

Journal of Unsolved Questions

Hard Times for Science

Article:

Mary Symmetrical & Mary Nonsymmetrical – A Hitherto Undetected Difference in the Iconography of the Two Most Important Women in the New Testament?

Views on Life, the Universe, and Everything: Quality of Quality Systems - A Critical Review

> Article: Does the New ICMJE Criterion Stem Co-Author Overflow?

Table of Contents

Preface

Editorial Note	Ι
Science & Technology Cooperation with Developing Coun- tries in Asia and Oceania	XX
Scientific Research Opportunities During the Thirty Years' War	XXII
Hard Times for Physics in Germany – The Work of the German Physical Society in Times of the Third Reich	XXVI
Questions of the Week	XXIX

Articles

N. Gaster, J. S. Burns, M. Gaster: Does the New ICMJE Criterion Stem Co-Author Overflow? 16

W. Seuntjens: Mary Symmetrical and Mary Nonsymmetrical – A Hitherto 18 Undetected Difference in the Iconography of the Two Most Important Women in the New Testament?

Views on Life, the Universe, and Every-thing

R. Stark: Quality of Quality Systems – A Critical Review

28



Preface

Editorial Note

Dear Reader,

you are holding in your hands the newest edition of JUnQ (or more likely you are looking at it on your screen). In this issue we wanted to focus on science under difficult conditions and encountered some difficulties ourselves on the way.

Let's face it, although scientists from Europe and the US like to complain about cuts in funding, our situation could be far worse. In this issue of JUnQ we wanted to explore how science is impacted by difficult conditions like war and poverty. Ludwig Kammesheidt provides us with an insight into cooperations with developing countries from Asia and Oceania launched by the BMBF (German Ministry of Education and Research) on page XX. In his essay on page XXII, Eike Harden takes a look into the life of some famous scientists during the Thirty Years' War and on page XXVI we are exploring the role of the German Physical Society during World War II.

It was less easy for us to find researchers who are actually working under difficult conditions, and were willing to give us an interview. We talked to people from Iran, who were afraid that sharing their view on the situation of the Iranian scientific community and how sanctions impact scientific work in Iran might have severe ramifications for them or their family members. We were writing emails to researchers from Cambodia to gain a deeper understanding of how researchers in developing countries deal with their limited budgets and how they think the situation could improve. But after a few replies they stopped writing us and we were not able to contact them anymore. Trying to get a more general overview regarding the situation of developing countries we turned to the OECD (Organisation for Economic Co-operation and Development). And while there is a lot of data available on money spent on higher education, basic research as well as research and development all over the world (OECD Science, Technology and Industry Scoreboard 2013 or Main Science and Technology Indicators, Volume 2013 Issue 2), the data is lacking or simply not available in many developing countries.

This of course makes sense, most developing countries are not members of the OECD and there are probably a lot of countries that rather spend money on other areas than statistics about their research budgets. But for us it was nevertheless frustrating to find there is so little information on our cover topic. So making a JUnQ issue about science under difficult conditions turned into making a JUnQ issue under difficult conditions. Well, I guess when you think about it, it was only a matter of time before the Journal of Unsolved Questions runs into questions it can not provide an answer to; or at least an idea for a solution. After all, the Unsolved Questions are what we are all about.

Speaking of unsolved questions, Wolter Seuntjens has looked at the praying gestures of Mother Mary and Mary Magdalene in many paintings from different bible scenes (page 18) and asks himself (and us) is there a special meaning in how these two biblical figures pray?

Natascha Gaster, Jorge S. Burns and Michael Gaster look into the problem of co-author overflow and ask if the new ICMJE (International Committee of Medical Journal Editors) recommendations will help to keep authorship to people who contributed significantly to scientific articles (page 16).

We also have a follow-up on the topic of our last issue (Quality in Science). In our section "Views on Life, the Universe, and Everything" Prof. Dr. Rainer Stark shares his views on the "Quality of Quality Systems" (page 28).

Here at JUnQ we are going again through a phase of change. Older members are finishing their PhD and starting to leave us. It is also with this issue, that our editor in chief Andreas Neidlinger is going back to just being a regular editor to focus more on his PhD thesis and I want to thank him for all the hard work he has put into the journal in the last years. But it's not all bad news. New members in the editorial board are bringing in fresh ideas and we cannot wait to see how JUnQ is going to evolve in the future. For the next issue Kristina Klinker and myself will be taking over the role of editor in chief. We hope we can carry on Andreas' spirit and continue to emphasize the importance of negative results in the scientific process.

We are also very happy, to welcome new members to our editorial board. Philipp Heller, Marita Metzler, Nicola Reusch and Katharina Stockhofe will join us and will aid us in our quest to develop and improve JUnQ.

I hope you will enjoy our newest issue and I wish you pleasant reading,

David Huesmann

Science & Technology Cooperation with Developing Countries in Asia and Oceania

Ludwig Kammesheidt¹

Project Agency International Bureau at DLR e.V.

1 Introduction

Funding programs for science & technology (S&T) collaboration of the Federal Ministry of Education and Research (BMBF) with countries in Asia and Oceania have focused so far on the heavyweights in the region such as India, China, Japan, and South-Korea, emerging countries, particularly Indonesia and Vietnam, and also, to a lesser extent, on industrialized countries like Singapore, Australia, and New-Zealand. Developing countries, depending on natural resource exploitation and low labor costs ("factordriven") for economic growth, have not been considered as S&T partners until the recent past. These countries typically allocate little budget to higher education and research and development (R&D), resulting, among others, in poor infrastructure and a low number of researchers who lack incentives to engage in science. However, developing countries have to cope with a number of challenges such as natural resource depletion, environmental pollution, urbanization, climate change, and health problems, to name a few issues which can only be solved by conducting S&T. Moreover, these countries can offer access to a wide range of unique natural resources, e.g. biodiversity. Both, challenges of global scale as well as interesting subjects in the area of natural resource management and ecosystem research, make developing countries attractive as S&T partners in international cooperation projects.

In 2008, the Federal Government of Germany adopted the strategy for the internationalization of German science and research institutions. To strengthen the cooperation with developing countries in education and S&T is one of the four goals of the strategy. S&T collaboration can make a contribution to the economic, social and cultural development of these countries by eradicating poverty and solving issues of global scale. The coalition treaty (2014–2017) of the new government has reaffirmed the significance of international S&T cooperation.

2 Mobility Funding with Partners in Developing Countries

2.1 Scope and Objectives

The first mobility program targeting developing countries in Asia and Oceania was published by BMBF in May 2013. According to the regional portfolio of the BMBF-Division "Asia and Oceania" eligible partner countries were Afghanistan, Pakistan, Nepal, Bhutan, Bangladesh, Sri Lanka, Myanmar, Laos, Cambodia, the Philippines, Timor-Leste, Papua-New-Guinea and Pacific island states including Fiji.

The following research areas were given priority in the call:

- Health
- · Biotechnology including biodiversity
- Environmental sciences with particular focus on environmental technologies, energy, water, climate change issues and marine sciences
- Engineering
- Information and communication technology

The call aims to foster existing partnerships between German universities and research institutions with developing countries. Researchers from developing countries are invited to learn state-of-the-art lab methods and to attend workshops in Germany where they can meet with peers in their field. German scientists will familiarize with specific research needs and working conditions in the host country, and/or are doing preliminary data collection with partners. These activities should eventually lead to the elaboration of joint research proposals. Small and medium enterprises (SME) are welcome to participate.

In addition, the German project coordinator is supposed to assess the specific S&T capacity in the partner country in order to judge the long-term perspective for cooperation.

2.2 Selection of Proposals

A total number of 47 proposals were submitted. Partner countries were rather evenly distributed over the three subregions, i.e. South Asia, Southeast Asia and Oceania. All countries listed above were represented with the exception of Timor-Leste. Thematically most proposals dealt with health issues, environmental technology, biotechnology, biodiversity and ICT with an application in either the health sector or to facilitate communication under natural hazards. 15 proposals, covering the range of topics mentioned above, have been selected for funding. Most countries are represented with a single successful project only, except for Nepal (3), Bangladesh and Fiji (2 each). Funding will start in mid-2014 for a two-year period.

¹e-mail: Ludwig.Kammesheidt@dlr.de

3 Conclusions und Outlook

In contrast to other mobility calls with emerging countries, funding covers all travelling costs and allowances for researchers from developing countries while staying in Germany. Together with the opportunity to learn stateof-the-art lab methods and the exchange of project ideas with the eminent scientific community in the individual field at workshops, researchers from developing countries are valued as such which may encourage their willingness for a long-term commitment in international networking, and project application and implementation. Once established networks should expand funding opportunities and lay the foundation for problem-oriented solutions and innovations to environmental and development issues in those countries. German scientists strengthen their expertise in development-oriented research capacity and SME will benefit from market access.

The funding program will be evaluated for impact by BMBF through the International Bureau in due course. In case of a positive feedback, the program will be relaunched.

- Dr. habil. Ludwig Kammesheidt

Scientific Research Opportunities During the Thirty Years' War

Eike Harden¹

Hamburg State and University Library, Hamburg, Germany

It does not seem clear that scientific researchers differ in any relevant way from ,,ordinary" people when coping with crises. It might even seem that their work could suffer more because they need certain resources like literature or instruments. This need is a historical constant. In this article, I suggest that German scientists during the Thirty Years' War had already developed strategies to cope with such critical situations, and I will investigate in what these strategies looked like.

1 Introduction

The Thirty Years' War is known in Germany's history for its dramatic consequences, especially when considering the loss of people and resources. Although these losses varied in space and time, the war cost millions of human lives and brought extreme hardships to those that survived. In a corridor from the South-West to the North-East, many villages, towns and cities (e.g. Magdeburg) were completely destroyed, while other places were almost wholly spared out from the war theater.^[1] Out of the thirty years of the war, 1618–1648, the all-out war started only in 1625, when Christian IV (1577–1648) of Denmark got himself involved to prove himself as the champion of Protestant Europe. As of 1641, general fatigue had led to a preliminary peace treaty, signed in Hamburg, from which time on the war ceased to be "hot".

Scientific researchers do not seem to differ much from ordinary people in that they can just as well be shot or stabbed or die from other physical violence, in that they can get infected by an epidemic or just starve to death. This might lead one to think that there is no use in taking a closer look. But early modern scientific research was in need of resources such as books or scientific instruments as much as it is today. As rather large armies had to be supplied, their leaders took up the strategy that ,,the war supplies the war⁴⁴. Plundering seems to have become an essential part of warfare, both on an everyday basis taking food or shelter violently and as a periodical behavior after a victory, robbing luxury goods to further finance the war. I want to further investigate into some scientists' biographies from the Thirty Year's War.

Since I do not have enough data to evaluate statistically those scientists' behavior, as an alternative, I will carry out some small case studies. In order to cover most possible ways of coping with the war's consequences, I am going to choose people who lived in different times and places and made different choices regarding e. g. their employers, their preferred research methods or their favourite ways of publishing. Most of my examples will have worked in the fields of physics, astronomy and mathematics, just because I know those best.

All of my examples will be male Protestant scientists. This is due to the considerations that a) a female example would have complicated an already complex investigation: Women's frameworks in which they had to make their choices were quite different from men's. (In almost any case this framework would have been much smaller for women, leaving them considerably less options than men). b) Considering religion, the main difference when compared with Protestants is that Catholic scientists could become monks, an option many (if not most) of them chose because the Society of Jesus ran the Catholic universities in Southern Germany and becoming a university professor almost universally involved being a Jesuit.

The main questions I will ask are thus: Did scientists try to rescue themselves from epidemics, starvation and violent death? If they did, how did they? Did they e. g. flee from Germany or take refuge in places considered safe? Did they choose to work for a patron? If they didn't, how did they get access to resources like books, instruments or printing presses?

2 Case Studies

2.1 Johannes Kepler (1571–1630)

Kepler is perhaps the best known of my exemplary cases. Born into a poor Protestant family in Southern Germany, he found patrons like Emperor Rudolph II (1552–1612) or Albrecht von Wallenstein, Duke of Friedland (1583– 1643) who employed him because of his mathematical abilities. But Kepler almost always had to cope with personal problems being a Protestant at Catholic courts and an astronomer in orthodox surroundings.

He is also the oldest among my examples, 16 years older than e. g. Jungius (who I know best of my examples). Therefore, Kepler was already famous as an astronomer when the war broke out. One might suppose that he had a network of contacts to help him to cope with the new situation's possible disadvantages, but in 1618, Kepler was just a provincial mathematician in Linz, Austria, his mother accused of witchcraft and some time later he was even deprived of his library for some time. In 1627, Kepler left Linz and became court astrologer to the Duke of Friedland who provided him a printing press and for whom he had to devise horoscopes.

¹e-mail: harden@sub.uni- hamburg.de

Kepler thus differed greatly from Jungius. While Kepler lived as a Protestant among Catholics, Jungius chose to work in Hamburg, known as one stronghold of Lutheran orthodoxy. While Kepler never managed to become a university professor (although he had tried to), Jungius resigned such posts time and again. While Kepler spent his most productive years at court, Jungius taught almost his whole productive life at higher schools.

Kepler was largely affected by the war, at least in his later life. But did he have a strategy to cope with that? He was discriminated against because of his religious beliefs, but he did not flee with his family to Protestant Northern Germany where he might have been highly welcomed. Instead of this, he stayed as long as possible in Austrian service and then turned to a new patron. Perhaps, he decided to do so because he had been the happiest during his time with Rudolph at Prague.

2.2 Wilhelm Schickard (1592–1635)

In contrast to Kepler, Schickard was quite young when the war broke out, taking up his first research position in 1619. He was born in Herrenberg, a town not far from Weil where Kepler was born and he came to know Kepler in 1617. Schickard became a professor in Tübingen, teaching astronomy and Hebrew. He stayed there until he died of the plague at the age of 43.

Being a university professor, he got a salary for some foundational lectures he had to deliver. Moreover, he could propose private lectures for which his students had to pay separately and sometimes publish disputatious theses in print which were often paid for by students, too. Furthermore, Schickard was an able craftsman and inventor who contributed some engravings to Kepler's Harmonice mundi and built a mechanical calculator. One has to be aware, though, that salaries were not very high at universities (for a typical university of the time cf. ref. [2]). Often, an accomplished professor of Theology was the best paid employee of any university, receiving 300 Reichstalers a year. In order to get a relation, we may assume that a good scientific textbook cost about 1 Reichstaler, compared to, say, 100 Euros or Dollars today. This would result in an equivalent of c. \in 2,500 a month which is why it was important to look out for further income. Astronomy professors were often paid considerably less, sometimes only 100 Reichstalers a year, or c. \in 800 a month.

What about Schickard's strategy? He tried to capitalize on his talents which were not (as with Kepler) being an accomplished and well-known mathematician and astronomer but an ingenuous teacher and inventor. It was thus based on special personal abilities which are not easily comparable to my other examples' strategies. Nonetheless, trying to get a job at a university may be considered typical of German researchers of that time, perhaps the single most typical behavior one can recognize in them. Schickard seems to have been quite unlucky because he did not flee from Tübingen before the plague broke out. In contrast, Jungius fled from Rostock before the Catholic troops took the city and left Helmstedt because he did not get paid. In the end, Schickard failed to save his life and became a victim of the war.

2.3 Jan Amos Komenský (1592–1670)

Komenský himself once stated he was "Moravian by birth, Bohemian by language, Theologian by occupation". Being a cleric of the Bohemian Brethren, he was very much affected by the war which broke out in Bohemia and evolved during its first stages around the religious toleration of the different Protestant denominations. The Brethren were treated tolerantly by Rudolph II (who also employed Protestants like Kepler at his court). After the defeat of the Protestants in 1620, all non-Catholics were prosecuted in Bohemia. In 1622, Komenský's wife and two daughters died of the plague. In 1628 he had to leave Bohemia for good, and live in exile.

Komenský, like Schickard, was very young when the war broke out and had not yet established himself as a wellknown intellectual by then. But, unlike Schickard, he left his home area to save his life and accepted different occupations. He was Rector of the higher school at Leszno, Poland, where he and his fellow Brethren had found refuge. During this time he wrote a lot and thus became well-known in all of Europe and even North America as a philosopher which in turn induced patrons to invite him (e. g. the Dutch-Swedish industrialist Louis de Geer (1587–1652), the main weapons? supplier of the Swedish armies). I am inclined to contrast Komenský's strategy of "seizing any opportunity" with Schickard's "capitalizing on the greatest talents" and, perhaps, Kepler's "continuing along established paths". I shall return to this issue in my conclusion.

2.4 Johann Adolf Tassius (1585–1655)

Tassius was born in Northern Germany, in the small town of Bremervörde. Having established close contacts with the salt producing elite of Lüneburg, he went to Heidelberg and Tübingen universities as a tutor to Nikolaus Düsterhop (1597-1651), a Lüneburg patrician. In Tübingen, Tassius got to know Kepler's friend, Christoph Besold (1577-1638), Wilhelm Schickard, and Johann Valentin Andreae (1586–1654), author of at least two of the three foundational tracts about the "Rosicrucians". In 1621, Tassius was back in Lüneburg, and from there, he reestablished contact with Jungius whom he had know since their youth. Tassius and Jungius tried to found an academic society called "Societas ereunetica sive zetetica". Tassius's connections with Andreae and certain clues about Jungius have since led some researchers, e. g. F. Yates to suppose that Jungius might have founded the Rosicrucians.^[3]

At several times, Tassius was personally affected by the war: In the winter of 1625/6 e. g., he suffered from a grave fever which he survived only by chance. In 1637, he coincidentally reestablished contact with Andreae whom he had feared to have died during the looting of Calw. In 1629, Tassius and Jungius became professors at the higher school of Hamburg. Like Komenský's school in Leszno, the

Akademisches Gymnasium in Hamburg was made up like the philosophical department of a university but was not entitled to award academic degrees. Hamburg was considered a safe place as it was the communication center of Northern Europe and thus important to all parties involved in the war.^[4]

2.5 Joachim Jungius (1587–1657) – Statistical Evaluation of His Letters

He had tried for several years to get this appointment. This, we know from letters to and from his old friend Johannes Garmers (1586–1638) (most letters are published in ref. [5], although some surviving letters have been overlooked, e. g. ref. [6]). In the meantime, he had profited from his friend Tassius's capability of discovering opportunities and, like Komenský would have done, had seized it when he became professor in Helmstedt. Unlike Tassius at that time, but just like Kepler, Schickard and Komenský, Jungius was married when he moved away from Rostock where his wife had been born and Jungius himself had lived for at least twelve years, more than half of the time since he had left school. This seems to be quite atypical of Jungius who did never act rashly.

Let us take a closer look at his letters before I conclude this article. I will restrict this investigation to the letters that have survived from the war years 1625–1642. I do not look at earlier letters because the young Jungius had moved a lot during these years and most of his letters seem to have been lost (all data taken from [5]). Is there any correlation between the number of letters and the external situation?



Figure 1: Hamburg State and University Library, Portrait Collection, No. 12: Joachim Jungius.

Compared with 1625, the number of surviving letters sharply falls in 1626 to a minimum of only two letters surviving from 1627. This may be due to Jungius's moving from Rostock to Helmstedt and back to Rostock and the resulting loss of part of Jungius's belongings.

From this time on up to 1636, we do not know any letters written by Jungius which cannot mean that he did not write at all. What can be said, though, is that those were busy years for Jungius who wrote a textbook on logic and several disputations (13 of them published in print in only five years) and also devised a new teaching plan for the higher school.

From the end of 1636 through mid-1637, only few letters are extant. As those few are from the Rostock doctor, Christian Schmilow (1592–1638) who wrote about Jungius's wife who suffered of some kind of psychic disease (called "melancholy") and who died in 1637, I suggest that Jungius was occupied with his wife's well-being during these months and did not find the time for research.

Afterwards, the number rose sharply again, perhaps because Jungius now had more time than ever before, and he also might have been in need of distraction.

One last decline can be seen in 1641 which may be due to the war as diplomats from all parts of Europe came together in Hamburg to sign the preliminary peace treaty. Jungius may just have seized this opportunity to meet fellow intellectuals in person instead of writing to them and vice versa. But, in general, the numbers are too small, and the amount of losses is unclear, too, so that I dare not conclude anything from this correspondence.

3 Conclusion

In order not to fall prey to the "survivorship bias", I have to be cautious in my conclusions. There is no way to even make an educated guess about how many researchers' careers would have been more successful without the Thirty Years' War. Today, I can only look at those scientists who had survived and have contributed to science.

I have described Kepler's strategy as "continuing along established paths", Schickard's as "capitalizing on the greatest talents" and Komenský's as "seizing any opportunity". I might add Tassius's strategy of "deep networking" and Jungius's "planning and organizing". By these, I mean Tassius's talent of making many encounters in a short time whenever possible and relinking later on when useful, and Jungius's perseverance in almost every situation.

These strategies do not seem to be restricted to war times. Nothing about them suggests that it was adapted especially to the crisis situation in which these individuals lived. All of them continued along established paths in one way or another and capitalized on their greatest talents. Komenský, Tassius and Jungius seem to have been more successful during the crisis than Schickard and even Kepler, because through planning, organizing and networking, they had created the opportunities by themselves which they seized when the time had come.

This result suggests that the concept of resilience can take us quite a long way towards the explication of research success during crises. Creating strong social networks, being stubborn (to a certain degree) in pursuing one's goals and making use of the best opportunities one encounters help in building a career in good times and do as well help to survive the bad.

Additionally, these findings might disprove Heraclitus's theory that the war be ,,the father of everything". I could not find any hints that the war made possible opportunities that would not have been possible otherwise, except perhaps De Geer's enterprise which, to me, seems rather marginal in the development of science, although it contributed heavily to Sweden's early industrialization.

If I were asked what the results suggest about how to act in other critical situations, I would probably answer: "Prepare and hope for the best! "Build up networks, know your strengths, capitalize on them, do not yield in pursuing your goals and look at what has already been possible and successful in others! Then, when the crisis comes, you are ready. But remember that you might just not be lucky and

that the best of strategies does not help.

References

[1] Dülmen, R. v. Entstehung des frühzeitlichen Europa.

Augsburg: Weltbild, 2000.

[2] Bruning, J. and U. Gleixner (eds.) Das Athen der Welfen.

Wolfenbüttel: Herzog August Bibliothek, 2010.

[3] Yates, F. The Rosicrucian Enlightenment. London: Routledge & Kegan, 1972.

[4] Krieger, M. and M. North (eds.) Land und Meer. Cologne: Böhlau, 2004.

[5] Jungius, J., M. Rothkegel and B. Elsner Der Briefwechsel des Joachim Jungius. Göttingen: Vandenhoeck & Ruprecht, 2005.

[6] Westhoff, H. [Letter to J. Jungius]. Hamburg State and Univer-

sity Library, Nachlass Joachim Jungius: Pe. 11.

Hard Times for Physics in Germany – The Work of the German Physical Society in Times of the Third Reich

Andreas Neidlinger

When discussing hard times or problems for science and other research one usually thinks about tight financial situations. Of course the common researcher will always complain about too little funding, because – let's be honest – it could always be better. There might be a more effective machine for the job, the laboratory could be equipped better, air conditioning would be nice in the summer, and a new coffee maker would make my work obviously more effective. You get the idea ... Now, I do not want to say that everything is great in German research institutes, but – let's be honest again – it could be much worse.

When we were doing our first brainstorming about the current feature topic of JUnQ in an editorial board meeting, we quickly focused on developing countries, meaning countries that surely don't have that amount of money to spend on research that Germany or other western countries can put into scientific investigations. In addition, we dealt with areas of our planet where natural disasters hit the population (many countries will be in both groups). Both issues don't apply to German research nowadays. Today the government mostly doesn't interfere with scientific investigations; apart from maybe ethical questions regarding animal or even human experimentation etc. So actually we are doing quite fine.

But: When dealing with our own history we came to the conclusion that also in Germany there have been difficult times for science. There were periods that did not allow research as we know it today. I am speaking of the Nazi reign. Hitler's administration was controlling every part of life for the German citizens. The so called *Gleichschaltung* (i.e. coordination or making the same) was supposed to end pluralism of state and society. This was achieved by putting almost every public activity (unions, associations, etc.) under governmental control, increasing Hitler's influence on every part of German life. This process also wanted to gain influence on science. In my text I wish to deal with the influence of the Third Reich on the Deutsche Physikalische Gesellschaft (Germany Physical Society, short: DPG). The DPG was founded in 1845 as Physikalische Gesellschaft zu Berlin (Physical Society of Berlin) and was and is one of the oldest societies of physicists worldwide. It was renamed in 1899 to DPG and gained more and more importance among physicists in the 1930s. In a research project the DPG tried to uncover its own actions during the twelve years of Hitler's Reich.^[1]

First of all, we can surely say that the German government wanted research to focus more on military projects, meaning that fundamental research was not funded any more (or at least less than before). Furthermore, *unwanted* elements needed to be eliminated from German Physics. Since Jews were thought of as an inferior "race", the German Physics sooner or later had to get rid of these undesired influences. A very prominent ex-ample for this is Albert Einstein. He had been president of the DPG from 1916–1918 and was one of the most prominent physicist at that time. In the beginning of Nazi reign the DPG did not force members to leave. But Einstein demonstratively left the *Königlich-Preußische Akademie der Wissenschaften* (Prussian Society of Sciences) and went into exile to the United States. Max von Laue, president of the DPG in 1933, stood by Einstein, but in a private letter he reproachfully asked him why he needed to become politically active.^[11] This clearly shows that the physicists understood the situation, but obviously had no means to deal with them, apart from laying low.



Figure 1: Max von Laue.¹

In late 1933, the German government eventually reached out to gain more influence over the DPG by putting Johannes Stark, Nobel Prize laureate in 1910 and a supporter of the Nazis as candidate for president of the DPG. He also was the president of the *Physikalisch Technische Reichsanstalt* (Physical and Technical Institute of the German Reich) after the seizure of power. In addition to that, Stark was a strong supporter of the "German Physics", a movement that arose in the beginning of the 20th century, try-

¹"Max von Laue 1914" by Nobel foundation – http://nobelprize.org/nobel_prizes/physics/laureates/1914/laue-bio.html. Licenced under Public Domain by Wikimedia Commons – http://commons.wikimedia.org/wiki/File:Max_von_Laue_1914.jpg.

ing to cleanse the "pure and true" physics of Nordic scientists like Johannes Keppler and Isaac Newton from influences of "typical Jews" like Einstein. Followers of the German Physics said that Nordic or Aryan physicists were producing knowledge which is a matter of soul and life, whereas Jewish ideas are just an excrescence of a materialistic spirit. For example new models like Einstein's theory of relativity were rejected as not descriptive enough and counter intuitive.^[2]

Nevertheless, the secret vote left a defeated Johannes Stark (he only got two votes). A result of this slap in Stark's face was the political marginalization of the DPG in the government, meaning that it was able to postpone its *Gleichschaltung* at least for now. For the next few years the physicists still worked together with their emigrated (i.e. gone to exile) colleagues and the membership list still contained many Jewish people. This first phase lasted until 1938.^[3]



Figure 2: Johannes Stark.²

The second phase began in 1938 when the DPG could no longer hinder the influence of Hitler's Reich. Pressure arose from outside as well as from inside the society forcing the DPG to revise their bylaws to conform to Nazi ideals, i.e. to deal with Jews and other non-Aryan people. This lead to a circular letter from the president of the DPG at that time, Peter Debye, in December 1938 in which he bowed to the governmental demands:

> "Under the compelling prevailing circumstances the staying of German Jews in the Ger

man Physical Society cannot be maintained anymore in respect to the Nuremberg Laws.

In accordance with the executive board I ask all members, which fulfil this clause, to hand in their resignation of the society.

Heil Hitler! signed P. Debye, president"^[1]



Figure 3: Peter Debye.³

The first sentence of his letter was used to criticize Debye in Nazi Germany, since *only* "under the compelling prevailing circumstances" it was no longer possible to keep the "beloved" Jews in the society, as Herbert Stuart, Nazi official, stated.^[1] In 1940 Debye finally left Germany, which was the starting point of the next attempt of a takeover by the Nazis. Carl Ramsauer became president of the DPG. He was an industrial physicist and – even though he was no strong supporter of the Nazis – led the DPG to a more Nazi friendly behavior, meaning also friendlier in military industrial terms.^[1]

Under Ramsauer's presidency the DPG left its niche existence and became more active in the social and political life of the Third Reich. The first step in this was a memorandum claiming that theoretical physics was strongly neglected and physical institutes were dangerously underfinanced. He said that Anglo-American enemies were far ahead in their research and asserted that physics was essential for mobilization of the German war machinery.^[1]

²"Johannes Stark" by A. B. Lagrelius & Westphal, Stockholm – Published in 1920 in Sweden in Les Prix Nobel 1919 (p. 121) with a credit to A. B. Lagrelius & Westphal, Stockholm, web version. Also Britannica. The American Institute of Physics credits the photo to A. B. Lagrelius & Westphal (Swedish company used by the Nobel Foundation for most photos of its book series Les Prix Nobel). Licenced under Public Domain by Wikimedia Commons – http://commons.wikimedia.org/wiki/File:Johannes_Stark.jpg.

³"Debye100" by Unknown – http://chem.ch.huji.ac.il/~eugeniik/history/debye.html. Licences under Public Domain by Wikimedia Commons – http://commons.wikimedia.org/wiki/File:Debye100.jpg.



Figure 4: Carl Wilhelm Ramsauer.⁴

This was the first time for the DPG to take direct influence on physical research and politics. By these means the DPG under Ramsauer's direction moved closer to the military and industrial ambitions of the Nazis. It might be blamed on Ramsauer's industrial background that he finally began (or no longer postponed) the *Gleichschaltung* of the DPG. Still, the society (and Ramsauer) needed a basis for both possible ends of the Second World War – for the final victory and for the defeat.

In the absolute surrender of Germany the DPG and every other German institution, party, and organization was disintegrated. In 1946 various regional societies were re-founded that combined in 1950 as *Verband Deutscher Physikalischer Gesellschaften* out of which in 1963 the *Deutsche Physikalische Gesellschaft* emerged.^[1]

In summary one can say that the history of the DPG consisted of two phases. The first one from 1933–1940 in which it passively distanced itself from the Nazi powers, leading to isolation and marginalization of the society. After that and until the end of World War 2, the DPG moved towards the German government, in which it not directly took influence on the Holocaust or other horrific crimes of the Nazis, but by opportunism was kind of an accomplice.^[1]

References

D. Hoffmann, M. Walker, *Physik Journal* 2006, 5, 53–58.
 S. H. Lehnigk, in *Eine deutsche Katasrophe 1933–1940*, Band 5, Verlag Empirische Pädagogik, Landau, 2010, pp. 54–55.
 D. Hoffmann, *Phys. Perspect.* 2005, 7, 293–329.

```
<sup>4</sup>"Bundesarchiv Bild 102-05559, Carl Wilhelm Ramsauer" by Unknown – This image was provided to Wikimedia Commons by the German Federal Archive (Deutsches Bundesarchiv) as part of a cooperation project. The German Federal Archive guarantees an authentic representation only using the originals (negative and/or positive), resp. the digitalization of the originals as provided by the Digital Image Archive. Licensed under Creative Commons Attribution-Share Alike 3.0-de via Wikimedia Commons – http://commons.wikimedia.org/wiki/File:Bundesarchiv_Bild_102-05559,_Carl_Wilhelm_Ramsauer.jpg.
```

Questions of the Week

The Journal of Unsolved Question presents a "Question of the Week" on its homepage every week. Set up and formulated by the members of the editorial board, or guest writers, the main purpose of the "Question of the Week" consists in intriguing the reader by presenting topics of ongoing research. "Questions of the Week" published so far cover a wide variety of scientific fields, but share the feature to be of certain interest to several disciplines. In the following, we present selected "Questions of the Week" from the last six months.

How Big is the Proton?

by Stephan Köhler

While size is something easy to measure at the macroscopic scale it becomes a much more fuzzy concept as the size of the measured object gets smaller. At the molecular and subatomic level things get even worse as the objects of interest have now to be described by the wave-functions dictated by quantum mechanics.



One way to still make sense of the dimensions of an object is to imagine a simple geometric shape with the same physical properties (e.g. charge) of the object of interest. One then tries to find out how big this would have to be to reproduce the interaction with other particles that are observed in experiments. In this fashion one can think of the proton as a sphere with a certain distribution of charges and magnetic poles instead of the bubbling sea of quarks and gluons that it really is. The radius this charged sphere would have to have to correctly describe the Coulomb interaction between the proton and other particles is referred to as the charge radius of the proton.

To measure this one naturally needs particles that interact with the proton in this fashion. In principle one could do this with any charged particle but to make life easier one usually chooses electrons. This is done because an electron has no internal structure and can reasonably be thought of as a point particle. Therefore one does not need to take any fuzziness in the geometry of the electron into account. Such interacting systems between protons and electrons can be achieved in two different ways. The first is to just shoot an electron at a proton and measure how much it is deflected. The second way is to let the electron orbit the proton and measure its energy. The first way is done in particle colliders all around the world. In the second way one deals with a hydrogen atom on which spectroscopy has to be performed. This is done in even more places.

To get more information about the proton from spectroscopy one can exchange the electron with its heavier cousin, the muon. In our current understanding the relevant difference between an electron and a muon is just their mass. A muon is much heavier than an electron and thus gets closer to the proton while orbiting it. As this increases the interaction between proton and muon the effect of the proton structure is much more visible in spectroscopy. The atom one ends up with in these experiments is called muonic Hydrogen.

Unfortunately the measurements of the proton charge radius from spectroscopy of muonic hydrogen^[1] are significantly smaller than the ones obtained from proton-electron scattering.^[2]

Currently it is not clear why this is the case. Possible explanations range from problems in the data analysis or experimental uncertainty of fundamental constants to an insufficient theoretical description that gives the formulas from which the proton radius is calculated.^[3] A more exotic explanation relies on so called "new physics". This would mean our current understanding of the way fundamental particles interact is incomplete. If this is true it could be that the muon and the electron differ in their interaction with the proton so that they effectively see a particle of a different size.^[4] Which of these will resolve the problem remains to be seen.

Read more:

- [1] Antognini et al., *Science* **2013**, 339, 417.
- [2] Bernauer et al., Phys. Rev. Lett. 2010, 105, 242001.
- [3] Barger et al., Phys. Rev. Lett. 2011, 106, 153001.
- [4] Carlson and Vanderhaegen, Phys. Rev. A 2011, 84, 020102.

by Wolter Seuntjens

Dutch Academy of 'Pataphysics, Amsterdam

Peeing or, more delicately, urination or, medically and even more delicately, micturation, is, contrary to popular opinion, a rather complex behavior. In human infants and animals it seems spontaneous. In humans and some domestic animals it can be brought under conscious or voluntary control. In humans this is called, somewhat ambivalently, 'potty training'. In domestic animals it is called, rather confusingly, 'housebreaking' in American English or, slightly more logically, 'house-training' in British English. In many other animals who use urine as scent or territory markers it must also, at least partly, be under voluntary control. However, even if brought under voluntary control, it still sometimes happens that in healthy individuals some external stimuli may provoke the urge to urinate as if by reflex. One urban legend says that urination can be induced in

One urban legend says that urination can be induced in a sleeping person by holding one of his hands in water. There is considerable disagreement about this putative phenomenon.^[1]



Rembrandt, *The Abduction of Ganymede* (1635, Gemäldegalerie Alte Meister, Dresden).¹

Other much reported provoking stimuli of micturation are (1) the sound of running water, for example in taps, fountains, and waterfalls, (2) hand-washing in cold water, and (3) being in a loo / toilet / bathroom / washroom / restroom, as if by a conditioned reflex.^[2]

> He stared at a big bleary bald-headed sixtyyear-old man in the mirror. He turned on the cold water at one of the basins and cupped his hands and rubbed water over his face. The water really made him want to urinate, and so he went over to the toilet, which was some streamlined, low-slung beige thing, and he urinated.

Was this a bad sign, the urge he had always to urinate in the middle of the night?^[3]

In this literary passage it is unclear – apparently also for the novelist – whether the urge to urinate is caused by the washing of hands in cold water, by the splashing of cold water on the face, or by the sound of running water, or – prosaically – because of an age-effect on the bladder and its sphincters. There are probably at least two more local stimuli of the micturation reflex. The first stimulus is invasive and is used as an experimental and diagnostic tool. In the ice-water test (IWT) cooled water is injected through a catheter into the bladder.^[4] The second stimulus is non-invasive and is used as a means to induce urination in women who have recently given birth and are experiencing difficulty or pain urinating. The author of a popular self-help book advises:

You can encourage the urine to start flowing again by [...] placing hot or cold packs on your perineum (whichever triggers your urge to urinate).^[5]



Rembrandt, *The Abduction of Ganymede (detail)* (1635, Gemäldegalerie Alte Meister, Dresden).¹

Interestingly, the author writes also:

If it's good old-fashioned fear that's holding you back, you might want to try drinking plenty of liquids to dilute the acidity of your urine, straddling the toilet saddle-style when you urinate, urinating while you pour water across your perineum (you can use either a peri-bottle or a bowl), or – if you really get desperate – urinating when you're standing in the shower.^[6]

This advice comes closest to the idea conveyed in a passage that originally triggered my curiosity. In 1964 the Dutch writer and painter Jan Cremer published his first novel which became a best-seller and a *cause célèbre*. In this supposedly autobiographical picaresque Cremer described his childhood friendship with a young mother around 1950:

¹"Rembrandt – The Abduction of Ganymede – Google Art Project – cropped" by Rembrandt – Cropped from File:Rembrandt – The Abduction of Ganymede – Google Art Project.jpg, originally from Google Art Project. Licensed under Public Domain via Wikimedia Commons – http://commons.wikimedia.org/wiki/File:Rembrandt_-_The_Abduction_of_Ganymede_-_Google_Art_Project_-_cropped.jpg

If I happened to be in the street in the afternoon when Betty came home with the baby carriage, she'd say to me, "Come in and watch Bartje piss," and I'd go in with her. She would change his diaper and sprinkle a little cold water on his ass, and he'd react immediately by pissing until his little bladder was empty.^[7]

Apparently 'Betty' used this trick to ensure that her baby boy 'Bartje' would have an empty bladder when getting a dry and fresh diaper. This was before the days of disposable diapers and Bartje's diapers were most likely made of cotton. It was in his mother's interest that Bartje would have a dry diaper as long as possible. Ensuring that Bartje's bladder was empty when his diaper was getting changed was one way to do this.

Maybe it is the same reflex that is responsible for the often observed peeing while undoing a used and wet diaper. In such cases, especially boys can cause hilarity when they spray with urine the unexpecting adult who undresses the diaper.

Maybe the putative reflex was painted by Rembrandt. Ganymede's bottom region must have become relatively cold when being airlifted. An alternative explanation for the airborne micturation could be that Ganymede urinated because of 'real stress' incontinence: the distress or heightened negative stress that was caused by the situation in which he suddenly and unwillingly had found himself.

The reflex may thus be provoked by sudden cooling of the

natal region and it might therefore be called the cold bottom reflex.

To my surprise, I found no references in the scientific literature of this putative reflex. Also in recent handbooks of practical baby care I did not come across this parental trick. Therefore the following questions must be addressed: (1) is this a genuine phenomenon and reflex or was it an instance of poetic license by Jan Cremer? and (2) if this is a genuine reflex, was it and its practical applicability forgotten? or (3) was it a private observation and lucky discovery by 'Betty' that was recorded accidentally by Jan Cremer?

Read more:

[1] http://www.discovery.com/tv-shows/mythbusters/mythbustersdatabase/hand-water-asleep-urinate.htm

[2] Radley, S., J. Derek and C. Chapple, in *The Urinary Sphincter* (eds. J. Corcos and E. Schick), New York: Marcel Dekker, Inc., **2001**, pp. 335–55 (p. 352).

[3] Wolfe, T., *A Man in Full*. New York: Macmillan, **2010** [1998], p. 138.

[4] Al-Hayek, S. and P. Abrams, *Journal of Urology* **2010**.183, 1686.

[5] Douglas, A., *The Mother of All Pregnancy Books: An All-Canadian Guide to Conception, Birth and Everything in Between.* Hoboken (NJ): John Wiley and Sons, **2009**.

[6] *Ibid*. The 'peri-bottle' is a squeeze bottle named after and used specifically to cleanse the perineum.

[7] Cremer, J., *I, Jan Cremer*. (English Version by R. E. Wyngaard and Alexander Trocchi), London: Calder & Boyars, **1965** [1964], p. 48.

How does the Monarch Butterfly find out where to go?

by Stephan Köhler

The monarch butterfly is a species of butterflies that occurs around the world, but predominately in North America where it is famous for its long range migration. In these migrations the butterflies move during the autumn from regions in Canada and the northern United States to regions in Texas and Mexico to escape the winter. They return during the next spring. What is even more impressive about this migration is that the lifespan of the butterflies is too short for each individual to complete the whole trip. Adults die in breeding grounds in the north and the next generation returns to the wintering grounds in Mexico, where they have never been. This raises the obvious question: How do they know where to go?

Biologists have long studied migrating animals and distinguish between true navigators and compass navigators. True navigators like migratory birds and sea turtles have the ability to assess their latitude and longitude and can thus move using an internal map. This amazing ability allows them to correct their course if e.g. a storm pushes them of course. With the help of these corrections the migrating species will end up in a very narrow geographic region at

the end of their journey.



Monarch Butterfly²

Compass navigators on the other hand can only assess the direction in which they want to go (e.g. to the south east) but do not know exactly where they are. They can accordingly not perform course corrections if they should be brought off course and have a wider geographic distribution at their destination.

²"Monarch-butterflies-pacific-grove" by Agunther – Own work. Licensed under Creative Commons Attribution 3.0 via Wikimedia Commons – http://commons.wikimedia.org/wiki/File:Monarch-butterflies-pacific-grove.jpg

In a current study,^[1] Mouritsen *et al.* make the case that the monarch butterfly is a compass navigator rather than a true navigator. They base this on an experiment in which they moved Monarch butterflies across Canada and determined the direction in which they took of. This direction was the same at the initial location and the location on the other side of Canada, indicating that the Monarchs did not perform a course correction. They also analyzed data from capturerelease studies of the past 50 years that looked at the movement of butterflies during migration periods. This analysis showed that the data is more compatible with the hypothesis of a compass navigator than a true navigator. Support for this hypothesis comes from another recent study that shows that the butterflies use the sun and an internal clock to find out the vector along which they move. The direction along this vector depends on whether they have experienced the sufficiently low temperatures they would experience during

the winter in Mexico. This temperature dependence might explain why monarch populations on e.g. Hawaii show no migratory behavior.

However the experiment by Mouritsen *et al.* has been criticized for its methodology^[3] and it does not explain the narrow geographic range in which the monarch butterflies end up at the end of their migration. This seems more in line with true navigation and the sun compass may only be one instrument in the toolkit of the butterflies. On the other hand geographical features and prevailing wind directions might also be able to assist the butterflies in reaching their destination without true navigation.

Read more:

- [1] Mouritsen et al., PNAS, 2013, 110, 7348.
- [2] Guerra and Reppert, Current Biology 2013, 23, 419.
- [3] Oberhauser *et al.*, *PNAS* **2013**, *110*, E3680.

Does Life Originate from an RNA World Driven by Thermophoresis?

by Felix Spenkuch

Life on earth is a tremendously complex process and, independent of whether one believes in one god or the other or not, evidence accumulates that this complexity originates from an evolutionary process.^[1-3] According to the dogma of molecular biology DNA is to be transcribed into messenger RNA, a rather transient active copy, which is translated into proteins by using transfer RNAs (tRNA) as adaptors.^[4] This dogma states that proteins are the only class of macromolecules that carry out catalytic functions. But how could such a complex system have evolved from a "primordial soup". A significant modification of the central dogma of molecular biology was caused by the Nobel prize winning discovery of RNAs that are capable to catalyze biochemical reactions without the need of a protein component,^[5,6] giving rise to a theory of molecular evolution based on an RNA world.^[7,8] But even if you go for the RNA world hypothesis the initial question is only transferred from proteins to RNA: How could large, complex RNAs evolve from the vast ocean? This question leads to:

The concentration problem:

Any kind of (bio) chemical reaction can only proceed to high yield if the concentration of starting material is high and best yields are achieved when the products either catalyze further reactions or when product and starting material get separated, resulting in a constant pull due to the continuing disruption of any equilibrium. Alas the concentration of organic molecules in the primordial ocean is thought to be similar to the one in the contemporary ocean, which means too low to support life.^[9]

The contemporary solution to the concentration problem: In contemporary life forms the concentration problem is solved by compartmentalization: Bacteria and Archaea are equipped with a cell membrane that forms there outer hull, while Eukarya possess even additional sub compartments. Consequently the first life forms, so-called protocells, would consist of an outer membrane and an informational and functional biopolymer, i.e. RNA.^[10] It could be shown that fatty acids (the "ancestors" of present phospholipids) can self-assemble into lipid membranes and thereby form compartments that are capable to internalize new nucleic acid building blocks (nucleotides), while retaining the copied biopolymer.^[11]

Thermophoresis as a possible primordial solution of the concentration problem:

This "membrane first" approach would introduce an additional quite unlikely event in the schedule that would ultimately result in the evolution of life. As with basically any unlikely event there of course exists a competing theory, which in this case relies on inorganic compartmentalization as the cradle of life.^[12] Several years ago Baaske et al. proposed an especially elegant approach to inorganic compartmentalization in the RNA world: The authors applied their recently developed theory of thermophoresis in aqueous solutions^[13] in simulations on nucleotide diffusion in pore systems of hydrothermal vents at the bottom of the sea.^[14] Thermophoresis describes movement of molecules in a temperature gradient: Heat of a specific source (here a hydrothermal vent) dissipates in solution and the resulting temperature gradient facilitates molecule accumulation or depletion in the heat source, depending on the nature of the molecule investigated.^[15] The pore system of the vent would not only supply compartmentalization is this scenario but a whole network of compartments that are connected by thermophoresis. The result of the simulations of Basske et al. was: By an interplay of solvent transport by convection and thermophoresis single nucleotides could be accumulated more than 10^8 -fold, while polynucleotides were concentrated even more, depending on their length and the pore geometry.^[14] The authors note that their model already supplies a setting of temperature oscillation like it is used in exponential DNA amplification by the Polymerase Chain Reaction (PCR). Herewith a possible mechanism of mono- and polymer concentration was developed but an important question remained: It was unclear whether any self-replication of nucleic acids would be possible in the hydrothermal pore system. Obermayer *et al.* could address this question by a theoretical approach,^[15] while Mast *et al.* succeeded recently in addressing this system experimentally in a DNA system.^[16] It seems like the thermophoresis model is indeed capable to compete with other theories for the origin of life and we can be looking forward to the studies to come.

Read more:

- [1] J. E. Barrick et al., Nature 2009, 461, 1243-1247.
- [2] D. Brawand et al., Nature 2011, 478, 343-348.
- [3] F. C. Jones et al., Nature 2012, 484, 55-61.

- [4] F. Crick, Nature 1970, 227, 561–563.
- [5] C. Guerrier-Takada, K. Gardiner, T. Marsh, N. Pace, S. Altman, *Cell* textbf1983, *35*, 849–857.
- [6] K. K. Kruger et al., Cell 1982, 31, 147–157.
- [7] W. Gilbert, *Nature* **1986**, *319*, 618.
- [8] G. F. Joyce, Nature 1989, 338, 217–224.
- [9] V. Koonin Proc. Natl. Acad. Sci. USA 2007, 104, 9105–9106.
- [10] J. P. Schrum *et al. Cold Spring Harb. Perspect. Biol.* **2010**, 2, a002212.
- [11] Mansy et al., Nature 2008, 454, 122–125.
- [12] S. E. McGlynn *et al.*, *Phil. Trans. R. Soc. A* **2012**, *37*, 3007–3022.
- [13] S. Duhr, and D. Braun, Proc. Natl. Acad. Sci. USA 2006, 104, 9346–9351.
- [14] P. Baaske, F. M. Weinert, S. Duhr, K. H. Lemke, M. J. Rusell and D. Braun, *Proc. Natl. Acad. Sci. USA* **2007**, *104*, 9346–9351.
 [15] B. Obermayer, H. Krammer, D. Braun and U. Gerland, *PRL* **2011**, *107*, 018101-1-4.
- [16] C. B. Mast et al., Proc. Natl. Acad. Sci. USA 2013, 110, 8030–8035.

Is Coffee Good for You?

by David Huesmann

It is one of the most consumed beverages and for many people, beginning the day without it seems impossible. Coffee is omnipresent in our society, but is the consumption of coffee good for us? Well, for a beverage this popular you bet someone has already looked into this. But the results seem to be quite unclear.



Coffee ³

On the plus side we have lower risk of getting typ II diabetes, reduced risk of stroke (for women), reduced risk of dying from cardio vascular diseases and a general tendency to weight loss. Coffee is one of the main sources for antioxidants, which decrease oxidative stress and caffeine is linked to a reduced risk of getting Parkinson's disease. In men one cup a day cuts the risk of this neurodegenerative disorder in half.

On the other hand however we have elevated cholesterol levels, short-term elevated blood pressure and contaminants from the roasting process like acrylamide and furan (which were both linked to genotoxicity). During pregnancy, the coffee consumption should be kept under 3 cups per day and if you consume more then 5 cups a day you even have an elevated risk of dying from cardio vascular diseases.

All in all, it seems that with moderate coffee consumption, the beneficial effects outweigh the negative ones, but coffee is a very complex mixture of over 1000 chemical components and we are not even close to identifying how all these components influence our body.

Read more:

[1] E. Richling, M. Habermeyer, *Chemie in unserer Zeit* **2014**, *48*, 12–20.

- [2] http://www.hsph.harvard.edu/nutritionsource/coffee/
- [3] http://www.coffeeandhealth.org

³"Latte art" von Mortefot from Flickr – Coffeetime!. Licensed under Creative Commons Attribution-Share Alike 2.0 via Wikimedia Commons – http://commons.wikimedia.org/wiki/File:Latte_art.jpg

Is There a Vaccine Against the Devil's Cancer?

by Felix Spenkuch

No, dear reader, it's not like you think: JUnQ is not going to blame the devil for all cancer there is, since that alone just would not cure the disease. The title of this little piece is rather derived from the Australian island of Tasmania, where there lives a 8 kg weighing carnivore called the Tasmanian devil. The devil may have gotten his name from the aggressive fighting behavior that they cultivate among themselves. But it is exactly this aggressive fighting that may drive the little devil into extinction: Excessive biting promotes the spread of a highly contagious tumor across the whole devil population in Tasmania.^[1] In a way the tumor is a kind of transplant, called allograft that originates from another donating devil. Invasion of cells from cells of alien organisms, even if they belong to the same species, should generate an immune response of the recipient, especially if the alien cells form a life threatening tumor. However, the so called devil facial tumor disease (DFTD) originates from Schwann cells, cells that generate the isolating myelin coating of neurons,^[2] has a fatality rate of 100% while generating no immune response at all.

Why the immune system of the devil cannot cope with the tumor and how that may be related to the tumor's nerve cell origin could recently be addressed by Siddle and coworkers.^[3] A normal immune response requires the processing of a biological marker of the pathogen into a minimal signature. This signature, called antigen, is then presented on the cell surface by so-called MHC proteins. Cells of the immune system are able to recognize antigens presented in this way, which subsequently launches an immune response. Siddle and coworkers could show that the antigen procession pathway, which is prerequisite for any immune response, is down regulated in DFTD tumor cells. Since the immune evasion of the tumor cells is caused by a difference in regulation and not by a mutation, meaning by a loss of the respective genes, it should principally be reversible. The authors could establish administration of recombinant devil interferon as one way to trigger the immune response and suggest vaccination of devils with MHC-positive tumor cells as an ultimate measure to assure species survival.

Does this mean there is a cure to the devil's cancer?

Read more:

- [1] A. M. Pearse, K. Swift, Nature 2006, 439(7076), 549.
- [2] E. P. Murchison et al., Science 2010, 327(5961), 4567-4570.
- [3] H. V. Siddle, PNAS 2013, 110(13), 5103–5108.

Why Do We Think We Will Not Change in the Future?

by David Huesmann

When we look back on our lives we can see all the different changes we went through, how our values, tastes in food and music and so on changed. However, when we look at our future we do not expect this change to continue. Although it is quite unreasonable, we are rather confident that we have reached the end of our personal evolution just now. This phenomenon has been termed the end-of-history illusion.

But why do we think we will stay the same from now on? It is much easier to recall the past than to imagine the future. This then means that recalling past change is easier than imagining future change. Another possible explanation would be that the end-of-history illusion gives us a feeling of security, in assuring us that we will still have the same goals in the future. After all, what would we plan for if not for our current goals?



Slogan from Barack Obama's presidential campaign, 2008.⁴

Still more research is needed before we know why we cannot accept that we will change a lot in the future, but being aware of this phenomenon might help prevent the next tattoo of your current favorite band or movie as it will probably stay much longer than your love for it.

Read more:

[1] J. Quoidbach, D. T. Gilbert, T. D. Wilson, *Science* **2013**, *339*, 96–98.

[2] http://www.psychologytoday.com/blog/reality-play/201301/ the-end-history-illusion

⁴"Change We Can Believe In" by Original uploader was Blubberboy92 at en.wikipedia – Transferred from en.wikipedia. Licensed under Public Domain via Wikimedia Commons – http://commons.wikimedia.org/wiki/File:Change_We_Can_Believe_In.svg

Are There Benefits to Single-Sex Education?

by Stephan Köhler

Does it matter if boys and girls are taught in the same classroom? This is a question US policy makers currently have to engage. But which is also of interest to European countries where single-sex education has a long history in institutions like e.g. catholic schools. While advocates claim that single-sex education is beneficial to children most of the advanced arguments are far from being scientifically uncontroversial.^[1] While a better learning outcome is usually advanced as the main reason reviews of available studies can not find a significant improvement in outcome if the results are controlled for confounding factors. The main reason for these confounding factors are that many singlesex education schools are private and thus have certain criteria for admittance. Additionally students that can not keep up with the expected learning progression might transfer to other schools. Unfortunately only insufficient data on controlled (i.e. double blind) studies are available. These would include randomly assigning students to either singlesex or coeducational schools regardless of socio-economic background. Even in the rare cases where such observations were possible the results are not clear cut.^[2]

Another problem for assessing the effectiveness of single sex education is a possible placebo effect. In Schools were single sex education is introduced as a way to improve student performance teachers and students might be more motivated to achieve the expected results. Furthermore there is no scientific basis to assume that boys and girls need different teaching techniques that would make it necessary to

educate them separately.

If the upsides are not clear are there any downsides? The answer is quite possibly yes. Research has shown that children are picking up on the distinction that is drawn between boys and girls and assume that this is an important part of how society works. An assumption that has been shown to lead to more prejudice against the other group.^[3] Furthermore the students are deprived of the opportunity to learn how to productively interact with members of the other sex in a professional setting, which they most likely will have to do in their later life. Both of these effects could significantly contribute to the ingraining of sexism in society and adversely affect performance in a mixed sex society. In conclusion a significant amount of research still needs to be done to clarify what exactly the benefits and drawbacks of single sex education are. This is especially important as with all public policy issues the different education models compete for a limited amount of resources. Additionally the research into this topic is already used in legal cases to decide which path public schools in the United States should be taking.^[4]

Read more:

- [1] D. F. Halpern, Science, **2012**, 333, 1706.
- [2] Letters to Science, Science 2012, 335, 165.
- [3] L. J. Hilliard, L. S. Liben, Child Development, 2010, 81, 1787.
- [4] S. E. Eckes, S. D. McCall, *Educational Administration Quarterly*, **2014**, *50*, 195.

Graduate School Materials Science in Mainz - Germany











Graduate School MAINZ Johannes Gutenberg Unisersity Mainz Dr. Mark Bajohrs mainz@uni-mainz.de

CONCEPT

The Graduate School of Excellence "MAterials Science IN MainZ" (MAINZ) offers innovative scientific, technical and complementary PhD training combined with excellent research in materials science. MAINZ bridges previously disjoint fields of materials research. This allows MAINZ members to develop a common language, to foster interdisciplinary transfer of knowledge, and to gain insight into systems traditionally seen as separate.

Scientists from Johannes Gutenberg University Mainz, the Max Planck Institute for Polymer Research (MPI-P) and the University of Kaiserslautern (TUKL) have joined to form MAINZ. MAINZ has been selected as one of the few PhD programmes in the interdisciplinary area of Chemistry, Physics and Biology as part of the Excellence Initiative.

RESEARCH AREAS

Model Systems and Correlated Matter
 Functional Polymers
 Hybrid Structures
 Bio-Related Materials

TRAINING

The main goal of the Graduate School Materials Science in Mainz (MAINZ) is to provide excellent scientific training for PhD students while they conduct high-quality research. Our programme is committed to offering excellent training opportunities in a most flexible and individualized manner to kick-start the future career of our PhD students in academia, industry and beyond. This requires both: excellent training within materials science research (Training through Research) and complementary business, leadership, cultural, and other skills (Training for Life).

SUPERVISION AND MENTORING

PhD Students of MAINZ are expected to finish their thesis within three years. Therefore, they require excellent supervision. Hence, our PhD students benefit from more attention throughout their PhD studies, and receive individual supervision and mentoring. A fundamental characteristic of our supervision approach is that it is carried out under the guidance of two or more academic supervisors and one mentor. Our mentoring concept is very successful in opening new avenues for a career (in industry or academia) after completing the PhD degree. Details of our supervision policy, the duties of our supervisors and co-supervisors, and the tasks of the Thesis Committee are given on our website and are listed in our Training and Policy Manual (download via MAINZ website).



www.mainz.uni-mainz.de

Articles

Does the New ICMJE Criterion Stem Co-Author Overflow?

Natascha Gaster^a, Jorge S. Burns^b, Michael Gaster^{a,1}

^aLaboratory of Molecular Physiology, Departments of Pathology and Endocrinology, Odense University Hospital, 5000 Odense, Denmark

^bLaboratory of Cell Biology and Advanced Cancer Therapies, Department of Medical and Surgical Sciences for Children & Adults, University Hospital of Modena and Reggio Emilia, 41100 Modena, Italy

Received 13.01.2014, accepted 07.04.2014, published 13.04.2014

The ICMJE recommendations have recently been revised to include the addition of a fourth criterion to the Vancouver Protocol, the internationally recognized and globally applied standard for determining authorship on publications; authorship involves "Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved".^[1] This development serves to prevent authors from delegating responsibility without further ado to another author should part of the article be questioned. In addition to accepting full responsibility for the parts he or she has done, the author should be able to identify which co-authors are responsible for other parts of the work. Herewith, we consider possible outcomes of this latest revision especially with regard to its broadest implications. Does this change mean we can expect a shift in authorship patterns? One can readily envisage two possibilities. On the one hand it might serve as a reminder that authorship reflects a substantial contribution to the entire research process, from conceptualization to writing the article, emphasizing concern for gratuitous co-authorships. Yet on the other hand it might result in more frequent accredited types of honorary authorship; whereby an "honorary guarantor" is invited to partake authorship so as to more comprehensively meet the explicit demand for accountability in the resolution of questions. Arguably such an initiative is already underway with the "Contributed Submission" process in addition to standard direct submission to the Proceedings of the National Academy of Sciences, USA. To contribute an article, an Academy member must affirm that he or she had a direct role in the design and execution of all or a significant fraction of the work and the subject matter must be within the member's area of expertise. The articles must report the results of original research, receive comment from reviewers that are free of conflict of interest and remain subject to evaluation by the Editorial Board. Such endorsed articles need not necessarily improve quality, but provide an avenue for more controversial or innovative studies whose

significance may otherwise be difficult to appreciate.

Over recent years several studies show that the number of authors per scientific article is increasing, though the precise cause for this trend is not entirely known.^[2-5] Analysis of articles published in four prestigious American journals showed that single author articles were nearly extinct and that the average number of co-authors had increased from 4.5 in 1980 to 6.9 in 2000.^[3] Arguably, this could simply reflect the increased complexity of multidisciplinary research, but this assumption has been challenged. In a 2008 study, Papatheodorou et al., examined the average number of authors per article in different topics spanning the years 1985–2005 and suggested that heightened complexity alone was unlikely to account for finding an increased number of authors in every topic; rather it might also reflect a prevalent "publish or perish" mentality.^[4] This stigma is a consequence of a growing use of scientometric data for career advancement since Hirsch presented the h-index in 2005.^[6] This index aimed to reflect both productivity and the impact of published work and is commonly used nowadays for appraisal of researchers not only for appointing promotions, but also for awarding research funds. Arguably, even h-index assessments principally reflect the number of publications, emphasizing productivity yet weakening the importance of quality and significance.^[7,8] Beyond selfpromoting objectives, researchers may feel encouraged to expand co-authorship for the more altruistic goal of establishing collaborative research centers, given that sponsors may require evidence of pre-existing collaboration for positive evaluation.

An associated trend accompanying more authors is an increasing number of shared co-first or co-last authors with one self-defeating result from large numbers of authors and divisions being that with increasingly diluted contributions the significance of authorship declines and true merit is called into question.^[9] Perhaps the most pernicious contributions are coercive authorships, an obsequious nod to the pressure of patronage claimed by a senior position and hon-

¹e-mail: michael.gaster@rsyd.dk

orary authorships involving a renowned scientist who has not participated in the study but is invited with the aim of facilitating the publication process through prestige. Thus it is important to take into consideration that all four ICJME authorship criteria need to be upheld.

We argue that one possible response to the new criterion for authorship might be the evolution of a new alternative type of honorary authorship – namely, honorary expert authorships. In contrast to maligned credential-inflating honorary authorships, a manuscript might be supported by an expert specialist in the field who despite little direct involvement in the study is deemed a necessary author to fulfill the accountability criterion.

Given such observations concerning current practice, will the new ICMJE authorship recommendations lead to any authorship changes? With a prominent "publish or perish" dilemma, the present situation may be slow to change and only reappraised assessment metrics and greater work ethic compliance would likely influence this trend.^[10] Some institutions define guest authorship as scientific misconduct, but not all. However, unless there is universal adoption of more stringent attribution criteria, those who first comply might ironically be disadvantaged, seeming to have fewer publications than their less ethical peers. The long-term consequences for science and education would be severe if quality were to give way to quantity.

Some Journal Chief Editors have aimed to diminish profligate authorships by stipulating a maximum number of authors per article. However, declaring the permitted maximum number of authors may be interpreted as license to reach it and inadvertently encourage a permissive approach to authorship.^[3] In addition, many journals have introduced the policy that manuscripts need precise identification of

each author's contribution, although terms such as "final approval of manuscript" remain open to exploitation. Despite these initiatives we still observe an increased number of co-authors. This would suggest that more drastic steps are needed if we are to see a change in the current practice. In theory the new ICMJE recommendation is a step towards more ethical accreditation for research but it will not in practice be very influential without accompanying changes, with broader acceptance and implementation of the need to emphasize quality versus quantity.

References

[1] 2013 ICMJE Recommendations. http://www.icmje.org/urm_main.html (last access on 13.01.2014).

[2] K. S. Kahn, C. R. Nwosu, S. F. Khan, L. S. Dwarakanath,

P. F. Chien, Am. J. Obstet. Gynecol. **1999**, 18, 503–507.

[3] W. B. Weeks, A. E. Wallace, B. C. Kimberly, *Soc. Sci. Med.* **2004**, *59*, 1949–1954.

[4] S. I. Papatheodorou, T. A. Trikalinos, J. P. Ioannidis, *J. Clin. Epidemiol.* **2008**, *61*, 546–551.

[5] F. T. Hammad, S. Shaban, F. Abu-Zidan, *Med. Princ. Pract.* **2012**, *21*, 435–441.

[6] J. E. Hirsch, Proc. Natl. Acad. Sci. U S A 2005, 102, 16569– 16572.

[7] N. Gaster, M. Gaster, Bioessays 2012, 34, 830-832.

[8] L. Bornmann, R. Mutz, H. Daniel, J. Am. Soc. Inf. Sci. Technol. 2008, 59, 830–837.

[9] M. L. Conte, S. L. Maat, M. B. Omary, *FASEB J* 2013, 27, 3902–3904.

[10] N. A. Aziz, M. P. Rozing, PLoS One 2013, 8, e59814.

Mary Symmetrical and Mary Nonsymmetrical

A Hitherto Undetected Difference in the Iconography of the Two Most Important Women in the New Testament?

Wolter Seuntjens¹

Dutch Academy of 'Pataphysics, Amsterdam

Received 25.03.2014, accepted 18.06.2014 published 31.07.2014

Symmetry is an esthetic quality both in art and in life. Symmetry is generally associated with beauty, evolutionary fitness, and perfection whereas asymmetry is associated with the lack of beauty, diminished evolutionary fitness, and imperfection. The physical aspect of praying behavior is almost exclusively bilaterally symmetrical.

In the Christian tradition, praying with hands held together can be done in three ways: symmetrically, quasi-symmetrically, and asymmetrically.

In the history of Christian art the Virgin Mary and Mary Magdalene are undoubtedly the two most frequently depicted women. Contrary to expectation, the praying postures in which the Virgin Mary and Mary Magdalene are depicted are not random. The Virgin Mary prays most often symmetrically whereas Mary Magdalene prays predominantly nonsymmetrically (first rule). Moreover, both Marys pray mainly symmetrically in depictions of pre- and post-Passion scenes whereas they pray mostly nonsymmetrically in Passion scenes (second rule). The exception to the second rule is the theme of The Penitent Mary Magdalene, in which Mary Magdalene is depicted mostly praying nonsymmetrically (third rule).

As a tentative explanation of these differences it is proposed that: (1) The Virgin Mary is for the most part depicted symmetrically because she is the epitome of serene perfection whereas the more often nonsymmetrically depicted Mary Magdalene is the embodiment of emotional perfectability. (2) In Passion scenes both Marys are shown mainly in nonsymmetrical praying postures because of the extreme emotionality whereas in pre- and post-Passion scenes they both display the more beatific symmetrical praying postures. (3) The Penitent Mary Magdalene is generally depicted in the emotional nonsymmetrical praying posture because in that particular part of the post-Passion period Mary Magdalene's sainthood was still in the balance.

1 Introduction

(A) Symmetry and asymmetry are qualities that have provoked much discussion in art, aesthetics, and science generally.^[1,2] A common opinion is that symmetry is beautiful and perfect while asymmetry is imperfectly beautiful.

Bilateral symmetry is mirror symmetry in the sagittal plane, that is symmetry that divides the body vertically into left and right halves. In this article we will understand symmetry, for reasons of conciseness, as bilateral symmetry. The term laterality refers to asymmetries in body, brain, behavior, and cognition. Behavioral asymmetry is thus a part of laterality.

(B) In the history of Christian art the Virgin Mary (M) and Mary Magdalene (MM) are undoubtedly the most popular female subjects.^[3] Depictions of the Virgin Mary are

literally innumerable. However, these innumerable depictions can be categorized in a number of themes or stock scenes: Annunciation, Nativity, Adoration, Madonna and Child, Crucifixion, Assumption, *et cetera*. The same goes for depictions of Mary Magdalene. Stock scenes for the second most important woman in the New Testament are: Crucifixion, Lamentation, Noli me tangere, The Penitent Mary Magdalene, *et cetera*.

(C) Praying and prayer are words that refer to complex concepts. Prayer may be defined broadly as an invocation or act that seeks to activate a rapport with a deity, an object of worship, or a spiritual entity through deliberate communication.

In all religious traditions, not only in Christianity, praying behaviors are overwhelmingly symmetrical.^[4] The physical act of praying is a behavior that seems to invite symmetry. This is also true for postures associated with devotion, med-

¹e-mail: w.seuntjens@hotmail.co.uk

itation, and contemplation.

In the Western Christian tradition until about the eleventh century praying was done and depicted almost exclusively in the so called orante posture. In some Christian traditions and some liturgical contexts the orante posture is still used. However, after the eleventh century praying with hands held together took over as the predominant praying posture.^[5] Depictions of praying persons also increasingly displayed hands held together.^[6] Why the orante posture was almost completely superseded by the posture in which the hands are held together – a paradigm shift in praying behavior – is unclear.^[7] The origin of the hands held together posture in prayer is, itself, obscure. The influence of the medieval secular pledge of allegiance gesture is generally accepted. Also oriental gestures of salutation, valediction, devotion, and submission may have been influential.^[8] Appreciating this we may acknowledge that depictions of M and MM praying with hands held together are in all likelihood anachronisms: these depictions probably do not reflect historical fact.

In the Christian tradition, while praying the hands can be held together in three ways. As descriptions and definitions in the scholarly literature vary considerably and may give rise to confusion, it is wise to define our terms:

- 1. symmetrical = s = hands joined: The hands are held together perfectly symmetrically, the fingers and thumbs touching their opposite counterparts (Fig. 1)
- 2. quasi-symmetrical = qs = hands folded (= non-symmetrical): The fingers and thumbs are intertwined making the folded hands not quite symmetrical: either the right thumb or the left thumb is on top (Fig. 2)
- 3. asymmetrical = *as* = hands clasped (= nonsymmetrical): (3.a) The four fingers of each hand together, the thumbs crossed on top (Fig. 3); (3.b) The fingers of one hand cupping the fisted fingers of the other hand (Fig. 4)

Praying is an essential part of Christian life. Therefore, praying postures were and still are often depicted in Christian art. However, there are at least six problematic factors when studying artistic depictions of praying persons:

- 1. The development of the technical dexterity to draw may have influenced the way to depict praying persons with hands held together. It is arguably easier to draw the symmetrical hand posture than the quasi-symmetrical one. Thus, depicting the quasisymmetrical hand posture probably developed later than depicting the less demanding symmetrical hand posture.
- 2. The variety in which the praying hands were depicted may have been influenced by the epoch of artistic style. The relatively static Romanesque and Gothic styles go together more naturally with the symmetrically joined hands, whereas the expressive quasisymmetrically folded and the asymmetrically clasped

hands lend themselves more to the more dynamic Baroque and Romantic styles.

- 3. The theme may influence the variety in which the praying hands are depicted. This again may be associated with the factors (1) technical dexterity and (2) epoch of artistic style. For example, all included depictions of the Madonna of Ears show the praying M with hands joined.^[9] Also depictions of the Immaculate Conception theme appear to bring forth the symmetrical hand posture exclusively.^[10] On the other hand, depictions of The Penitent Mary Magdalene, in which MM's hands are held together, show predominantly quasi-symmetrical and asymmetrical praying postures.^[11]
- 4. Depictions of hands held together may occur in various contexts. For example, hand postures in praying may be similar to hand postures in salutation or submission. On the other hand, other bodily postures may also be used for the depiction of prayer. In other words, there are some types of praying behavior in which the hands may not be held together, and, conversely, hands may be held together also in nonpraying behavior. For example, Édouard Manet's *Lady in Pink* (c. 1880, Galerie Neue Meister, Dresden) probably does not depict praying behavior.
- 5. Another factor may be the theological interpretation and implication of the depicted hand postures in praying. For instance, there may have been an association between the branches and denominations of Christianity (e.g. Roman Catholic versus Protestant) on the one hand and the popularity of various hand postures (e.g. s versus qs) during prayer on the other hand. The German Wikipedia article 'Gebet' ('Prayer') states that praying with hands folded quasisymmetrically originated in the Reformation.^[12] This is evidently not true.^[13] The earliest depiction of quasi-symmetrically folded hands may be seen on the sarcophagus of Adelfia from Syracuse, Sicily (early fifth century). Textually, we find the first mention of it in a work by Saint Gregory the Great (Dialogue II, 33. Late sixth century). Quasi-symmetrically folded hands we see in some angels in Giotto's Lamentation (c. 1305, Scrovegni Chapel, Padua). Nevertheless, the denomination or the branch of Christianity may be a factor in favoring joined (s) or folded (qs) hands in depictions of praying. Holding the thumbs crossed with otherwise symmetrically joined hands (qqs) may have been relatively frequent especially prior to around 1550. The crossed thumbs, which according to popular opinion would refer to the instrument upon which Jesus was executed, preclude a perfectly symmetrical hand posture. If, for example, this particular hand posture were displayed by the Virgin Mary in a depiction of the pre-Passion period, this would be a presage of the Crucifixion (e.g. Giorgione, Adoration of the Shepherds / The Allendale Nativity, c. 1505, National Gallery of Art, Wash-



Figure 1: The Virgin Mary praying with symmetrically joined hands. Albrecht Dürer, *Praying Mary* (1518, Gemäldegalerie, Berlin).²



Figure 3: Mary Magdalene praying with asymmetrically clasped hands. Domenico Fetti, *Saint Mary Mag-dalene Penitent* (1615, Museum of Fine Arts, Boston).⁴



Figure 2: Mary Magdalene praying with quasisymmetrically folded hands. Jan van Steffenswert, *Kneeling Mary Magdalene* (c. 1525, Bonnefanten Museum, Maastricht).³



Figure 4: The Virgin Mary praying with asymmetrically clasped hands. Arnaud de Moles, *Crucifixion* (detail), stained glass (c. 1510, Chapelle du Saint-Sacrement, Cathedral of Saint Mary, Auch).⁵

²"Albrecht Dürer 010" von Albrecht Dürer – The Yorck Project: 10.000 Meisterwerke der Malerei. DVD-ROM, 2002. ISBN 3936122202. Distributed by DIRECTMEDIA Publishing GmbH. Licenced under Public Domain via Wikimedia Commons – http://commons.wikimedia.org/wiki/File: Albrecht_D%C3%BCrer_010.jpg

³"Jan van Steffenswert – Knielende Maria Magdalena1" by Jan van Steffenswert – Ophelia2. Licensed under Public Domain via Wikimedia Commons – http://commons.wikimedia.org/wiki/File:Jan_van_Steffenswert_-_Knielende_Maria_Magdalena1.JPG

⁴"Fetti, Domenico – Saint Mary Magdalene Penitent – 1615" by Domenico Fetti – Web Gallery of Art. Licensed under Public Domain via Wikimedia Commons – http://commons.wikimedia.org/wiki/File:Fetti,_Domenico_-_Saint_Mary_Magdalene_Penitent_-1615.jpg

⁵"Auch – Cathédrale – Vitrail – 6" by MOSSOT – Own work. Licensed under Creative Commons Attribution-Share Alike 3.0-2.5-2.0-1.0 via Wikimedia Commons – http://commons.wikimedia.org/wiki/File:Auch_-_Cath%C3%A9drale_-_Vitrail_-6.jpg

6. In general, over the long time period from which the art works were selected the symbolic content of both the Virgin Mary and Mary Magdalene has varied considerably. In other words, we should be very careful when interpreting works from different epochs.

The above problematic factors may be interrelated: one causes the other, *et vice versa*.

If, however, we agree to overlook these problems temporarily, we may be able to study the distribution of depicted praying postures in a pragmatic way.

2 Hypotheses

- $1H_0$ The variables symmetry (*s*, *qs*, *as*) and person (M, MM) are independent of each other, meaning the degree of symmetry of the hand posture is independent of the depicted praying person.
- 1H₁ The variables symmetry (s, qs, as) and person (M, MM) are associated. Specific combinations occur disproportionately frequently, meaning the Virgin Mary has been depicted more often symmetrically, whereas Mary Magdalene has been depicted more often nonsymmetrically.
- 2H In scenes from the Passion period both Marys are shown mainly performing nonsymmetrical praying postures, whereas in pre- and post-Passion scenes they both display more often the symmetrical praying posture.
- 3H The Penitent Mary Magdalene is most often depicted in a nonsymmetrical praying posture.

3 Materials and Methods

For the comparison only 'serious' works of art showing M and MM displaying symmetrical and nonsymmetrical praying behavior were selected.^[14] The operational definition of praying behavior was 'holding hands together'. Inevitably, some degree of arbitrariness slipped in at selecting the depictions. It excluded, for example, most depictions in which the hands are symmetrically joined with crossed thumbs (*qqs*) (e.g. Francisco de Zurbarán, *Childhood of the Virgin*, c. 1659, Hermitage, Saint Petersburg). It also excluded the quasi-symmetrical posture of the flat hands or underarms crossed against or directly in front of the breast, typical of many depictions of M (e.g. Fra Angelico, *Annunciation of Cortona*, c. 1434, Prado, Madrid).

In some works of art the hands are held parallel but not touching. Sometimes this posed a further difficulty: when should this be counted as a symmetrical hands-joining (s) praying posture? For example, Donatello's *Mary Magdalene* (1454, Museo dell'Opera del Duomo, Florence) was included but Pedro Berruguete's *Annunciation* (c. 1495, Monastery of Miraflores, Burgos) was not.

A large number of works (N=1,091) depicting either the Virgin Mary, Mary Magdalene, or both Marys, were selected and compared (Fig. 5).^[15]

For the database, works from all categories of the visual arts were accepted, as were selected paintings, drawings, prints, photos, sculptures, *et cetera*.

The depictions had to be available on the Internet. They were readily found in *Wikimedia Commons*, using for example, the search term 'Christian art by subject', in *WikiPaintings*, using for example the keywords 'Mary Magdalene', and in other Internet databases.

The depictions that were included in the database all originate from the Western Christian tradition (Roman Catholic, Anglican, and Protestant). Works from the Orthodox traditions were not included.



Figure 5: Diagram (time = x-axis ; number of depictions = y-axis) of the overall database.

The selected depictions originate from a period of about 900 years, the earliest depiction dating from around 1100, the most recent work from 2013.

In order not to inflate numbers and not to include 'doubles', only one work per artist per theme was selected. Of the numerous Immaculate Conceptions by Murillo, for example, only one work was included. However, in case the artist used both symmetrical and nonsymmetrical hand postures in depictions of the same theme both works were included. For example, two depictions of The Penitent Mary Magdalene by Jusepe de Ribera were included: one showing s and one qs. This anti-inflationary criterion might earn the criticism of inviting selection bias by excluding many works that could have influenced the results. However, it is quite likely that this criterion worked against the hypotheses. In other words, an inflationary selection would have been the worse choice methodologically. Thus, for theoretical and practical reasons, the chosen approach was to follow the anti-inflationary method of data selection.

The method then consisted of simply tallying the different praying hand postures (s, qs, and as) for M and MM in different stock scenes. In other words, this research was an exercise in 'stamp collecting' in the Rutherfordian sense. IBM SPSS Statistics 21 was used as statistical tool.

4 Results

The results of the nominally scaled variables of degrees of symmetry (*s*, *qs*, *as*) and depicted person (M, MM) are presented in contingency tables (Tables 1–8). In order to be able to compare the two unlike sized samples (N_M =801;

 N_{MM} =290), the results are mainly given in percentages. For further exploration, a number of associations between degree of symmetry and categories of depicted scenes (pre-Passion; Passion; post-Passion) are also presented.

It was found that the praying hand posture of the Virgin Mary is predominantly symmetrical whereas Mary Magdalene is mostly praying nonsymmetrically (quasisymmetrically or asymmetrically).

In 579 cases (72.3%, with $N_M = 801$) (Table 1) M is depicted with symmetrical praying hands whereas MM is more often depicted with nonsymmetrical hand postures while praying: *qs* and *as* in 204 cases (70.3%, with $N_{MM} = 290$). Symmetrical praying hands in depictions of MM were found in 29.7% of the sample, whereas M is depicted with quasisymmetrical hands in 24.5% of the sample.

As a result, when all works are taken together, the difference in praying hands posture of M and MM is confirmed and the result is highly significant ($p \le 0.05$). This in itself is an interesting finding that asks for the further analysis of some specific factors.

Within the Passion period (Table 2) (N=386) the three categories of symmetry are distributed relatively evenly over M and MM. Both M and MM show mostly the quasisymmetrical hand posture (M=66.3%; MM=78.1%). A much smaller proportion of the sample show the symmetrical hand posture (M=26.0%; MM=14.1%). A comparatively high percentage of depictions of the Passion period show asymmetrical hand postures (M=7.8%; MM=7.8%). In contrast to the general pattern (Table 1), M is depicted displaying disproportionally high percentages of qs (66.3% versus 24.5%) and as (7.8% versus 3.2%).

Table 1: Distribution of symmetrical, quasi-symmetrical, and asymmetrical praying hands by the Virgin Mary and Mary Magdalene in all selected works.

All selected works		М	MM	Total	
	as	Frequency	26	20	46
	as	% within M/MM	3.2%	6.9%	4.2%
Symmetry	qs	Frequency	196	184	380
		% within M/MM	24.5%	63.4%	34.8%
	s	Frequency	579	86	665
		% within M/MM	72.3%	29.7%	61.0%
Total		Frequency	801	290	1091
		% within M/MM	100.0%	100.0%	100.0%

Table 2: Distribution of symmetrical, quasi-symmetrical, and asymmetrical praying hands by the Virgin Mary and Mary Magdalene in all works depicting a scene from the Passion period.

Passion period		М	MM	Total	
	as	Frequency	20	10	30
		% within M/MM	7.8%	7.8%	7.8%
Symmetry	qs	Frequency	171	100	271
		% within M/MM	66.3%	78.1%	70.2%
	s	Frequency	67	18	85
		% within M/MM	26.0%	14.1%	22.0%
Total		Frequency	258	128	386
		% within M/MM	100.0%	100.0%	100.0%

In the database a total of 182 cases show Crucifixion scenes (Table 3). The results suggest that in this particular theme the degrees of symmetry are also distributed relatively evenly between M and MM. And again in contrast to the general pattern (Table 1), M is depicted displaying disproportionally high percentages of qs (66.4% versus 24.5%) and as (7.6% versus 3.2%).

A total of 77 works showing Crucifixion scenes originating from the time period of 1100–1500 were selected (Table 4). Here it was found that M was depicted praying mostly quasi-symmetrically (69.8%). MM was depicted praying symmetrically slightly more often (25.0%) when compared with the time period of 1100–2013 (17.5%).

In the small number (N=36) of selected works showing

Deposition scenes (Table 5) it was found that M and MM were mostly depicted praying quasi-symmetrically (80.6%). There were only a few instances of symmetrical hand postures (8.3%). Relatively frequent are the 4 (11.1%) depictions of asymmetrical hands postures.

In the selected works (N=70) showing Lamentation scenes (Table 6) it was found that M and MM were depicted mostly praying nonsymmetrically (71.4%). Only a minority of cases showed the symmetrical hand posture (28.6%).

In the sample (N=71) showing post-Passion Assumption (M) and Elevation (MM) scenes (Table 7), M is depicted in 100% of the cases with hands held together symmetrically and MM in 96.2% of the cases.

Table 3: Distribution of symmetrical, quasi-symmetrical,	and asymmetrical pr	raying hands by th	ne Virgin Mary	and Mary
Magdalene in Crucifixion scenes.				

Crucifixion			М	MM	Total
	as	Frequency	9	2	11
		% within M/MM	7.6%	3.2%	6.0%
Symmetry	qs	Frequency	79	50	129
		% within M/MM	66.4%	79.4%	70.9%
	s	Frequency	31	11	42
		% within M/MM	26.1%	17.5%	23.1%
Total		Frequency	119	63	182
		% within M/MM	100.0%	100.0%	100.0%

Table 4: Distribution of symmetrical, quasi-symmetrical, and asymmetrical praying hands by the Virgin Mary and Mary Magdalene in Crucifixion scenes in works dating between 1100 and 1500.

Crucifixion 1100-1500		М	MM	Total	
	as	Frequency	3	0	3
		% within M/MM	5.7%	0.0%	3.9%
Symmetry	qs	Frequency	37	18	55
		% within M/MM	69.8%	75.0%	71.4%
	s	Frequency	13	6	19
		% within M/MM	24.5%	25.0%	24.7%
Total		Frequency	53	24	77
		% within M/MM	100.0%	100.0%	100.0%

Table 5: Distribution of symmetrical, quasi-symmetrical, and asymmetrical praying hands by the Virgin Mary and Mary Magdalene in Deposition scenes.

Deposition			М	MM	Total
	as	Frequency	2	2	4
		% within M/MM	10.5%	11.8%	11.1%
Symmetry	qs	Frequency	16	13	29
		% within M/MM	84.2%	76.5%	80.6%
	s	Frequency	1	2	3
		% within M/MM	5.3%	11.8%	8.3%
Total		Frequency	19	17	36
		% within M/MM	100.0%	100.0%	100.0%

Articles

Table 6: Distribution of symmetrical, quasi-symmetrical,	and asymmetrical praying hands by the Virgin Mary and Mary
Magdalene in Lamentation scenes.	

Lamentation			М	MM	Total
	as	Frequency	2	4	6
		% within M/MM	4.3%	16.7%	8.6%
Symmetry	qs	Frequency	26	18	44
		% within M/MM	56.5%	75.0%	62.9%
	s	Frequency	18	2	20
		% within M/MM	39.1%	8.3%	28.6%
Total		Frequency	46	24	70
		% within M/MM	100.0%	100.0%	100.0%

Table 7: Distribution of symmetrical, quasi-symmetrical, and asymmetrical praying hands by the Virgin Mary and Mary Magdalene in Assumption / Elevation scenes.

Assumption / Elevation		М	MM	Total	
	as	Frequency	0	0	0
		% within M/MM	0%	0%	0%
Symmetry	qs	Frequency	0	1	1
		% within M/MM	0%	3.8%	1.4%
	s	Frequency	45	25	70
		% within M/MM	100%	96.2%	98.6%
Total		Frequency	45	26	71
		% within M/MM	100.0%	100.0%	100.0%

Table 8: Distribution of symmetrical, quasi-symmetrical, and asymmetrical praying hands by Mary Magdalene in The Penitent Mary Magdalene scenes.

The Penitent Mary Magdalene			MM
	as	Frequency	9
	us	% within MM	9.0%
Symmetry	qs s	Frequency	65
		% within MM	65.0%
		Frequency	26
		% within MM	26.0%
Total		Frequency	100
		% within MM	100.0%

In the sample (N=100) showing The Penitent Mary Magdalene (Table 8), MM is depicted 74% *as* and *qs* while only 26% *s*. The preference for nonsymmetrical praying posture is thus even more pronounced than in the overall database (*as* and *qs* 70.3% and *s* 29.7%).

Summarizing the above, it seems that both the depicted theme and the stylistic epoch explain some but not all of the differences in the distribution of symmetrical and nonsymmetrical depictions of M and MM. However, overall there seems to be a very real difference between depictions of M and MM as regards hand posture in praying.

5 Discussion

This investigation started out with a rather more general hypothesis. From the idea that women are more symmetrical than men, both anatomically and behaviorally, it could be inferred that praying posture is more symmetrical in women than in men. More particularly, it could be argued that in the history of Western art depictions of hand postures while praying will be more symmetrical in women than in men. Thus, conforming to this original hypothesis, in Martin Schongauer's *The Nativity* (c. 1478, Gemäldegalerie, Berlin) the Virgin Mary is depicted displaying a devout and elegant *s* and Joseph, the husband of Mary and earthly foster-father of Jesus, is depicted displaying a somewhat lackadaisical *qs*. However, although it is a parsimonious hypothesis which at first blush is corroborated by not a few depictions, a preliminary statistical test of this hypothesis was inconclusive.

The original question was probably too general and the first sample (N=350), a true jumble of praying saints and sinners, was consequently too broad. However, while collecting the first sample it did not escape my notice that there appeared to be a disparity in favored praying postures between

M and MM. In other words, there was a strong hint that the Virgin Mary was depicted praying predominantly symmetrically whereas Mary Magdalene was depicted praying mostly nonsymmetrically. Therefore, the original hypothesis was dropped and instantly replaced with a new hypothesis: in the history of Western Christian art depictions of M and MM display different preferences for hand postures while praying.^[16] This new hypothesis called for a larger, a more specific, and an only partially overlapping database.

The iconographies of both M and MM have been studied comprehensively. However, a difference between M's and MM's preferred praying postures has ostensibly never been noticed.^[17] In a recent monograph on the iconography of Mary Magdalene the topic of praying hand postures is not mentioned.^[18]

Incidentally, the new data suggested also that there are marked differences in praying postures for both Marys in different periods of their lives. The critical period is the time that is called the Passion of Christ. Thus, it is possible to differentiate between three periods:

- A pre-Passion
- B Passion
- C post-Passion

The themes or stock scenes that are associated with the pre-Passion period are, for example, Annunciation, Nativity, and Adoration. For the period of the Passion there are Crucifixion, Lamentation, and Entombment. Finally, for the post-Passion period we have Noli me tangere, Pentecost, and Assumption.^[19] Regardless of the stylistic epoch (Gothic, Baroque, *et cetera*), both Marys display in both the pre-Passion and the post-Passion periods significantly more *s* and in the Passion period more *qs* and *as*. The exception to this rule are depictions of the theme of The Penitent Mary Magdalene, which appears to favor particularly the display of *qs* and *as* by MM.

Of course, not all depictions of, for example, The Penitent Mary Magdalene show MM in a praying hands posture. Sometimes MM is shown in the typical melancholy posture of hand supporting head while reading or while contemplating a skull. And, of course, not in every Annunciation M displays a praying hands posture. Frequently she is depicted while crossing her arms in front of her breast, or often she is depicted holding the book she is reading when Gabriel surprises her. However, if M or MM is depicted in a praying hands posture that posture appears not to be stochastic.

Even though the outcomes of the statistical tests may be highly significant, interpreting the non-randomness of M's and MM's praying hand postures may prove difficult.

1. The first possible interpretation holds that the phenomenon is spurious instead of genuine. Indeed, the used sampling method itself must be criticized as not ideal random and not ideal *tout court*. One problem is that the selected works are not evenly distributed over the sampling period (Fig. 5). The fact that the

majority of the selected works originates from the Renaissance and the early Baroque may have influenced the results. The uneven distribution may be due simply to the uneven distribution of depictions of praying hands over time: in certain periods more praying hands were depicted by 'serious' artists than in other periods. Moreover, the fact that a different hypothesis was the starting point of the research and that part of the database assembled for testing that first hypothesis was also used for testing the later hypotheses, might provoke the criticism of data-dredging duplicity. However, this study was not intended to present a 'tiger that isn't'.^[20] Instead, the aim was to discover a pattern, if there is one, using the neutral tool of statistics. Generally, in answer to both charges, it should be pointed out that (a) this article is only a first exploratory study of this hypothetical phenomenon and that (b) a methodologically more sophisticated retest of the hypotheses resulting in a corroboration or a refutation of the results would be warmly welcomed.

2. Alternatively, if the differences between praying postures of M and MM are genuine, if they are not random but rather do show a pattern then we are in need of an explanation.

The Virgin Mary is the epitome of female beauty and perfection: *Tota pulchra es, Maria*. In Giorgio Vasari's words, depictions of M should show:

> [...] all the beauty which can be imagined in the expression of a virgin; in the eyes there is modesty, on the brow there shines honor, the nose is one of very graceful character, and the mouth betokens sweetness and excellence.^[21]

The legendary and three-in-one conflated Mary Magdalene, on the other hand, was considered to be a woman with a past.^[22] She is often depicted as attractive. There are many examples, especially in the second half of the nineteenth century, of an erotically charged MM.^[23] In this way she was a popular subject for the Pre-Raphaelists. Even though MM may be depicted as beautiful, often with long luxuriant flowing hair, often loose and uncovered, often curly, often red – three rather suspicious elements – there is nearly always a sense of melancholy about her. In contrast, another favorite of the Pre-Raphaelists and the Symbolists, Salomé symbolizes pure female seductiveness.

Provided we make a distinction between beauty and attractiveness, Mary Magdalene is "the best looking woman in the picture".^[24] The Virgin Mary, however, is nearly always the more perfectly beautiful. Furthermore, when M and MM are depicted together, MM is almost without exception the more emotional figure. The relative emotional way in which Mary Magdalene is depicted can be seen, for instance, in Crucifixion scenes in which she embraces the basis of the cross, sometimes kissing the cross or Jesus's feet. In Matthias Grünewald's *Isenheim Altarpiece* (c. 1510, Unterlinden Museum, Colmar), even if the Virgin Mary clasps her hands asymmetrically, Mary Magdalene still shows the more emotional posture by kneeling and extending the crossed fingers of her quasi-symmetrically folded hands in the gesture that expresses her extreme despair. Another example of the relative emotionality of M and MM is Jusepe de Ribera's *Descent from the Cross* (1637, Museo Nazionale di San Martino, Naples) in which M has her hands clasped asymmetrically and MM kisses the left foot of the dead Christ.

There are only a few instances in which the pattern is broken and the 'first rule' is inverted: in Geertgen tot Sint Jans's *Man of Sorrows* (c. 1495, Museum Catharijneconvent, Utrecht) and in Pietro Perugino's *Monteripido Altarpiece* (1502, Galleria Nazionale dell'Umbria, Perugia) in which M displays a quasi-symmetrical and MM a symmetrical praying posture.

A more general reversal of the 'first rule', which states that M preferably displays *s*, can be found in scenes belonging to the Passion period. For example, in Crucifixion scenes M displays far more *qs* and *as* than *s*.^[25] Also, in the closely related Mater Dolorosa and Pietà themes the vast majority of the depictions of M is *qs* or *as*.^[26] This is arguably due to the extreme emotional nature of the scenes. So, in this case M performing *qs* or *as* conforms to the 'second rule', which says that both M and MM are more emotional in depictions of scenes from the Passion period than in depictions of the pre- and post-Passion periods and consequently show predominantly *qs* and *as*.

The symmetrical praying hands posture (s) needs more discipline as it is only fixed in one direction (push). The quasisymmetrical posture (qs), being a real fastener, is interlocked in all directions (push and pull, up and down) and needs therefore less discipline to uphold. Thus, a complementary or second-level explanation may be that M, as the epitome of perfection, is naturally more disciplined than the more emotional and accordingly less disciplined MM and that this is expressed by their relative symmetrical praying postures.

Interestingly, if MM and Mary of Egypt, an apocryphal saint who according to legend led an even more sinful life prior to sainthood, are depicted together, or at least in a couple of paintings that belong together, then MM is the more symmetrical (e.g. Quentin Metsys, *Penitent Mary Magdalene* and *Penitent Mary of Egypt*, c. 1525, Museum of Art, Philadelphia).

Another interesting point is that, as with the relative symmetry of praying hands, M's hair is more symmetrical than MM's hair. Jesus, also, is depicted almost exclusively with a symmetrical hairdo. This is because at least since Saint Augustine Jesus is regarded as the epitome of male beauty.^[27] Only as a child did Jesus sometimes have an asymmetrical or even a blithely disorderly hairdo.^[28] In general, Jesus is depicted with symmetrical features and praying with symmetrical hand postures.^[29] One of the few counterexamples of Jesus with asymmetrically clasped hands is (workshop of) Dirk Bouts, *Christ Crowned with Thorns* (from the Diptych *Christ and the Virgin*, c. 1473, National Gallery, London). This may again be attributed to the extreme emotional nature of the scene depicted.

6 Conclusion

The distribution of praying hands postures (*s*, *qs*, and *as*) in depictions of M and MM appears not to be random. This research suggests a distinct pattern that is characterized by the 'first rule' (M = s; MM = qs or *as*) and the 'second rule' (pre- and post-Passion M and MM = *s*; Passion M and MM = *qs* or *as*). The 'third rule', finally, says that MM in a particular stock scene – The Penitent Mary Magdalene –, and contrary to the 'second rule', displays *qs* or *as*.

7 Prediction

Assuming that the observed pattern is indeed a new fact, it is difficult if not impossible to see in advance where this new fact will lead. But, if it is a new fact, then its interpretation and its possible connections with other facts and interpretations old and new should be addressed. If, however, the pattern is a fluke, then that is also interesting. In both cases, true pattern or coincidental illusion, it will be fascinating to find out what is really the matter with the two Marys. So, as this research is only a first exploratory investigation it is wisest to state that there is still a great deal of terrain to be discovered and that perhaps in the process of exploration, new insights will be gained.

8 Acknowledgments

Denise Wächter (University of Erfurt) I thank for statistical support. Grateful I am also to Karolina Hansen (Polish Academy of Sciences, Warsaw) for help with the initial database. Jessie Wear (EEB1, Brussels) I thank for her gracious linguistic assistance. Finally, I thank Sandra Kampczyk-Januschko for her impressive proofreading and generous advice.

Notes and References

[1] György Darvas, *Symmetry*. Basel: Birkhäuser Verlag, 2007. [2] Gilian Rhodes and Leigh W. Simmons, 'Symmetry, attractiveness and sexual selection' in *Oxford Handbook of Evolutionary Psychology*, (eds. R. I. M. Dunbar and Louise Barrett). Oxford: Oxford University Press, 2007, pp. 333–364.

[3] Robert Kiely, *Blessed and Beautiful: Picturing the Saints*. New Haven: Yale University Press, 2010, p. 83.

[4] Friedrich Heiler, *Das Gebet: eine religionsgeschichtliche und religionspsychologische Untersuchung*. München / Basel: Ernst Reinhardt Verlag, 1969 [1918], pp. 98–109.

[5] Thomas Ohm, *Die Gebetsgebärden der Völker und das Christentum*. Leiden: Brill, 1948, p. 270.

[6] Engelbert Kirschbaum S.J. (ed.), *Lexikon der christlichen Ikonographie*. Rome / Freiburg / Basel / Wien: 1990 [1974], vol. 2, column 86 'Gebetshaltung'.

[7] Thomas Ohm, *Die Gebetsgebärden der Völker und das Christentum*. Leiden: Brill, 1948, p. 270.

[8] Friedrich Heiler, *Das Gebet: eine religionsgeschichtliche und religionspsychologische Untersuchung*. München / Basel: Ernst Reinhardt Verlag, 1969 [1918], pp. 106–107.

[9] Madonna of Ears or Maria im Ährenkleid: a typical late medieval to early modern German depiction of the Virgin Mary as a young temple servant in a dress decorated with ears (i.e. the top parts of the wheat plant).

[10] The Immaculate Conception (N=43) is a theme that became especially popular during the Counter-Reformation: 35 (81.4%) of the Immaculate Conceptions are younger than 1545 (after the Council of Trent). Thus with this theme we may see the influence of factor (5) theological interpretation and implication.

[11] Of the included works (N=100) depicting The Penitent Mary Magdalene 26 are *s*, 65 are *qs*, and 9 are *as*. However, the *s* depictions are predominantly (14 = 58%) in earlier works (prior to 1596). Thus with this theme we may see the influence of the factors (1) technical dexterity and (2) epoch of artistic style.

[12] "Das Gebet mit verschränkten Fingern kam erst in der Reformation auf." (Wikipedia 'Gebet': http://de.wikipedia.org/wiki/ Gebet#Gebetshaltung)

[13] Friedrich Heiler, *Das Gebet: eine religionsgeschichtliche und religionspsychologische Untersuchung*. München / Basel: Ernst Reinhardt Verlag, 1969 [1918], p. 103.

[14] This is, of course, risky phrasing. It means that only works by well-known artists were selected. Moreover, only those works that are in museums, churches, or private collections and that can be found in Internet databases were included.

[15] The database can be consulted at http://junq.info/wp-content/uploads/2014/07/M_MM_Ref_15_safe.xlsx.

[16] "Basic research is like shooting an arrow into the air and, where it lands, painting a target."

[17] Engelbert Kirschbaum S.J. (ed.), *Lexikon der christlichen Ikonographie*. Rome / Freiburg / Basel / Wien: 1990 [1974], vol. 3, columns 154-210 'Maria'; vol. 3, columns 212-233 'Marienleben'; vol. 7, columns 516-541 'Maria Magdalena'.

[18] Michelle A. Erhardt and Amy M. Morris (eds.), *Mary Magdalene: Iconographic Studies from the Middle Ages to the Baroque.* Leiden / Boston: Brill, 2012.

[19] More exhaustively, the list of themes or stock scenes contains:

A pre-Passion: Immaculate Conception; The Childhood of the Virgin; Presentation of the Virgin in the Temple; The Marriage of the Virgin; Annunciation; Visitation; Nativity; Adoration (including Adoration of the Shepherds; Adoration of the Magi); Madonna and Child; Madonna (alone); Madonna of Ears; Circumcision of Jesus; Presentation of Jesus in the Temple; Purification; The Holy Family; Sacred Conversation; Disputation / Christ among the Doctors ; Baptism of Jesus; Jesus in the House of Martha and Mary (Magdalene); The Raising of Lazarus: Mary Magdalene anoints Jesus's feet.

- B Passion: Jesus Taking Leave of His Mother; Stations of the Cross; Man of Sorrows / Ecce Homo; Crucifixion / Calvary; Descent from the Cross / Deposition; Lamentation; Pietá; Mater Dolorosa; Mary Magdalene Mourning; Entombment.
- C post-Passion: Resurrection; Noli me tangere; Pentecost; Ascension of Jesus; Death of the Virgin; Assumption; Coronation; Mary as Intercessor; Madonna in Glory; The Penitent Mary Magdalene; Elevation / Ecstacy of Mary Magdalene; Last Judgement; The Holy Trinity.

[20] Michael Blastland and Andrew Dilnot, *The Tiger That Isn't: Seeing Through a World of Numbers.* London: Profile Books, 2007.

[21] Giorgio Vasari, *Lives of the Most Eminent Painters*. (ed. Marilyn Aronberg Lavin; trans. Mrs. Jonathan Foster), New York: The Heritage Press, 1967, vol. 2, pp. 41–42.

[22] Susan Haskins, *Mary Magdalen: Myth and Metaphor*. New York / San Diego: Harcourt Brace & Company, 1994 [1993].

[23] From the opera *Tosca* (libretto by Luigi Illica and Giuseppe Giacosa, music by Giacomo Puccini, premiered Rome, 1900, Act I, Scene 5): Tosca: Chi è quella donna bionda lassù? Cavaradossi (*calmo*): La Maddalena. Ti piace? Tosca: È troppo bella!

[24] Robert Kiely, *Blessed and Beautiful: Picturing the Saints*. New Haven: Yale University Press, 2010, p. 98.

[25] Crucifixion (N=182), the most frequent theme in the database, of which M displays 73.9% *qs* or *as* and 26.1% *s*. Most (93%) depictions of M in Crucifixion scenes displaying *s* were relatively early, made before 1650.

[26] Mater Dolorosa (N=20) of which 80% is qs or as. Pietà (N=28) of which is 82.1% is qs or as. Again, most (77.7%) depictions of M in Mater Dolorosa and Pietà scenes displaying s were early, made before 1510.

[27] Saint Augustine, *Expositions on the Psalms*: 33–50. (trans. Maria Boulding O.S.B.), Vol. 2, New York: New City Press, 2000, p. 283 (Psalm 44).

[28] See the numerous Madonna and Child depictions. For example: Raphael's *Madonna and Child (The Small Cowper Madonna,* c. 1505, National Gallery of Art, Washington) and Murillo's *Virgin and Child* (c. 1650, Pitti Palace, Florence) in which M has a perfectly symmetrical hairdo and Jesus's hair is parted asymmetrically.

[29] The symmetry of Jesus's features is the more outstanding when compared to those of His tormentors in, for example, Hieronymus Bosch, *Christ Carrying the Cross*, c. 1525, Museum of Fine Arts, Ghent.

Views on Life, the Universe, and Everything

Quality of Quality Systems – A Critical Review

Rainer Stark¹

Former vice president Quality and Environment, Continental AG Received 11.05.2014, accepted 20.06.2014 published 31.07.2014

Rainer Stark studied mathematics and physics at the TU Braunschweig (Germany) and received his PhD in mathematics. After a short intermezzo as lecturer for didactics of mathematics at the University Vechta, he moved to Hannover to work for Continental AG. In the more than 30 years at Continental, he worked in many positions, last as vice president Quality and Environment. Further, he was an elected member of the board of directors at Continental for eight years as representative of the executive employees. Rainer Stark is honorary professor at the Leibnitz University Hannover. He received the B.A.U.M. (Bundesdeutscher Arbeitskreis für Umweltbewusstes Management e.V.) environmental prize for the "development and implementation of an integrated environment management". Since his age-related departure from Continental AG, Rainer Stark works as consultant for business management.

1 Introduction

Quality is a dazzling term without a universal, broadly accepted meaning. If you ask three people for their interpretation of the word "quality", you will most likely get three different answers. Looking at technical literature, there is no consensus and even in norms there are different definitions. This is not the place to expand on this interesting topic, instead I will give a fitting definition for our purpose:

Good quality means that everything IS *as it* SHOULD BE.

"Good quality" implies that there is also "bad quality", which is true. Quality is neither good nor bad, but maybe the word is used – generally and in advertisements – to imply specifically good quality.

So quality is nothing more than the nonvaluated result of a target-actual comparison.

With this simple definition we want to take a look at the quality of quality systems – especially the quality of international quality norms.

But first some comments on the structure of industrial systems for quality assurance, with which (good) quality is ensured along the value chain. Today we talk about integrated quality assurance systems or about quality assurance along the process of product realization. The fundamental idea of this system and the importance of the single elements can easily be illustrated using the historical development.

In the beginning, there was the final inspection. After having finished his product, a craftsman or artist took a step back and inspected his work to check whether it IS how it SHOULD BE. You can already find this critical inspection of ones own work in the first chapter of the Bible: "And God saw that it was good." (Gen 1,10).

Only through Taylorism, with its division into industrial corporations, it became necessary and reasonable to establish an independent control in the production, before the customers conducted the IS/SHOULD BE comparison with their own eyes.

I want to exemplify this with an example from my professional life: The final check of a car tire is the inspection of the visual surface and the inner part of the tire. Apart from that, further measurements are being conducted like out of balance measurements that we all know from the balancing of wheels.

The second logical step in quality assurance is the control during the production process. This follows logically from the insight, that the end point control can only remove flawed products but cannot prevent them. It is the objective of process control to avoid mistakes and perform permanent target-actual comparisons during the production process. Apart from the examination of the semi-finished products, process control is mostly about assessing the pro-

¹e-mail: starkgarbsen@aol.com

cess itself. Only machines and processes that are controlled and work steadily can produce good and flawless products. A car tire consists of about 30 pieces, all of which have to be manufactured accurately and then have to be assembled precisely. One single flawed element can make the whole tire unusable. It is easy to imagine that many parameters have to be controlled here.

The next step in the evolution of quality management is the inclusion of product development into the system, because mistakes in the development cannot be compensated even in the best controlled production. For instance, during the years of its use the surface of the tire is subjected to a variety of environmental influences such as exposure to direct sun light, oxygen and ozone. That is why the rubber – especially the outer layers – is blended with ageing inhibitors. It is the job of product development to determine the right inhibitors and amounts for a long lasting tire.

The forth step in this short description of the development of the quality system – the analysis of customer requests – can again be explained by a flaw in the value-added chain: The product development might be very good, but if it starts with wrong assumptions the product will not be bought. As customers all of us have probably left something at the store because it was not in accordance with our expectation of how it SHOULD BE.

Therefore – and this is the fifth and last element – the observation of the own products in the market and during their utilization is of great importance. This is quite a complex task for tires because not only the drivers but also the retailers, the car manufacturers, the car journalists, the repair shops and waste disposal companies have to be included.

Of course the single steps in this system have not been developed strictly one after another and they were, on a very rudimentary level, present in early companies. But only since the 80s and 90s, an integrated system with many feedback loops has been described and implemented.

With the constant development of the quality system in companies, major customers have increased the standards for their suppliers. Whereas before, it was sufficient to provide proof of a good final product, customers are requiring more and more proof of an integrated quality system. With this, the sharp distinction between supplier and customer has been more and more blurred in favor of a better collaboration. The high accuracy and reliability that industrial production shows today is, next to the general technical development, in no small part thanks to a comprehensive system of quality assurance.

Based on the motto "trust, but verify", the major customers have used audits to check the quality of quality control systems of their suppliers. A rather unattractive byproduct of this development is the additional expenditure on both sides, which is sometimes jokingly called "auditourism". Sometimes the auditors of different major customers came and went through the doors of the same supplier, asking the same questions.

A quality standard which defined the main demands of a modern quality system was supposed to help here. The idea was that the conformation to this norm would be certified by an accredited, neutral institution. In 1987 the first edition of this norm, ISO 9000, was published by the International Organization for Standards (ISO) in Geneva. Since then there have been a number of revisions.

Looking back, one has to call this norm a success story like no other. The ISO 9000 is estimated to be the world's most widely spread book recognized in 170 countries. It outnumbers even the Bible or the Koran. Today, more than one million companies are certified according to this norm worldwide.

A success story! But for whom? Certainly for all the new careers that began to form around the new norm: Auditors, certifiers, accreditors, consultants and trainers. But what is the benefit for certified companies? What is the contribution of this norm to the quality of the products? Or is this norm – as it is often claimed – just a blind formalism to which the industry has succumbed?

To answer these questions, it is helpful to take a look at the older editions of the norm, for example from 1994. The title of this edition was: "Quality Systems – Model for quality assurance..."

This title says without question that this is a norm for quality systems. But if one closely inspects the norm something completely different becomes apparent in the introduction:

"They (the standards) specify **requirements** that determine which elements quality systems have to encompass..."

and

"... but is not the purpose of these international standards to enforce uniformity of quality systems".

Therefore the ISO 9000 is not a **standard for a system** but (only) a **standard for the requirements regarding the system** which is something completely different. So we see false labeling already in the title, resulting in dramatic consequences for the companies affected as well as the development of the certification process.

Obviously, *no one* has read this far carefully, especially not the certifiers. Because the ISO 9000 was not implemented as "system requirements", but as "systems". Certifiers came to the companies demanding a quality handbook – an account of the established quality system "according to ISO 9000" i.e. structured after the 20 elements of this norm. However, these elements are – as experience shows – absolutely unsuitable for structuring quality systems.

In the beginning, some companies – including Continental AG – refused to give up their handbooks, which had proven successful in practice. For the certifiers, we constructed a correlation matrix to create a link between the elements of the norm and the chapters in our handbook. While it was hard enough to convince the auditors that this was in fact the right way, we soon had to realize that the auditors were not adequately qualified for this task. Knowledge about quality systems alone is not enough for the application of the norm. A basic understanding of the products and processes in question is also required. In the end, we – as many others

<u>JŴnQ</u>

- went the way of least resistance: A handbook "according to ISO 9000" for the auditors.

From there on, the quality manager in a factory had two tasks: First of all (as always), to ensure the quality of products and processes according to the established system and second, to get the stamp for an ISO 9000 certificate as cheap as possible.

So what has resulted from the implementation of the ISO 9000?

- In reality, the norm IS not how it SHOULD BE.
- Wishes of customers were not fulfilled.
- For a company, the certification is added expenditure with hardly any improvement of the product.
- In the evolution of quality systems the ISO 9000 has been a step backwards.
- With regard to the definition we started out with, the ISO 9000 is an example for bad quality.
- Customers still audit suppliers.

It should not be withheld here that the ISO 9000/2000 – a completely revised edition from 2000 – removed some of the more rough deficits of its predecessor. Firstly, the title was corrected and is now (correctly) "Quality System **Re-quirement**". Secondly, the structure was fully revised. It is now process oriented and fits roughly the Continental AG handbook from 1985. In the tongue of quality assurance this is called a "silent recall".

Sadly, these and later corrections of the norm, which were overdue, had no effect on real practice. Still, handbooks are not written for the company's need, but only "according to the norm" for the sake of getting a certificate. On the contrary, many companies delegate this cumbersome task to consultants, which at the same time – through a different division of the company – carry out the certification. But this was and is not the purpose of this norm and certification!

The critical review of established industrial quality systems presented here shows at first a positive historical development leading to the introduction of a quality norm (the ISO 9000). While previously the assurance of product quality and performance of the company were paramount, the focus now shifted towards the compliance to formal, external standards. Therefore, the newer development of quality systems has to be said to have bad quality.

This raises a whole lot of questions which cannot simply be answered by looking at them with the systematic view of quality assurance. In fact they are probably more related to fields like psychology, social sciences or maybe even theology. Nevertheless, I want to address these questions here and comment on them from my point of view.

How can it be possible that a widely recognized institution like the ISO publishes such an amateurish first edition of a new norm?

A hint comes from a certain polarization which can be observed within the quality sciences: On the one hand there are people working pragmatically and close to the product. They are part of the value-added chain and are responsible for their products. On the other hand there are people working mostly on the theoretical aspects and the systematic of quality management. This group includes professors, trainers, consultants, normers, certifiers, and auditors; occupations which have no direct contact to a product or the production process.

During the historic development of quality management described in this article, there has been a growing, inflated secondary sphere with whole new occupations. In the course of this process, there is an interesting development. While quality assurance was purely empirical in the beginning, it shows more and more deductive traits with theories and models which are no longer validated in practice. Even reasonable critique or objections from the practical side are hardly noted. The objections and modification proposals by Continental AG for instance – brought forward via the official channels from the DGQ (German Association for Quality, Frankfurt) to the DIN (German Institute for Norms, Berlin) and finally to the ISO (International Organisation for Standardisation, Geneva) – were not considered in the design phase of the ISO 9000.

Why does the industry not fight the – apparently not very productive – practice of certification?

The answer to this is probably complex. First of all, there is no "the industry". The parties involved have no clout on their own or are not properly represented by their professional bodies.

But maybe the most important aspect is the following: Norms and neutral certificates in general are thought to contain an unearthly truth ("The norm is always right and is above my own experience."). It can only be understood in this context that the ISO 9000 survived the turnaround with regard to its content from one edition to the next. (If I personally observe certain analogies to the three abrahamic religions here, it is because of my personal experience on both of the subjects and it is in no way meant as a scientific analysis.)

Another aspect that should be mentioned here is a certain resignation of the industry, bordering on an extortion mentality: Why should anyone fight the superiority of the ISO 9000 paradigm? Especially if it will be in vain because the certificate is mandatory for every company. And for the critics of the norm there is the tale of "The Emperors New Clothes". It is much easier to stand at the roadside with all the others and applaud the emperor.

Will there be an end to the wave of certifications?

Probably not. Now that the market in the industry only shows small growth and is mostly about re-certification, new markets like hospitals, doctor's offices, pharmacies, and retirement homes are being taped into. It is hardly surprising that the question of how useful these quality certificates are to the parties involved, is not being asked.

Why does the operative quality management work anyway?

From my experience, the answer is quite simple. First we had a working quality management, then the norm. The evolution of quality systems shown here was a long learning process of people and companies. Here structures are stuck in the heads of people that are much stronger than the norms being enforced from the outside.

However, the ISO 9000 – in its present, process oriented form – is not completely superfluous. For me personally the norm serves as a checklist when I come to a new company as a consultant. I look at the norm point by point and

ask the questions

- 1. Is this point relevant?
- 2. If yes, how is it translated into the system here and now?
- 3. Is there a need for action?

However, this – let us say reflected – handling of the norm requires knowledge in the field of quality system theory as well as from production. I have only met few people who were lucky enough to gain experience in both fields and this is probably the crux of this norm.

- Translated from German by David Huesmann

Publishing Details

Main Editorial Board

Philipp Heller, Johannes Gutenberg-University, Mainz, Germany David Huesmann, Johannes Gutenberg-University, Mainz, Germany Kristina Klinker, Johannes Gutenberg-University, Mainz, Germany Stephan Köhler, Johannes Gutenberg-University, Mainz, Germany Robert Lindner, Johannes Gutenberg-University, Mainz, Germany Marita Metzler, Biologist, Mainz, Germany Andreas Neidlinger, Johannes Gutenberg-University, Mainz, Germany Nicola Reusch, Philipps-University Marburg, Germany Felix Spenkuch, Johannes Gutenberg-University, Mainz, Germany Katharina Stockhofe, Johannes Gutenberg-University, Mainz, Germany Thomas Spura, Johannes Gutenberg-University, Mainz, Germany

Senior Editor

Thomas D. Kühne, Johannes Gutenberg-University, Mainz, Germany

Contributing Authors

Articles:

Natascha Gastera, Michael Gaster, Odense University Hospital, Odense, Denmark Jorge S. Burns, University Hospital of Modena and Reggio Emilia, Modena, Italy Wolter Seuntjens, Dutch Academy of 'Pataphysics, Amsterdam, The Netherlands

Views on Life, the Universe and Everything: Rainer Stark, Continental AG, Germany

Contact Information

http://junq.info JunQ@uni-mainz.de twitter: JUnQJournal Facebook: JUnQ Journal

Verleger und Herausgeber: Andreas Neidlinger, Duesbergweg 10-14, 55128 Mainz, Germany

Druckerei: flyeralarm, http://www.flyeralarm.com/de/

Verantwortlicher Redakteur: Andreas Neidlinger

Rechtsform: JUnQ ist ein unentgeltliches, wissenschaftliches und spendenfinanziertes Projekt, das Nullresultate als wichtige Beiträge zum Erkenntnisgewinn etablieren möchte. JUnQ wird finanziell von der Johannes Gutenberg-Universität Mainz, Graduiertenschule der Exzellenz Materials Science in Mainz, unterstützt.

JUNO



www.junq.info

junq@uni-mainz.de