

$$\left(\frac{i}{N-1}, \frac{1}{d_{i+1}}\right)$$

and

$$\left(\frac{i+1}{N-1}, \frac{1}{d_{i+2}}\right).$$

Assume that

$$\frac{i}{N-1} < \frac{1}{d_{i+1}}$$

(the first point lies strictly above the diagonal) and

$$\frac{i+1}{N-1} \geq \frac{1}{d_{i+2}}$$

(the second point lies below or on the diagonal) then the line connecting these two consecutive points intersects the diagonal line. This happens in the point with coordinates which are both equal to the ci-speed, obtained as follows. The line through the points

$$\left(\frac{i}{N-1}, \frac{1}{d_{i+1}}\right)$$

and

$$\left(\frac{i+1}{N-1}, \frac{1}{d_{i+2}}\right)$$

has equation

$$y = \frac{(N-1)(d_{i+1} - d_{i+2})}{d_{i+1}d_{i+2}}x + \frac{d_{i+1} + (i+1)(d_{i+2} - d_{i+1})}{d_{i+1}d_{i+2}}$$

Setting x = y yields that the ci-speed is equal to

$$\frac{d_{i+1} + (i+1)\Delta_i}{d_{i+1}d_{i+2} + (N-1)\Delta_i} \quad (1)$$

with $\Delta_i = d_{i+2} - d_{i+1}$. We note that if $d_{i+2} = d_{i+1}$ then the ci-speed is $1/d_{i+1} = 1/d_{i+2}$.
If it never happens that

$$\frac{i}{N-1} < \frac{1}{d_{i+1}}$$

and

$$\frac{i+1}{N-1} \geq \frac{1}{d_{i+2}}$$

then $d_{i+1} = \infty$ for $i = 0, \ldots, N-1$ and the intersection point is the point with coordinates (0, 0).

TWO SIMPLE EXAMPLES

Example 1. If the set of articles consists of 5 articles, which are, at a given moment cited

as shown in Table 1, then this set's ci-speed is 0.5 (N = 5; i = 1 ; $d_{i+1} = 1$; $d_{i+2} = 2$ in equation (1)).

Index nr (i)	d_{i+1}	i/(N-1)	$f_{i+1} = 1/d_{i+1}$
0	1	0	1
1	1	0.25	1
2	2	0.50	0.50
3	3	0.75	0.333
4	uncited	1.00	0

Table 1 Citation data

Example 2. If the set of articles consists of 4 articles, which are, at a given moment cited as shown in Table 2, then this set's ci-speed is 7/13 ≈ 0.538 (N = 4; i = 1 ; $d_{i+1} = 1$; $d_{i+2} = 4$ in equation (1)).

Index nr (i)	d_{i+1}	i/(N-1)	$f_{i+1} = 1/d_{i+1}$
0	1	0	1
1	1	0.333	1
2	4	0.667	0.25
3	5	1.000	0.2

Table 2 Citation data

Figure 1 illustrates the procedure for the second example.

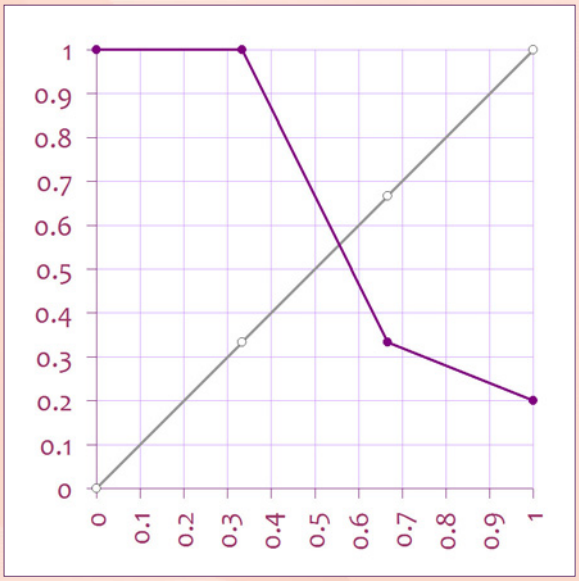

Figure 1

C. PROPERTIES

1) If none of the articles has been cited then the intersection point is (0, 0) and the ci-speed index is 0 (the exceptional situation, not obtained by equation (1)).
2) If all articles are cited during their publication year then the intersection point is (1, 1) and the ci-speed index is 1, see equation (1).
3) The ci-speed index of a fixed set of articles never decreases in time.
4) When the N articles all have the same d-value (a case also considered in Egghe-Bornmann-Guns), then the ci-speed is 1/d; the larger this d-value the smaller the ci-speed.
5) When the N articles all have the same d-value, and if this value is multiplied by a positive constant c, then the new ci-speed index is 1/(cd). This is smaller than 1/d if c > 1, equal to 1/d if c = 1, and larger when c < 1.
6) If there are 2k+1 articles and the one ranked k+1 (with index number k) has d-value 2, then the ci-speed is 0.5.
7) If, at a certain moment, the ci-speed of a journal volume is determined by two cited articles then the index for that journal volume has reached its final value in the sense that when other articles that are uncited at that moment, become cited (later) the journal volume's ci-speed does not alter anymore (a typical *h*-type robustness property). The reason is that citing such a previously uncited article only changes the polygonal line beyond (to the right of) the intersection point.
8) If the ci-speed is determined by a cited article and an uncited one then the ci-speed can still increase in the future. Note that only in the case that not a single article has been cited the ci-speed is determined by uncited articles only.

D. A REAL-LIFE EXAMPLE

As an example we determine the ci-speed of the first issue of the *Journal of Informetrics*, volume 1, issue 1 (2007). Table 3 shows the data (note that all these articles are already cited, be it that some have only received self-citations). Data were collected on September 13, 2010.

The ci-speed is 0.545 (including self-citations) and 0.5 if self-citations are not taken into account.

Index nr (i)	d_{i+1}	i/(N-1)	$f_{i+1} = 1/d_{i+1}$
0	1	0.000	1
1	1	0.111	1
2	1	0.222	1
3	1	0.333	1
4	1	0.444	1
5	2	0.556	0.5
6	2	0.667	0.5
7	2	0.778	0.5
8	3	0.889	0.333
9	3	1.000	0.333

Table 3 First-citation data for JOI 1(1), all citations

Index nr (i)	d_{i+1}	i/(N-1)	$f_{i+1} = 1/d_{i+1}$
0	1	0.000	1
1	1	0.111	1
2	1	0.222	1
3	2	0.333	0.5
4	2	0.444	0.5
5	2	0.556	0.5
6	3	0.667	0.333
7	3	0.778	0.333
8	3	0.889	0.333
9	∞	1.000	0

Table 4 First-citation data for JOI 1(1), non-selfcitations

E. CONCLUSION

We have introduced the ci-speed, a Hirsch-type measure for the speed with which a set of articles receives its first citation. Examples of its application were provided. It is shown that the notion of ci-speed has good properties.

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A DEMOGRAPHIC LOOK AT SCIENTOMETRIC CHARACTERISTICS OF A SCIENTIST'S CAREER

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ABSTRACT

Some demographic methods are reformulated for application in a scientometric context. The age of publications and citations are presented in age-pyramids and supplemented by the mean age of the publications in each h-core. This approach is applied to 14 active Price awardees.

1. INTRODUCTION

Since the h-index has been introduced by JE Hirsch in 2005, the analysis of scientists' individual careers gained a new impetus. Scientists in different disciplines were very soon ranked according their h-index. Although such exercises proved hazardous by many reasons (cf. Glänzel, 2005), the presentation of the h-index of scientists, considered 'leading' in their fields, remained quite popular (e.g., Glänzel and Persson, 2005; Egghe, 2006; Bar-Ilan, 2006, 2010). Indeed, Hirsch's indicator might serve as kind of confirmation of the supposed high level of an individual's research performance. Besides its well-known subject-dependence (cf. Batista et al., 2006), the h-index is sensitive to the scientist's academic age. In order to eliminate this effect, it was suggested to normalise the individual's h-index by the respective career length (e.g., Jensen et al., 2009). However, normalisation eliminates important aspects that are captured by the h-index. Subject-specific peculiarities and characteristics of career stages are thus lost if the measure is normalised. The changes in the h-index and the h-core along with the age structure of publications and citations allow a deeper insight into an individual's career and might reflect breaks, a caesura or shift in the scientist's academic life. For the following exercise we have selected Price medallists with a career length of about three decades or more and applied some special tools, which are partially adopted from de-

mographic analysis, to study their individual careers from a bibliometric perspective.

2. A DEMOGRAPHIC LOOK AT THE CAREER OF PRICE AWARDEES

2.1. THE AGE PYRAMID

In demographics, the population pyramid is an elementary tool to reflect the age structure and the growth characteristics of a given population. In an age pyramid or age structure diagram, the age distribution in a human population is shown in a double bar diagram, where the various male age groups are plotted against the corresponding female groups. Demographers distinguish 5–7 paradigmatic shapes reflecting different types of expanding, stationary and contracting population models. From the mathematical viewpoint, one can distinguish simple linear, convex and concave shapes as well as more complex shapes with and without inflection point. Most known shapes in demographic analysis of human populations are the triangle (reflecting steady growth with high fertility and high mortality in all age groups), the pagoda shape (with very high fertility and high infant mortality), the bell shape (typical of the baby boom in the industrial countries after World War II), beehive shape (reflects a stationary structure, provided infant mortality is low) and the "onion" shaped (reflecting superannuation of the population).

Of course, the above characteristics refer to 'real' populations; the adoption of the model in a informetric context does certainly require some re-interpretations. While the notion of fertility can still be interpreted as the current publication activity, *mortality does not exist* in this context since papers, once published, and citations, once received, will not disappear from the system any more. And life expectation can at the best be interpreted in terms of obsolescence as reflected, for instance, by the life-time distribution of citations (cf. Glänzel and Schoepflin, 1995). The concept of mortality should therefore be renounced when this model is applied to informetrics. This holds, above all, for the interpretation of the triangle and pagoda shape. Both patterns just express higher activity in recent years; by contrast, the beehive shape reflects stable publication activity over time, while the onion or urn shape indicates decreasing activity of the author in the recent years. The same holds *mutatis mutandis* for the age profile of citation impact. Since papers are still cited even when a scientist is not active any more, the right-hand side of the diagram tends to be rather triangle- or pagoda-shaped. However, beehive or onion shape might occur as well.

In the present study we have grouped publication and citation counts by three-year periods to avoid fluctuations and to avoid periods of relative inactivity. We plot the distributions of papers according to their age at the left-hand side of the diagram, that of citations at the right-hand side. In order to facilitate visualisation, we have rescaled citations by factor 25.

2.2. THE AVERAGE AGE OF PUBLICATIONS IN EACH HIRSCH CORE

Let *h* denote the actual value of an h-index. All publications, which have received at least *h* citations, form the Hirsch core (Jin et al.,2007). Then a h-core sequence could be tracked in accordance with the h-index sequence (cf. Liang , 2006; Burrell, 2007). Here we include the most recent ones in the h-core if there are several publications with exactly *h* citations.

The calculation of the age of publications in each h-core is also based on the three-year period. The age of papers in each h-core is equivalent to the difference between the "current unit" (i.e., the period for the h-core in question) and the time unit of publication. For instance, a publication in unit 1 has an age of 2 if it appears in the h-core of unit 3. Here we define the "time zero" (for this author) as the time unit when the author's first publication appeared in the WoS.

The arithmetic mean age of publications of this *h-core sequence* is calculated, which expresses whether the more recent or the older publications are predominant in the respec-

tive h-core. The obtained patterns, in a way, correspond to the above-mentioned patterns of publication and citation age, but they do reflect completely different aspects.

Also for this indicator, we can find for paradigmatic patterns.

1. A linear shape of the mean age of the h-cores plotted against time reflects steady growth of the age of most cited publications.
2. A convex shape reflects growing age of the most cited papers. This means that the "top" papers were rather published in earlier stages of the scientist's career.
3. A concave shape reflects decreasing age of highly cited papers, that is, recent papers by the author are the more cited ones.
4. "Indefinite" shape. This covers all cases not listed above.

Case 1 can be considered a standard situation. One might expect that a paper remains in the h-core once it has already received a sufficient number of citations. One reason is certainly the well-known success-breeds-success effect. If an author becomes less active or inactive, the age of the h-core will disproportionally increase after a while. This might result in a convex shape. If, however, more and more recent papers enter the h-core, the age curve turns concave. Sometimes a newly emerging 'hot topic', such as the h-index, network visualisation or the China's emergence is responsible for this phenomenon.

In the following section we will present the scientometric age pyramids and the h-core age of selected Price awardees.

3. THE PRICE MEDALLISTS

For the following discussion we have selected a group of Price Medallists who where active in the last 25 or more years, and have a sufficiently large number of papers in scientometrics and information science. Several awardees had to be excluded because the above-mentioned reasons. This is not at all a "quality" assessment as well as the proposed method is not intended for evaluation or ranking. The method simply requires a sufficiently large number of recent publications. Only papers indexed as *article*, *letter*, *note*, *proceedings paper* and *review* in Thomson Reuters *Web of Science* (WoS) since 1955 have been taken into consideration. Data have been retrieved between 5 and 24 August 2010.

The awardees are presented in alphabetic order. A short introduction of the Price medallists can be found in Glänzel and Persson (2005) or on the official website of ISSI Society at http://www.issi-society.info/price.html.

Two graphs are presented for each awardee, the first one refers to the age pyramid, the second one to the average age of publications in each h-core. Unlike in an earlier study (Glänzel and Persson, 2005) non-scientometric papers have not been removed. In most cases, this did not prove a problem, but for Tibor Braun, who is a very active author in both chemistry and scientometrics throughout his career, we had to make up two charts, one each for his total publication output and his papers in scientometrics and scientometrics and information science. All charts can be found in the Appendix. We would like to leave their interpretation to the reader; and we would like to encourage the reader not only to view statistics and trends but also to look at the topics and the content of the work by the authors under study. Nevertheless, we will give the following hints.

At a first sight at the diagrams, some typical patterns immediately strike the eye. The triangle and pagoda type combined with the decreasing average age of the publications in each h-core (e.g., Egghe, Glänzel, Leydesdorff, Rousseau) suggests some recent hot topics in the work of the authors in question. The intensive and sped up communication in these topics resulted in both impressive publication activity and high citation impact. We could actually identify, e.g., topics like *h-index*, *mapping and visualisation of networks* as well as studies of *emerging economies*.

AJF van Raan switched from physics to bibliometrics around 1985. He has no further physics paper indexed in the WoS after this year. The break is clearly visible (cf. Figure 12, top). Although András Schubert still published papers in chemistry after he has

started up his career in scientometrics, one can observe a similar break in Schubert's age distribution in 1980. By contrast, chemistry was always predominant in Tibor Braun's career. He remained faithful to chemistry throughout his career till the very present. As already mentioned above, we therefore present his scientometric age profile and the h-core diagram for all papers and separately for scientometrics. Interestingly enough, the shape of both his scientometric pyramid and the average age in each h-core mirror the shape obtained from his complete work.

Beyond any doubt, Eugene Garfield's scientometric age pyramid is the most impressive one among all Price awardees. At present, his career comprises more than 55 years. Since our version of the WoS goes back only till 1955, we might have missed about three of his journal papers published in 1954. The age profile of publication forms almost a perfect Gaussian distribution with a mode/median/mean around 1985. Most of these papers were published in *Current Contents.* The fact that the age curve of citations does not follow the publication patterns (with the necessary delay) is worth mentioning. Citation impact increases steadily since 1999.

4. CONCLUSIONS

In the present paper individuals' publication and citation age patterns have been presented in a demographer's way. It might be interesting to extend this type of informetric application to real author populations such as research groups or departments. Probably more pronounced shapes and trends can be expected. The changing constitutions of teams with stable cores (continuants) but with varying extend of transients, newcomers and terminators (cf. Price and Gürsey, 1976) might have strong influence on the age structure of the team's publications and citations received by those. Young and dynamic teams are, of course, expected to have somewhat different profiles than "gerontocratically" structured groups but to analyse this is left to future research.

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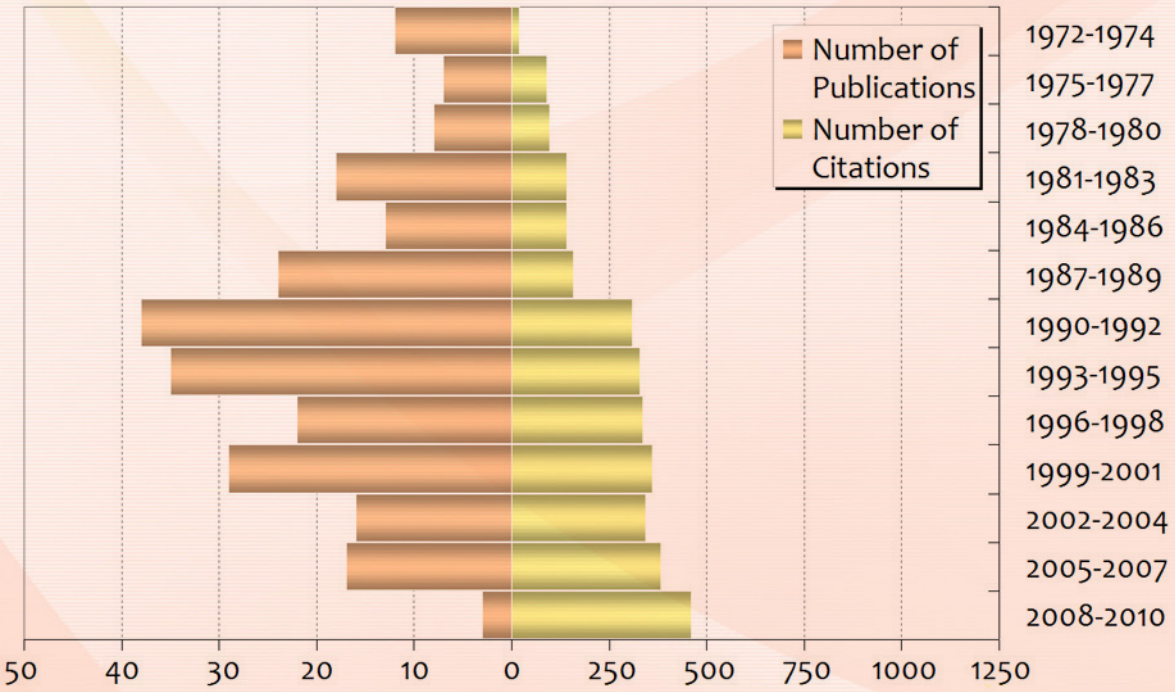
APPENDIX

TIBOR BRAUN – 1



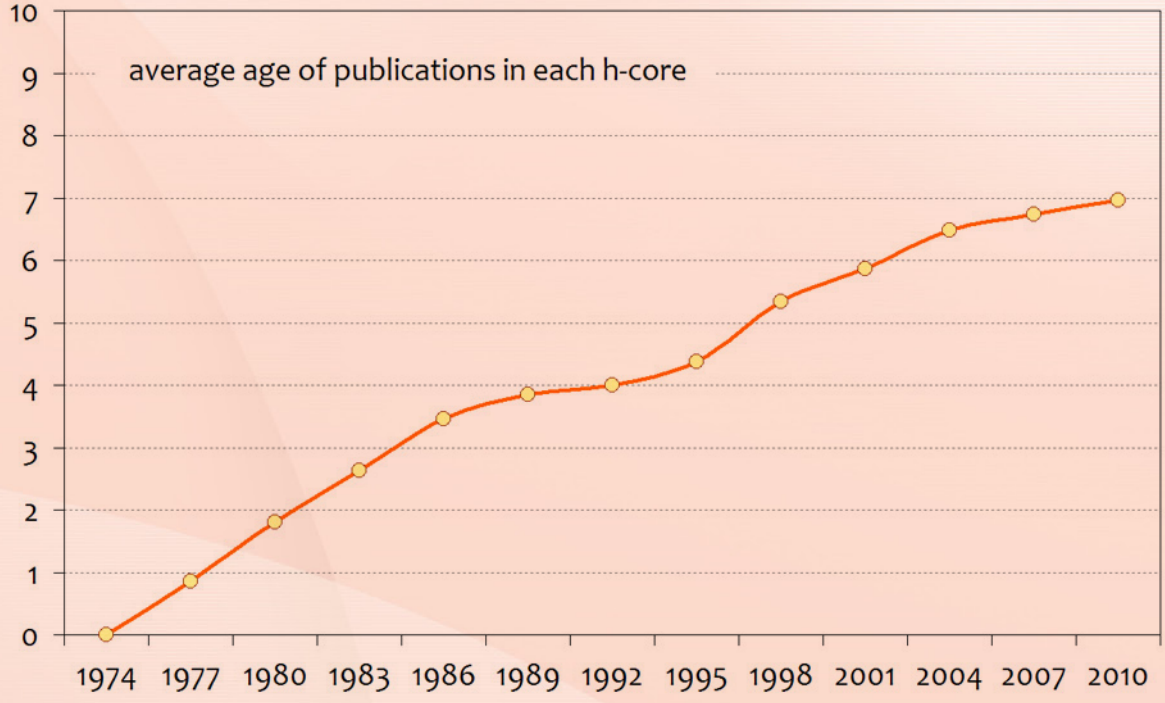
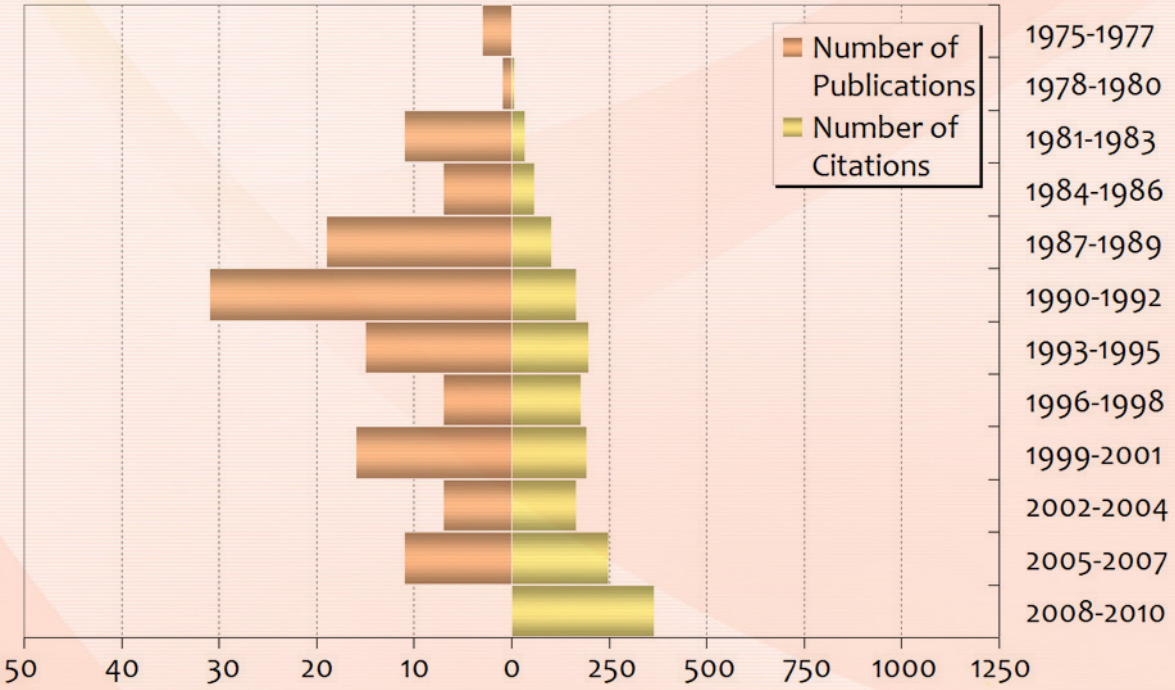


Figure 1a. Scientometrics age pyramid and mean age sequence of publications in each h-core for Tibor Braun (Price award received in 1986) – all papers

APPENDIX

TIBOR BRAUN – 2



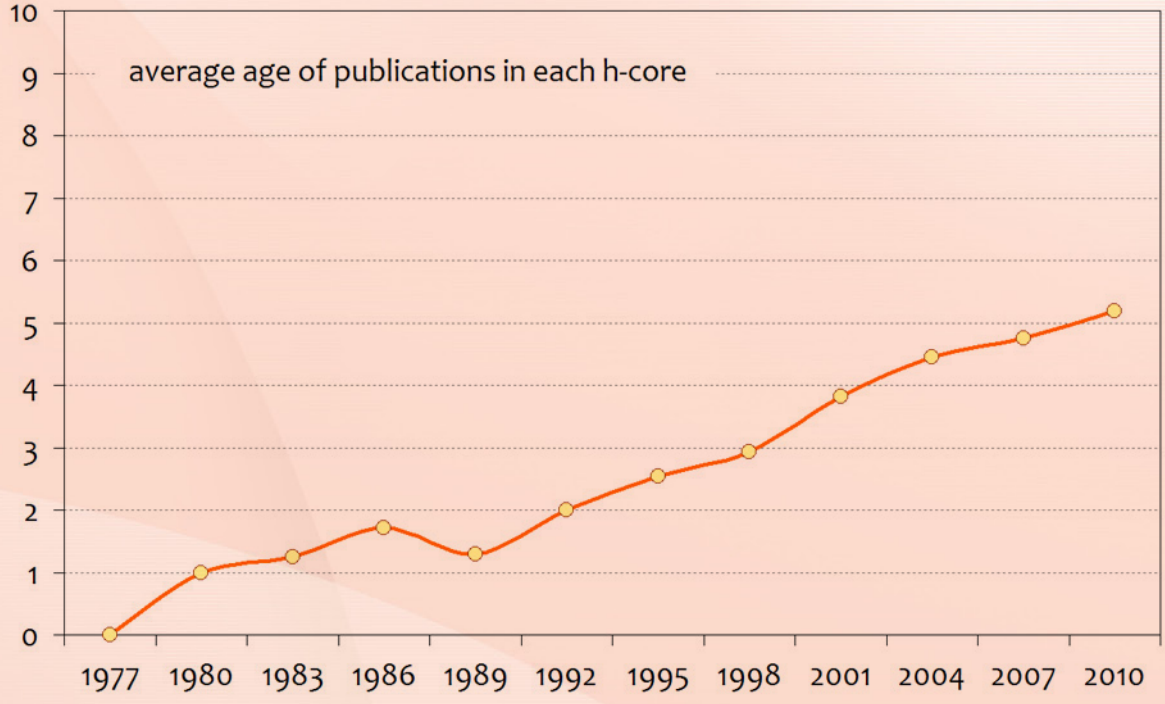
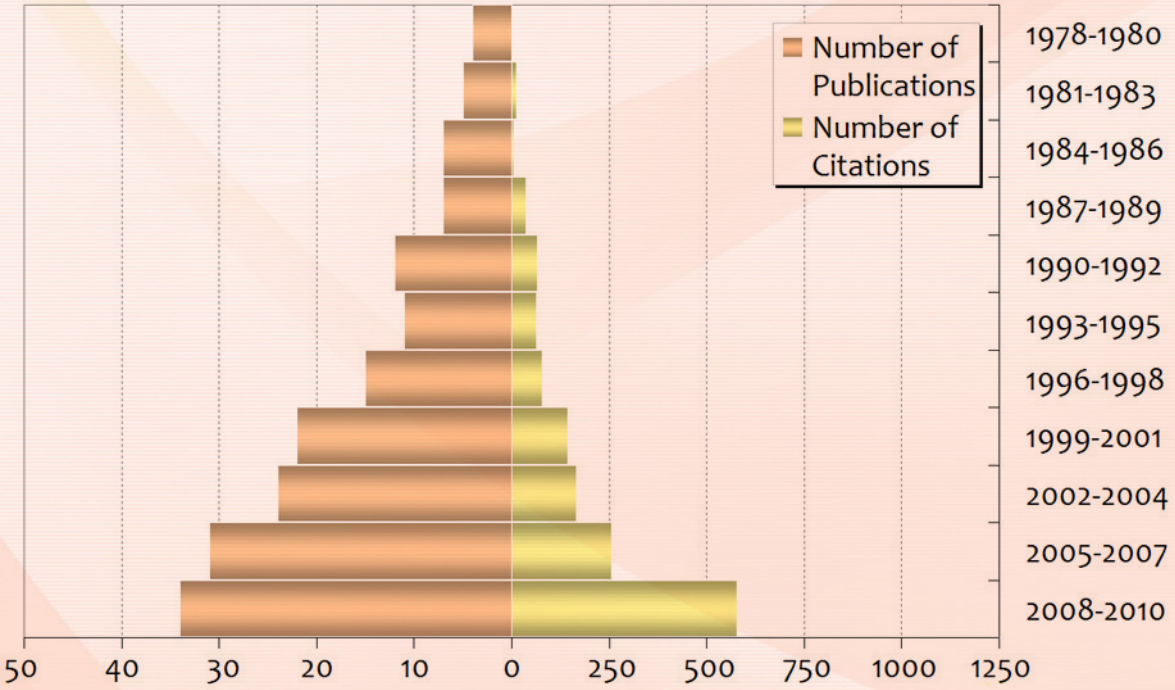


Figure 1b. Scientometrics age pyramid and mean age sequence of publications in each h-core for Tibor Braun (Price award received in 1986) – scientometric papers

APPENDIX

LEO EGGHE



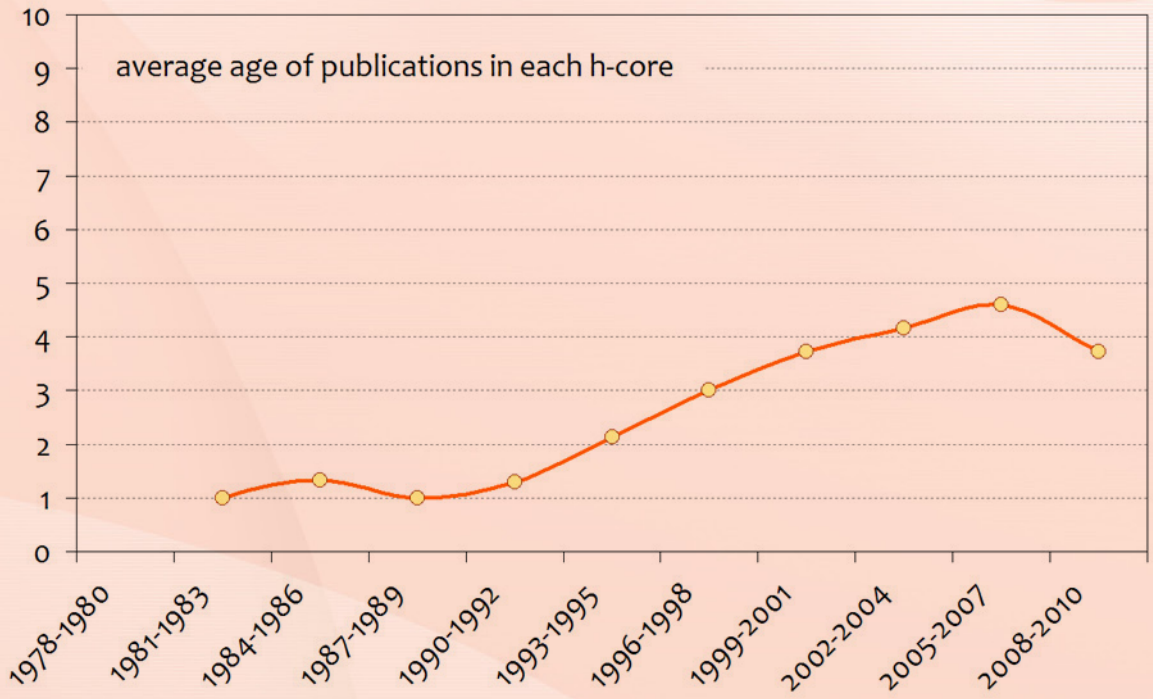


Figure 2. Scientometrics age pyramid and mean age sequence of publications in each h-core for Leo Egghe (Price award received in 2001)

APPENDIX

EUGENE GARFIELD

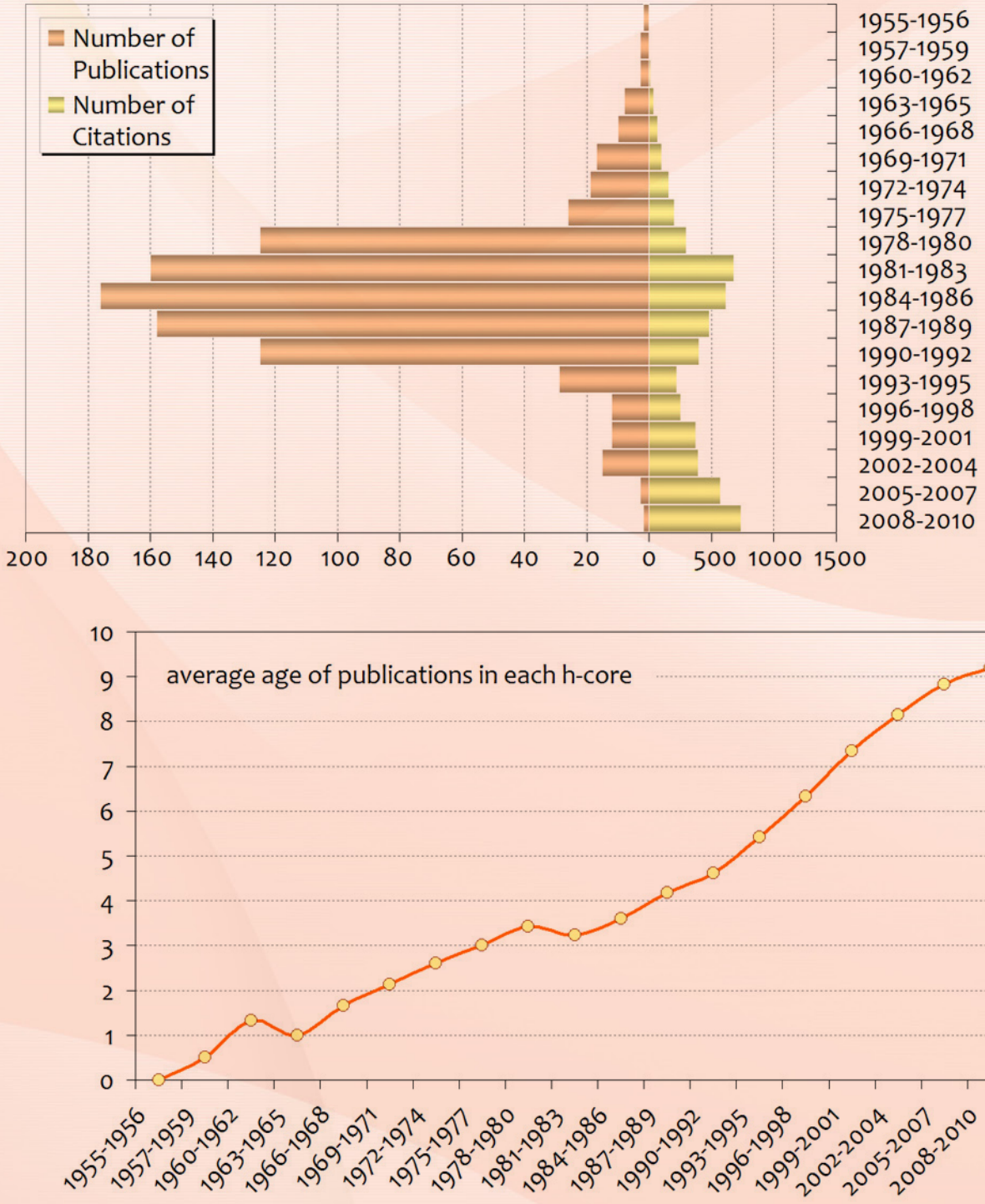
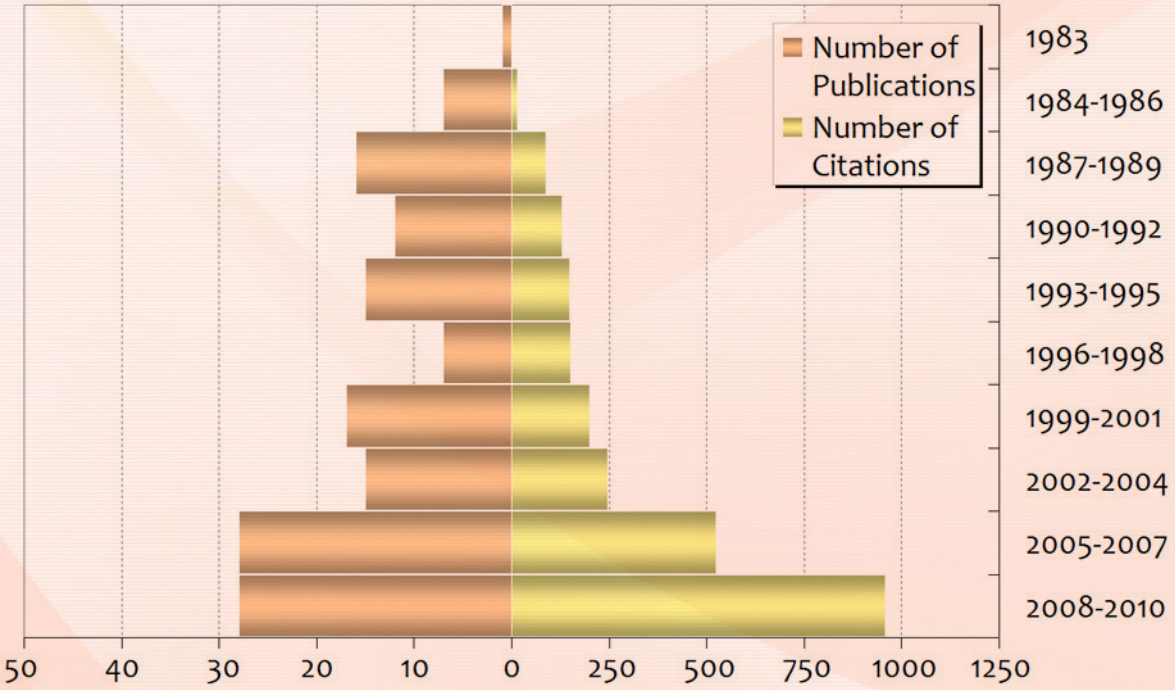


Figure 3. Scientometrics age pyramid and mean age sequence of publications in each h-core for Eugene Garfield (Price award received in 1984)

APPENDIX

WOLFGANG GLÄNZEL



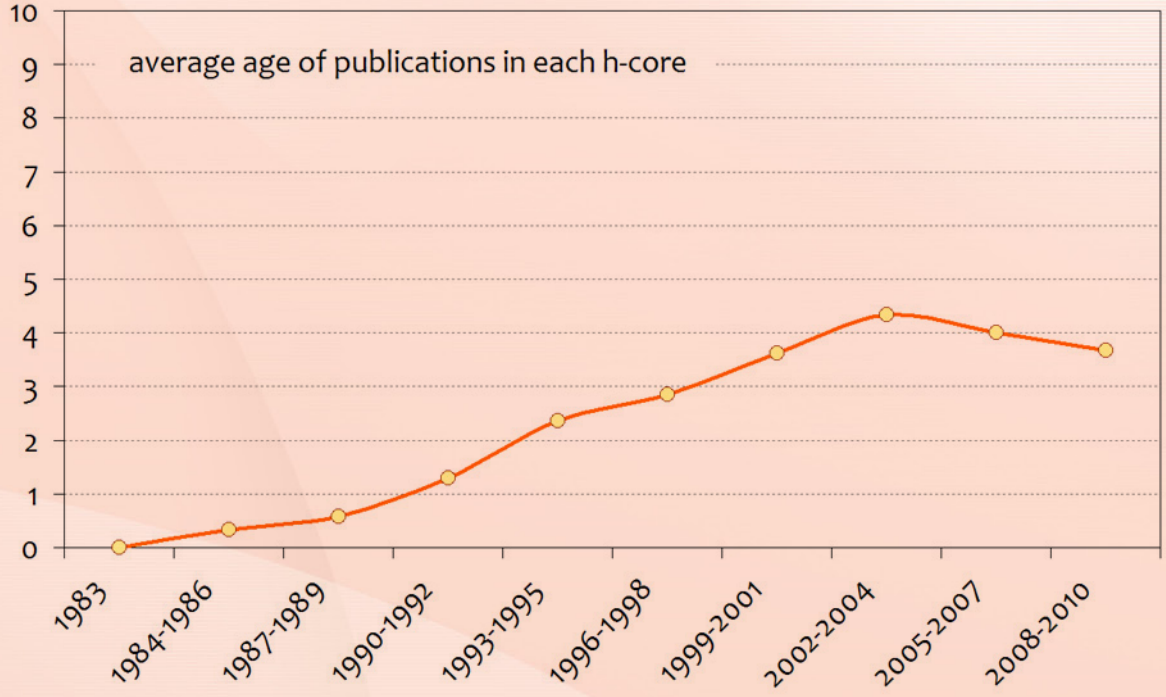
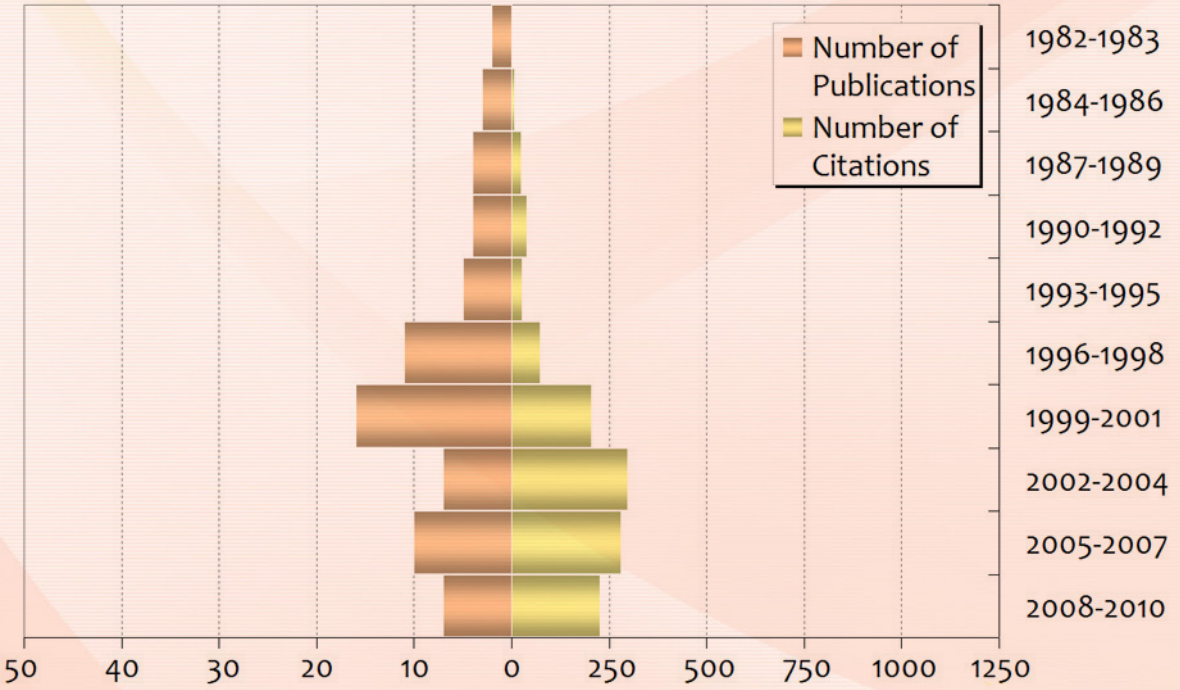


Figure 4. Scientometrics age pyramid and mean age sequence of publications in each h-core for Wolfgang Glänzel (Price award received in 1999)

APPENDIX

PETER INGWERSEN



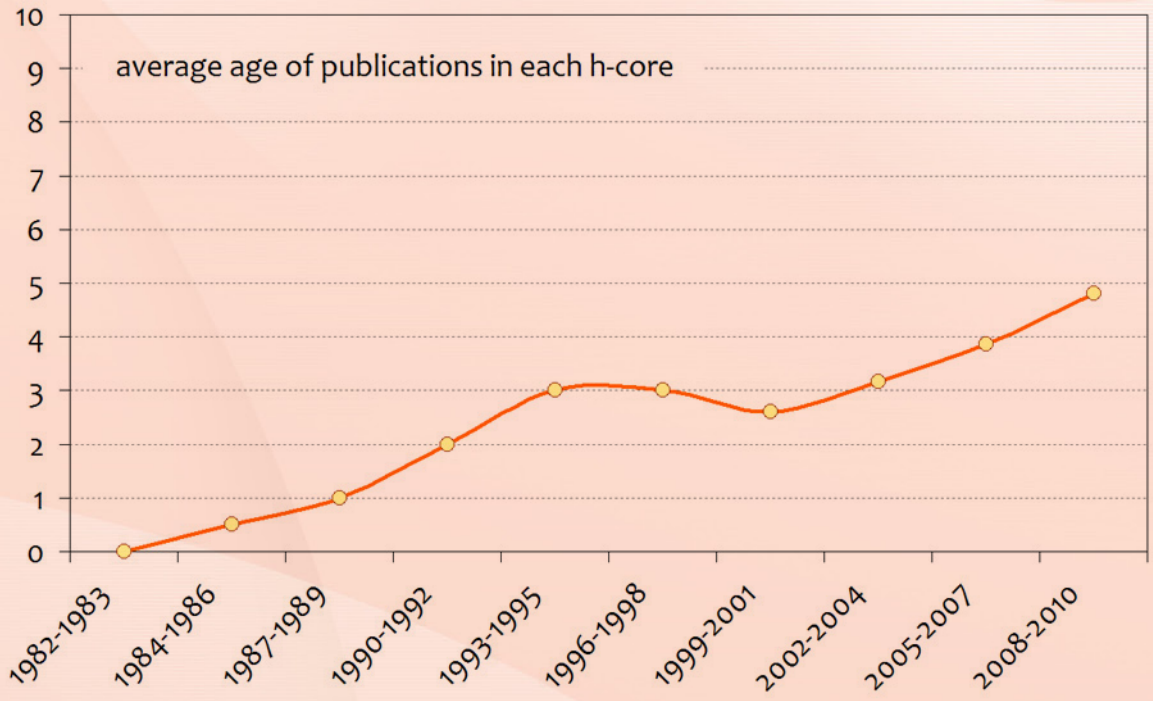
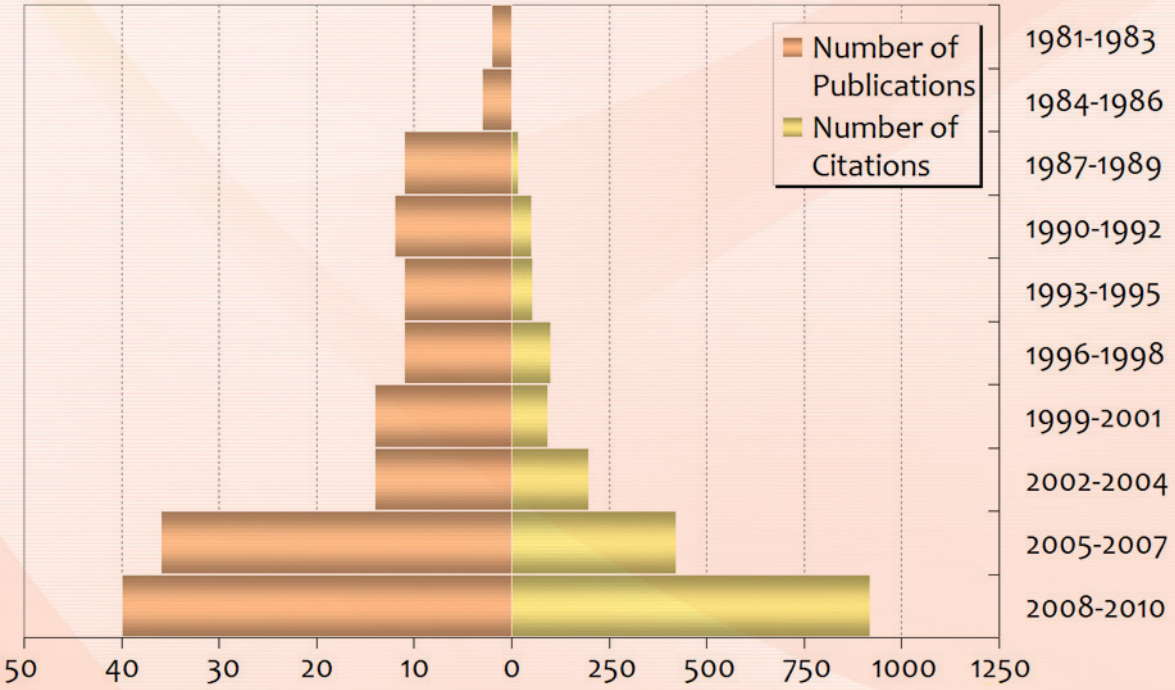


Figure 5. Scientometrics age pyramid and mean age sequence of publications in each h-core for Peter Ingwersen (Price award received in 2005)

APPENDIX

LOET LEYDESDORFF



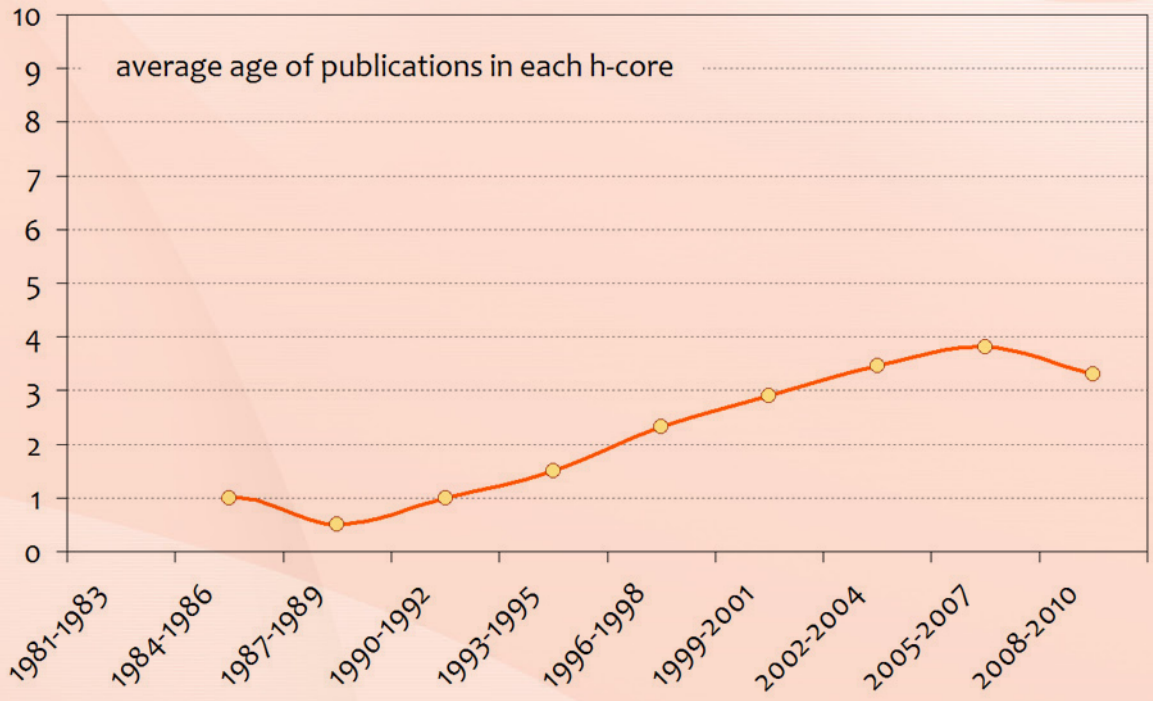
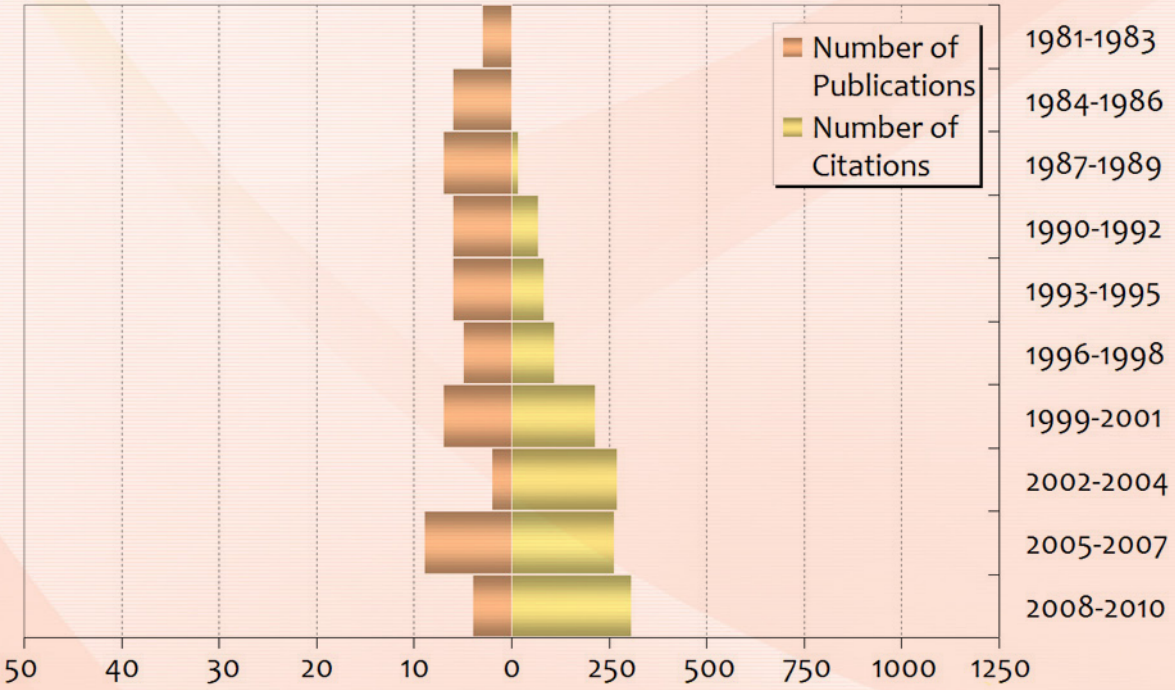


Figure 6. Scientometrics age pyramid and mean age sequence of publications in each h-core for Loet Leydesdorff (Price award received in 2003)

APPENDIX

KATHERINE MCCAIN



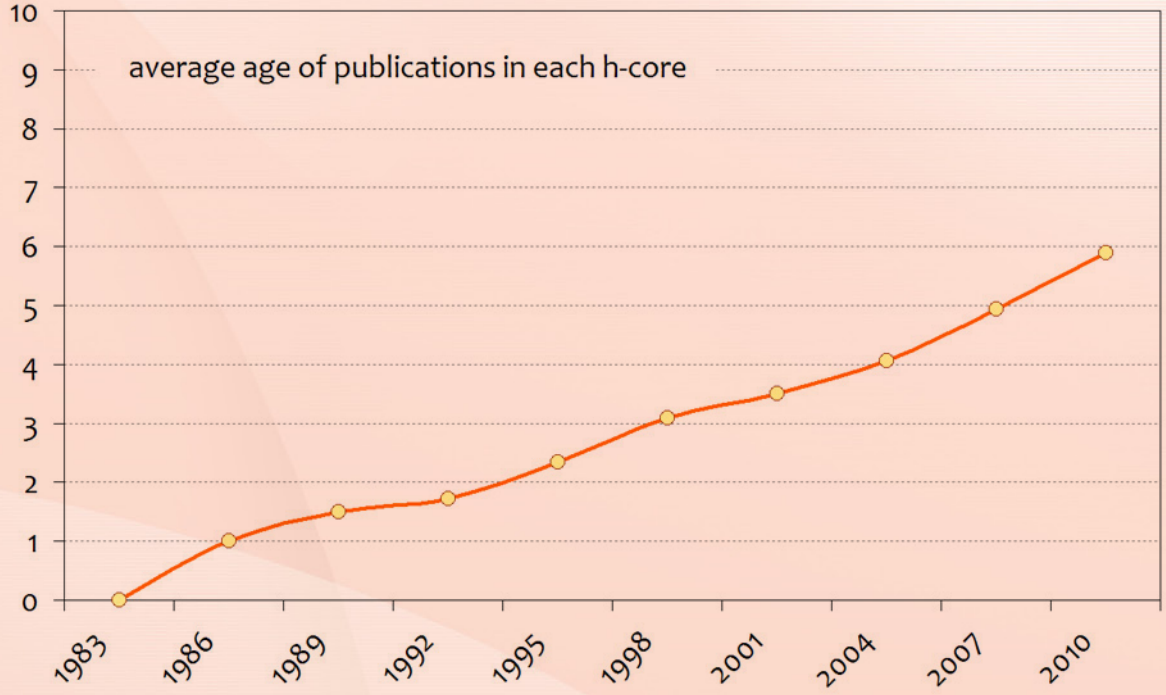
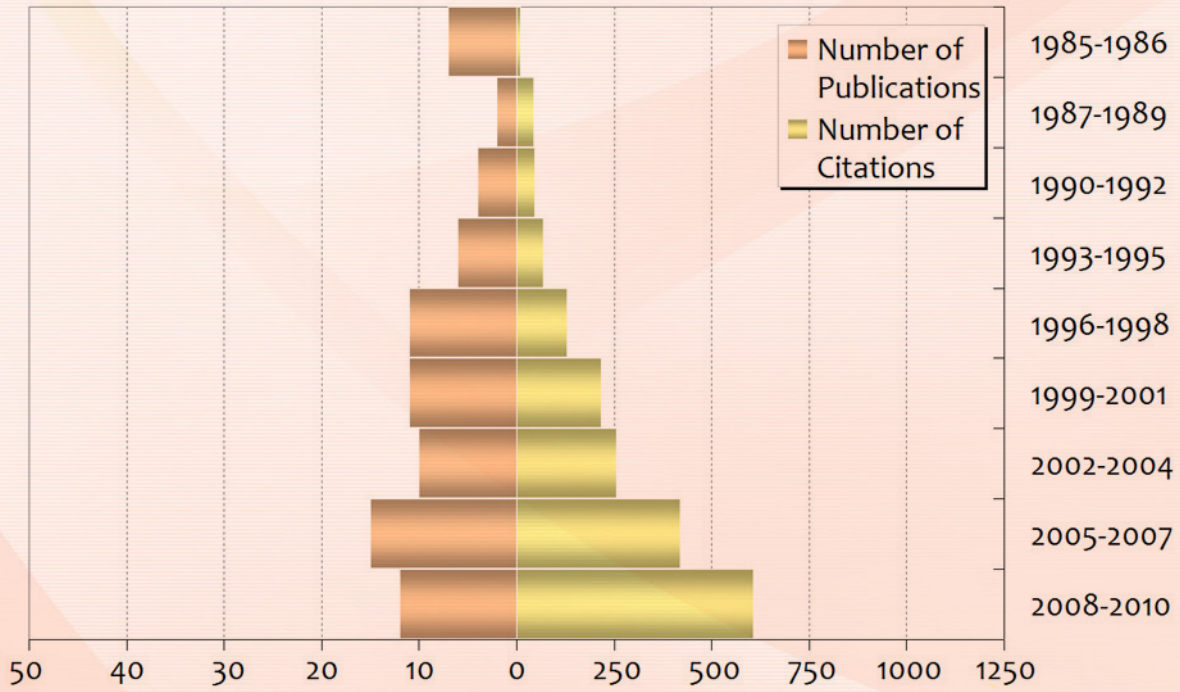


Figure 7. Scientometrics age pyramid and mean age sequence of publications in each h-core for Katherine McCain (Price award received in 2007)

APPENDIX

HENK MOED



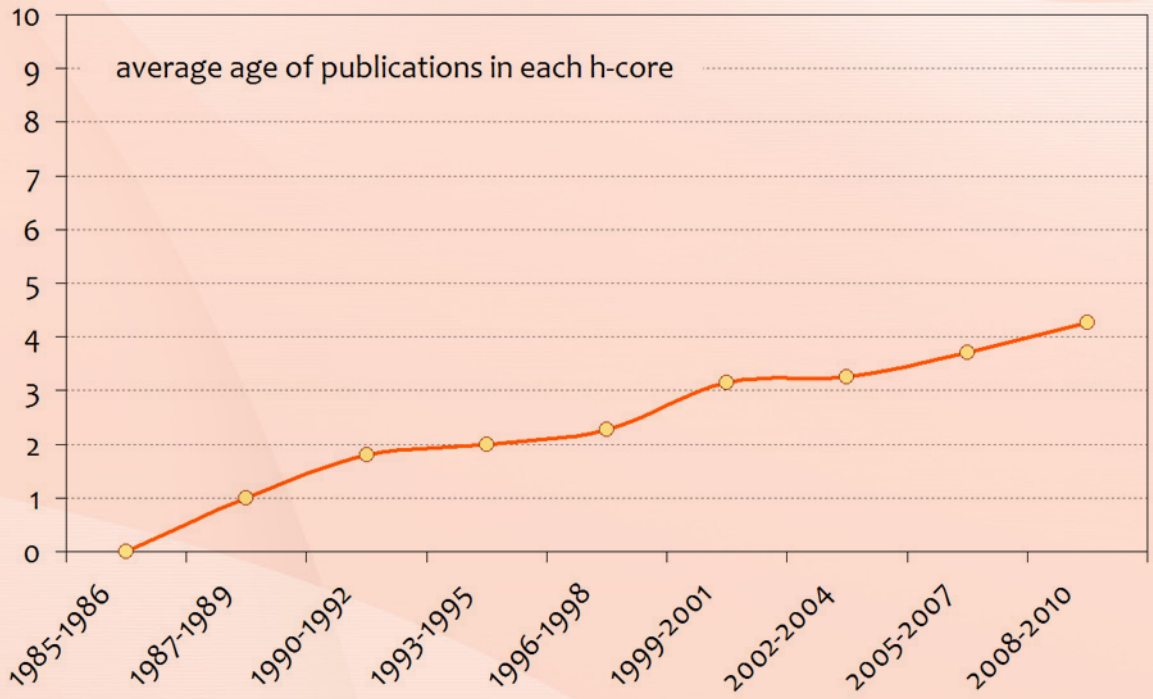
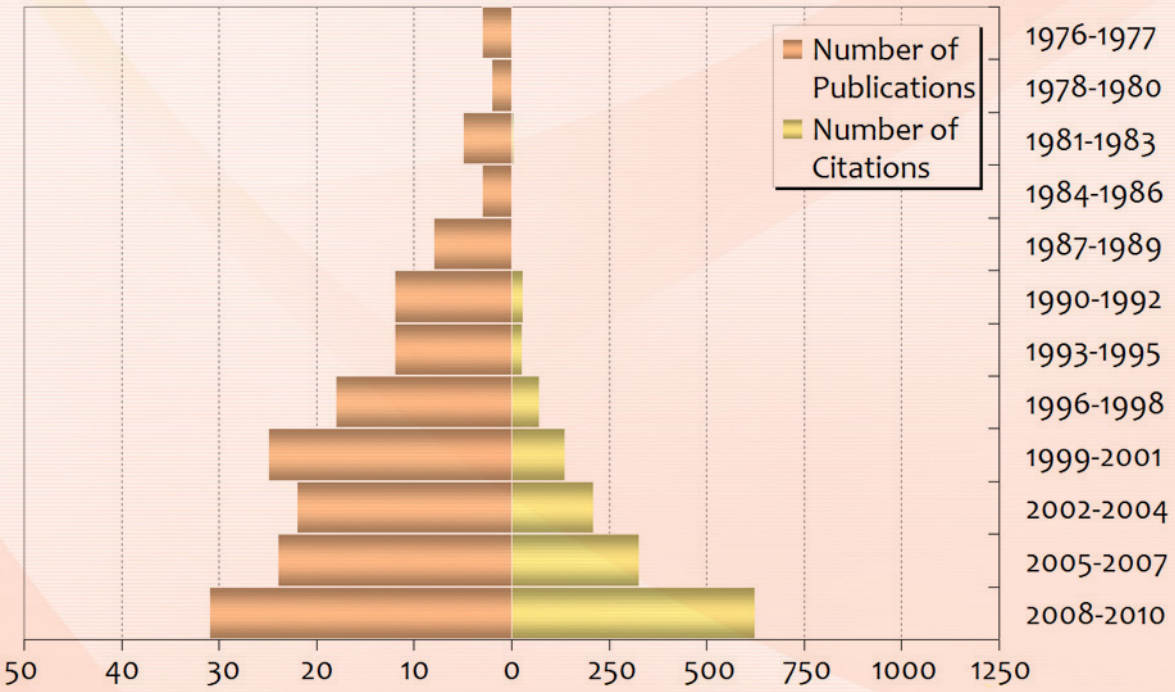


Figure 8. Scientometrics age pyramid and mean age sequence of publications in each h-core for Henk F. Moed (Price award received in 1999)

APPENDIX

RONALD ROUSSEAU



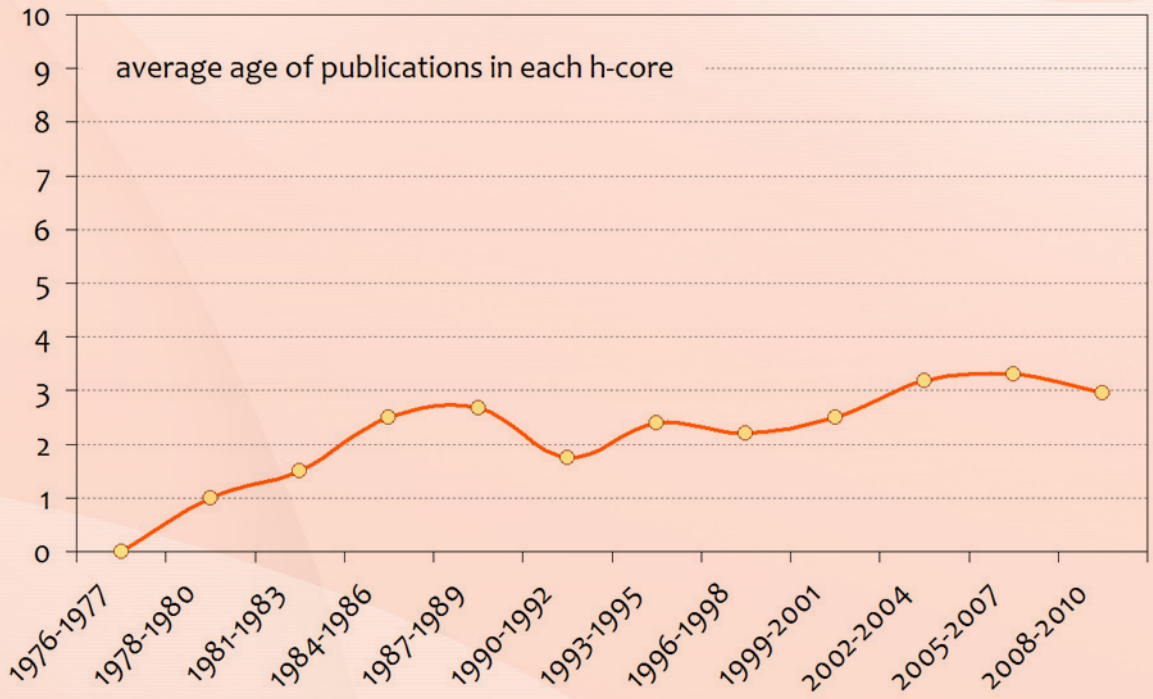
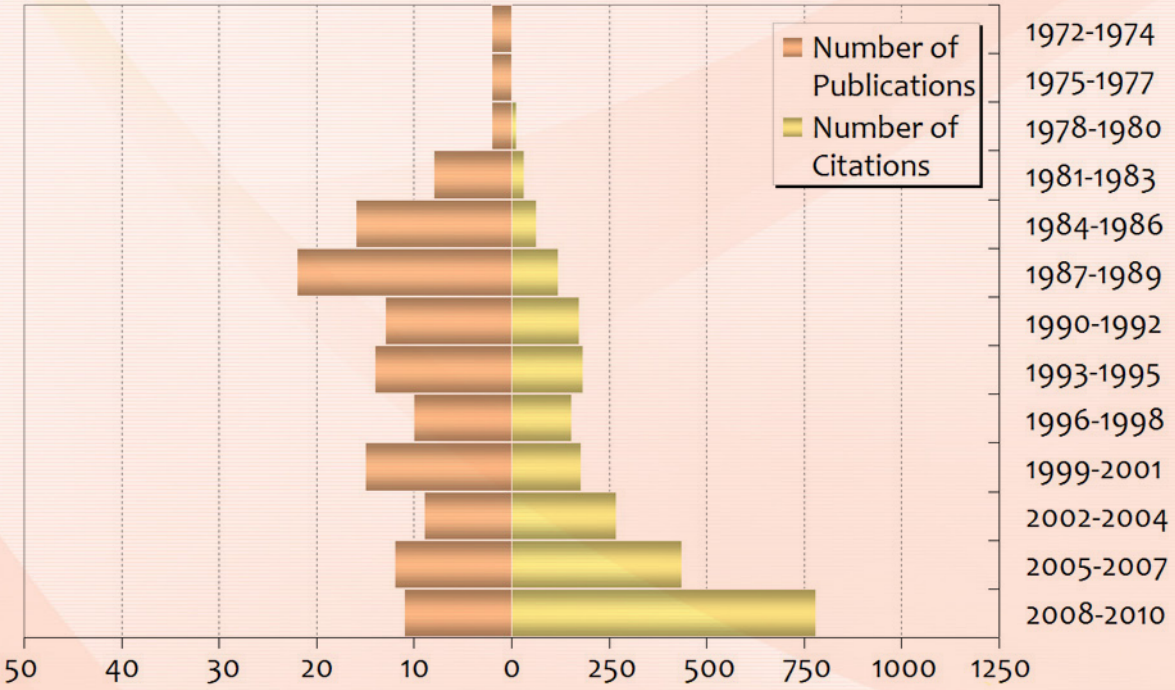


Figure 9. Scientometrics age pyramid and mean age sequence of publications in each h-core for Ronald Rousseau (Price award received in 2001)

APPENDIX

ANDRÁS SCHUBERT



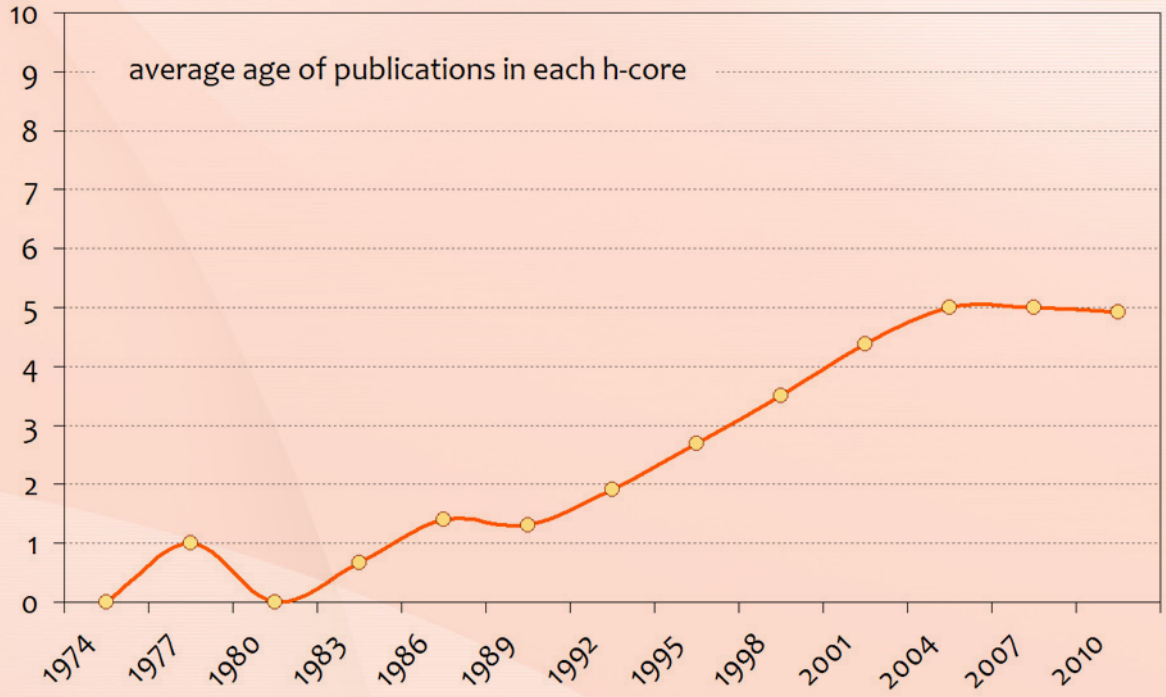
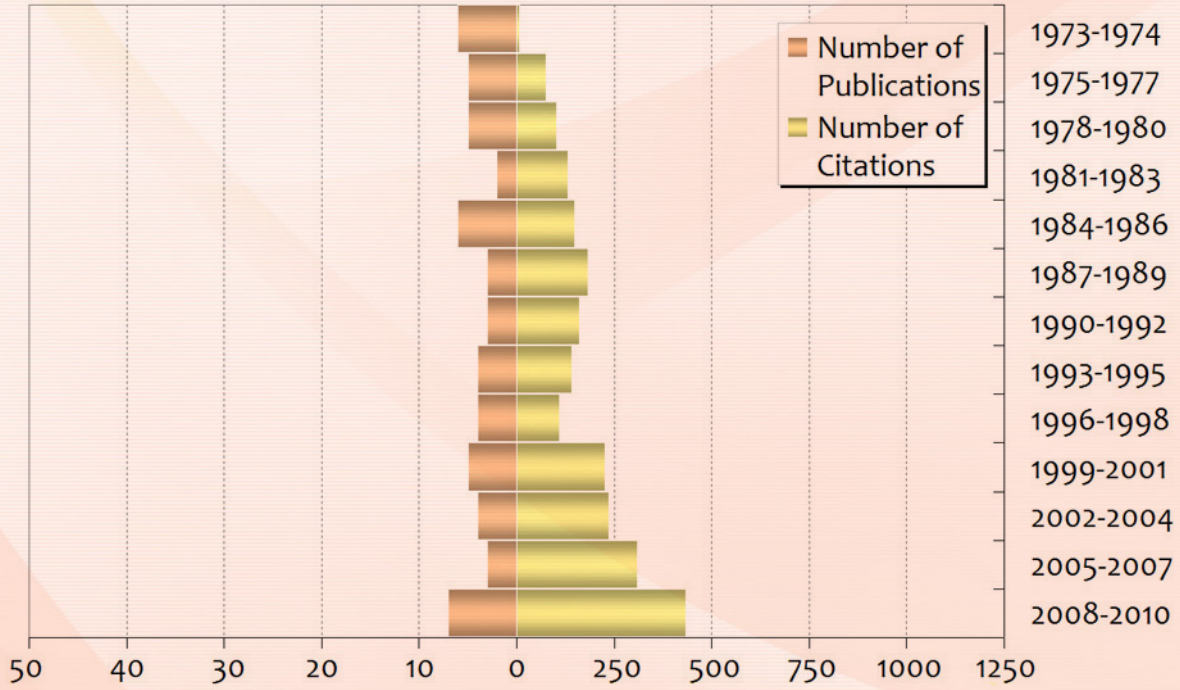


Figure 10. Scientometrics age pyramid and mean age sequence of publications in each h-core for András Schubert (Price award received in 1993)

APPENDIX

HENRY SMALL



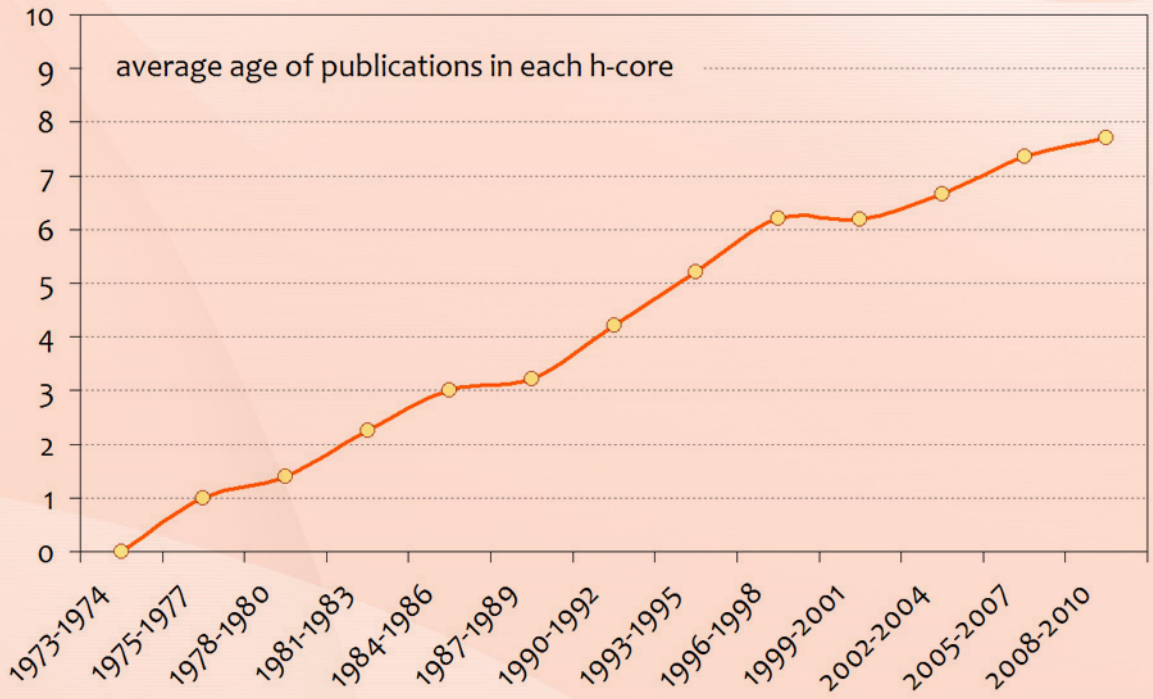
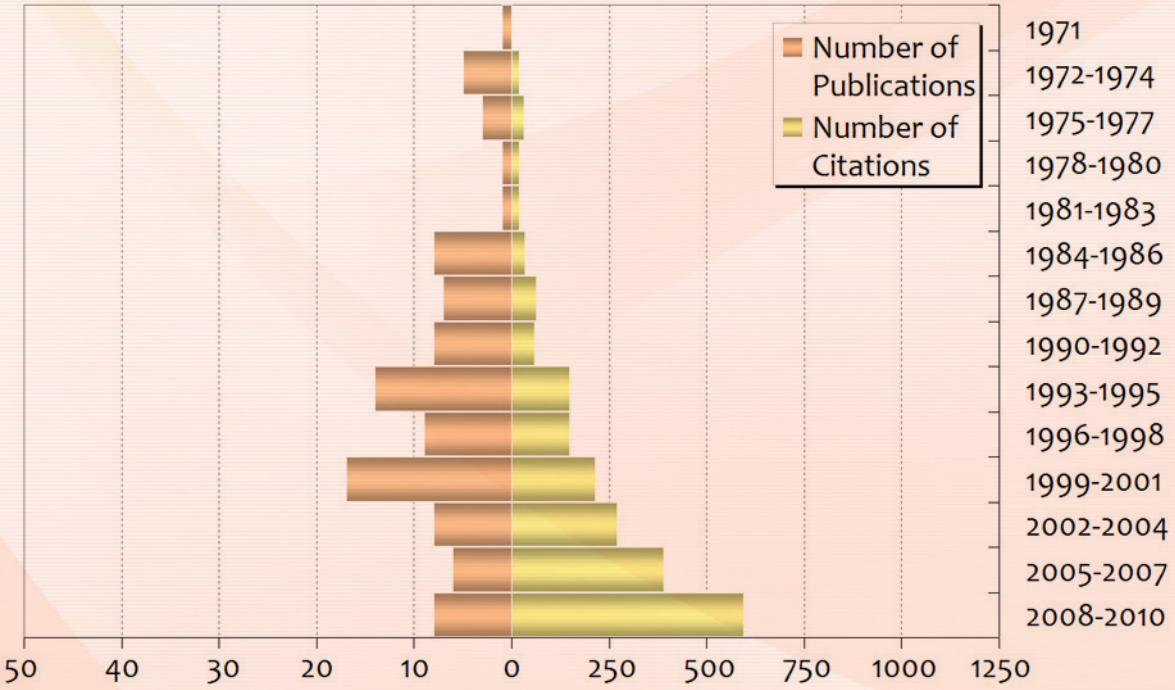


Figure 11. Scientometrics age pyramid and mean age sequence of publications in each h-core for Henry Small (Price award received in 1987)

APPENDIX

ANTHONY F. J. VAN RAAN



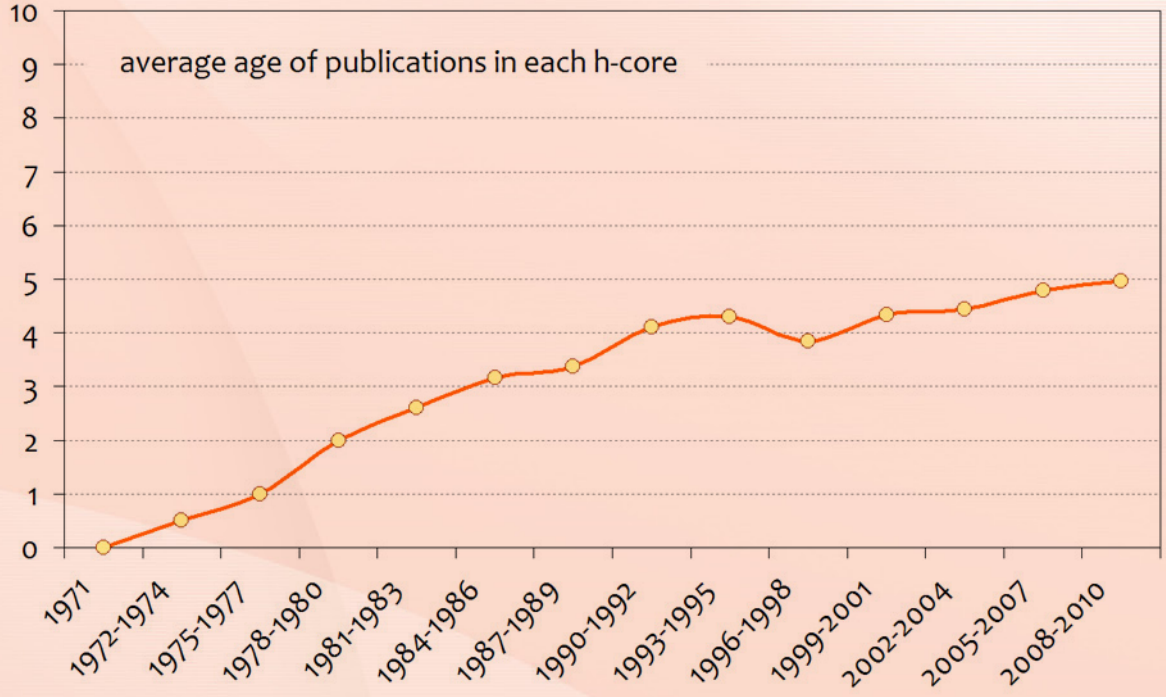
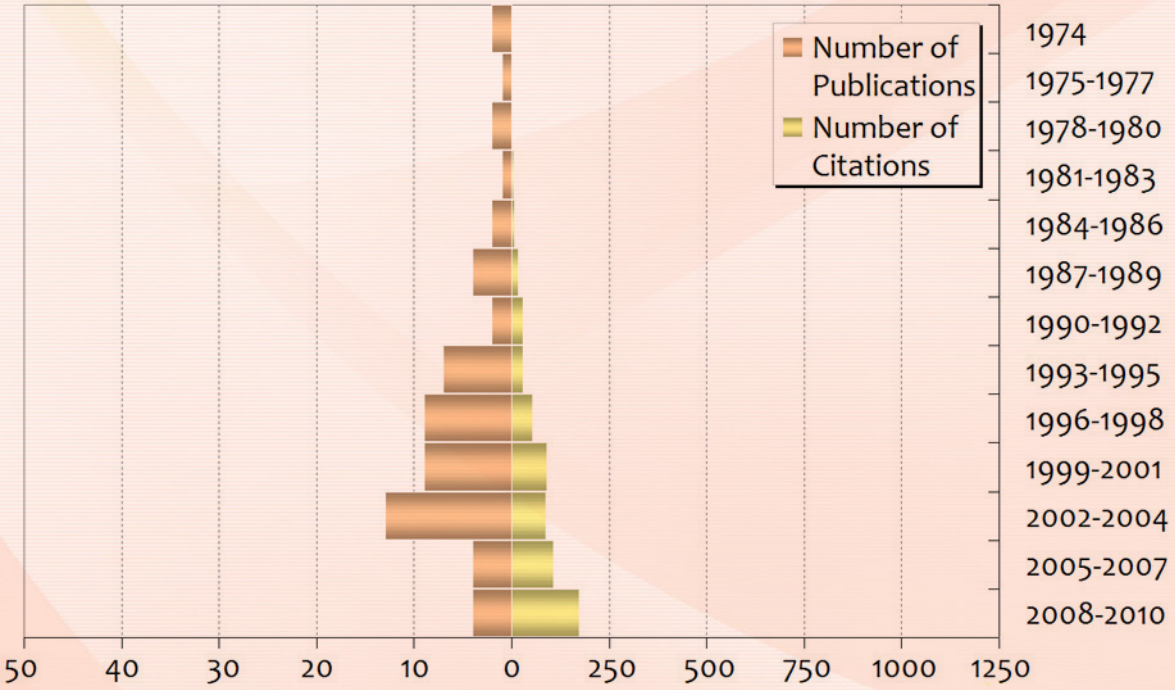


Figure 12. Scientometrics age pyramid and mean age sequence of publications in each h-core for Anthony J.F. van Raan (Price award received in 1995)

APPENDIX

PÉTER VINKLER



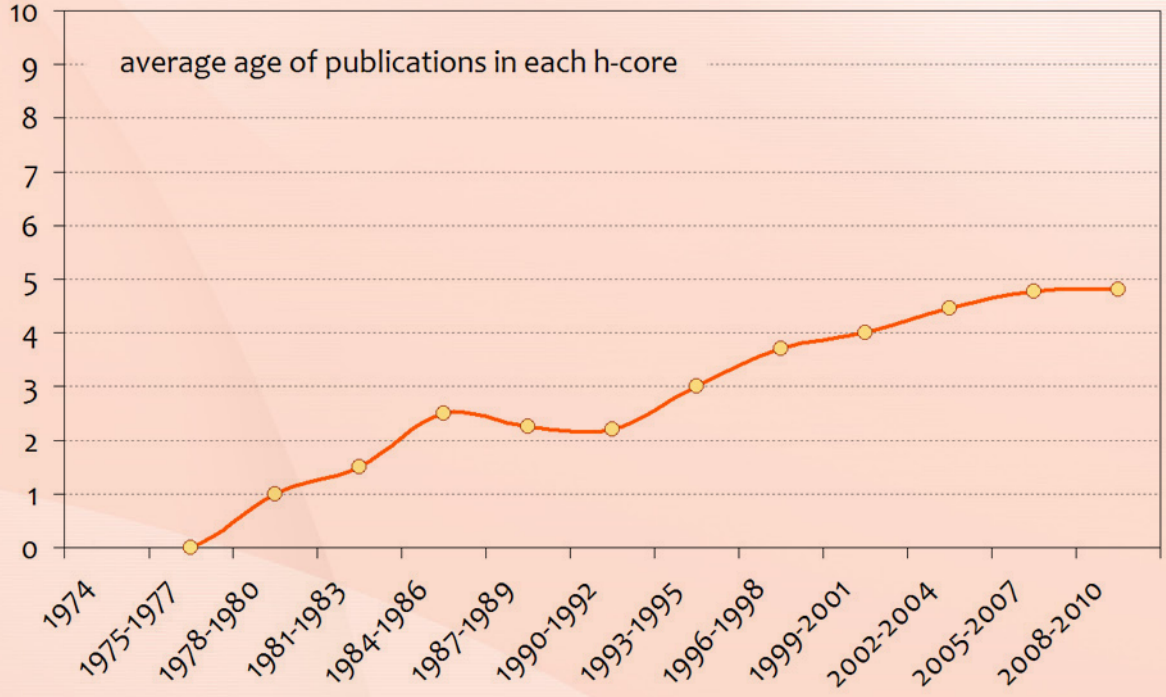


Figure 13. Scientometrics age pyramid and mean age sequence of publications in each h-core for Peter Vinkler (Price award received in 2009)

APPENDIX

HOWARD D. WHITE

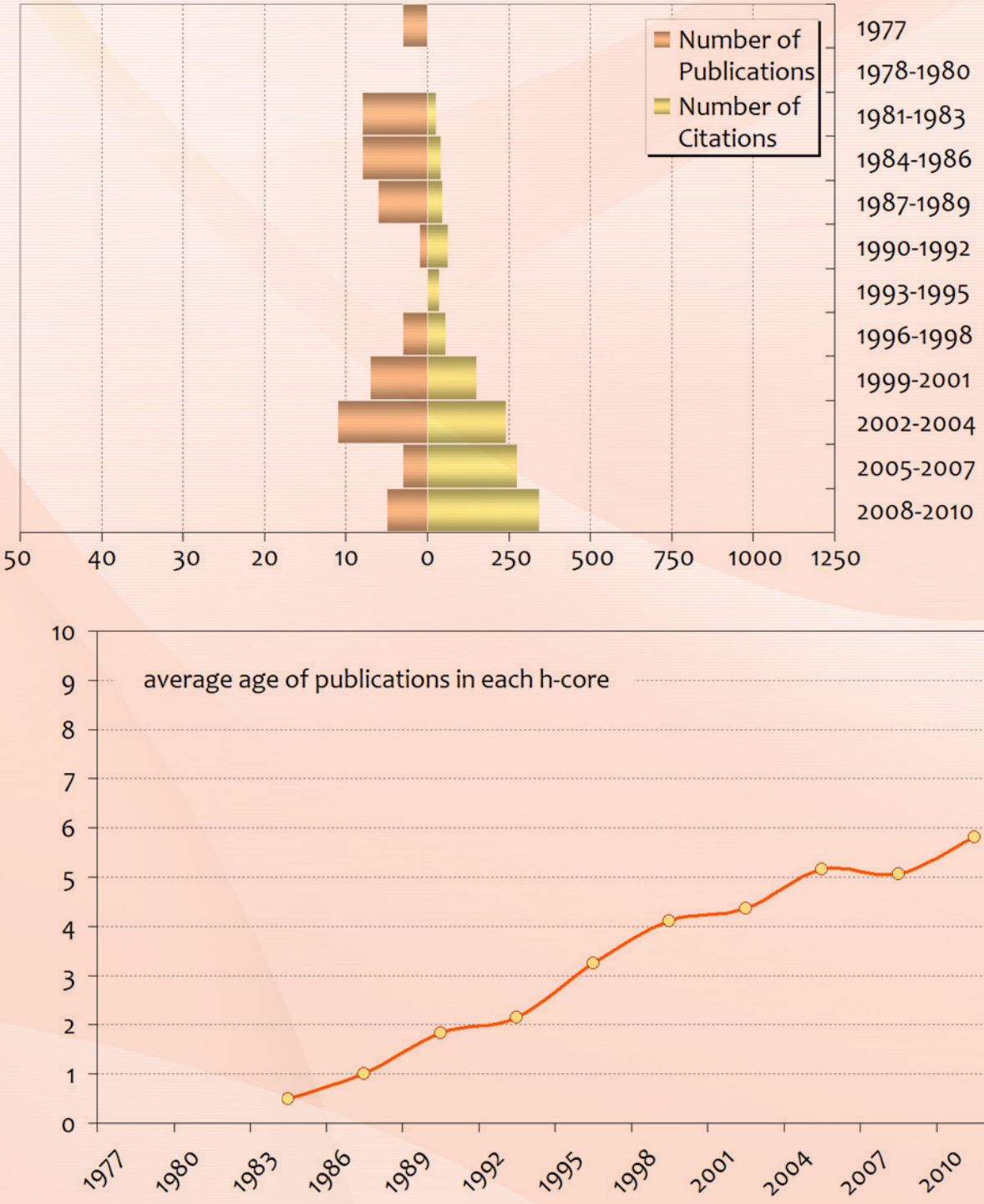


Figure 14. Scientometrics age pyramid and mean age sequence of publications in each h-core for Howard D. White (Price award received in 2005)