Theme：Interdisciplinary Approach・Transition・Leadership・Graduate School Education
7th GSDM International symposium “Anthropocene: Global Leaders for a World in Transition”
Date：2020 . 3 . 4 (Wed.)　13：00－17：30
Place：Ito International Research Center, The University of Tokyo

Research and Development Aiming for Continual Creation of Innovation toward Human Security and Well-Being

Hideaki KOIZUMI
Executive Vice President, The Engineering Academy of Japan
Honorary Fellow, Hitachi, Ltd.
Fellow/Board Member, Research Center for Advanced Science and Technology, The University of Tokyo

Reference

Roles Expected from the Engineering Academy of Japan (EAJ) —A Compass for a Chaotic Era—
https://www.eaj.or.jp/app-def/S-102/eaj/wp-content/uploads/2020/01/EAJ-NEWS-182.pdf

AEPM Kyoto Statement 2019
https://www.eaj.or.jp/?ai1ec_event=sts-forum-2019

テーマ：学際的アプローチ・トランジション（転換期)・リーダーシップ、大学院教育
第 7 回 GSDM 国際シンポジウム 「アントロポセン（人新世）：変遷する世界におけるグローバルリーダーの役割」
日時：2020 年 3 月 4 日（水）13：00－17：30
会場：東京大学 伊藤国際学術研究センター 伊藤謝恩ホール

イノベーションの連続的な創発*を目指す研究・開発
～人々の安寧とよりよき生存**へ向けて～

*Continual emergence of innovation

**Human Security and Well-Being

小泉英明
公益社団法人日本工学アカデミー 上級副会長
株式会社日立製作所 名誉フェロー
東京大学先端科学技術研究センター フェロー・ボードメンバー

参考

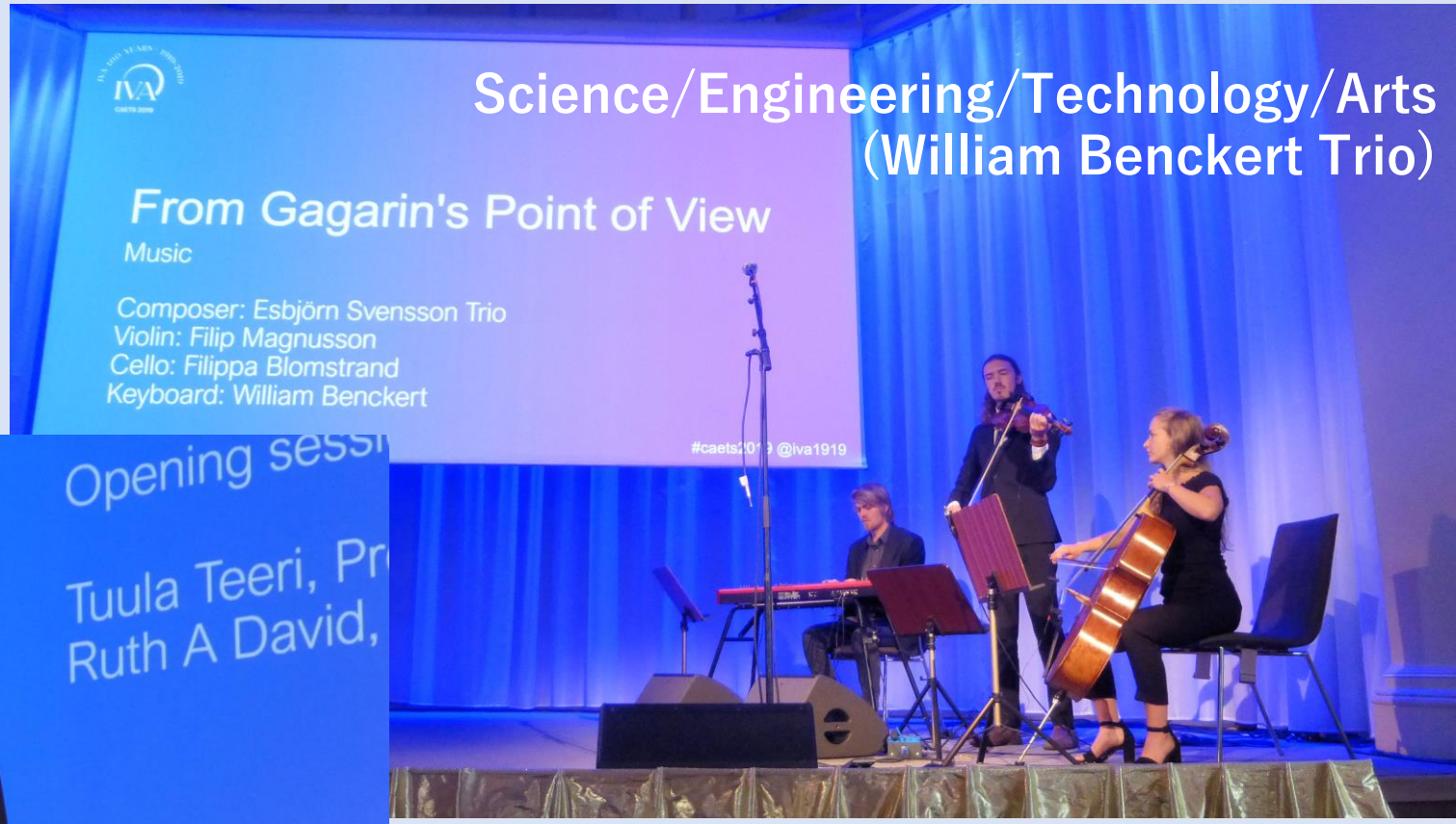
日本工学アカデミーが果たすべき役割：混迷する時代が求める羅針盤、EAJ NEWS 新年号（2020）
https://www.eaj.or.jp/app-def/S-102/eaj/wp-content/uploads/2020/01/EAJ-NEWS-182.pdf

AEPM Kyoto Statement 2019
https://www.eaj.or.jp/?ai1ec_event=sts-forum-2019

CAETS* Convocation 2019 (Stockholm)

Left:
Tuula Teeri CAETS and EVA President

Right:
Ruth David CAETS Secretary General



Science/Engineering/Technology/Arts (William Benckert Trio)

CAETS* : International Council of Academies of Engineering and Technological Sciences

Photos by H. Koizumi

壁に埋められたノーベルの像

IVA 100th Anniversary

At Narra Latin Conference Center in Stockholm
講演会場

Reception at the City Hall
ノーベル賞授章式にも使用

Photos by H. Koizumi

Engineering a Better World － the Next 100 Years

CAETS* Convocation 2019 hosted by IVA** in Sweden

CAETS/IVA President: Tuula Teeri, CAETS Secretary General: Ruth David,
IVA Vice President/Program Committee Chair: Magnus Breidne

CAETS*: The International Council of Academies of Engineering and Technological Sciences, Inc. founded in 1978.
CAETS consists of 30 member national academies of industrialized countries including the Chinese Academy of Engineering (CAE: President Xiaohong Li), the US :National Academy of Engineering (NAE: President John Anderson) and the Engineering Academy of Japan (EAJ: President Hiroyuki Abe).
The EAJ hosted CAETS Convocation in 2007 (President Junichi Nishizawa), the CAE did it in 2014 (President Zhou Ji)
Board Member: CAETS President Tuula Teeri, CAE President Xiaohong Li and others, Board Member Elect: EAJ Executive Vice President Hideaki Koizumi and others.

IVA:** The Royal Swedish Academy of Engineering Science founded in 1919. The IVA cerebrated its100 years Anniversary with the CAETS Convocation at Norra Latin Conference Center and IVA Conference Center in Stockholm, June 24~28, 2019.

Engineering a Better World – the Next 100 Years

Chair of the Program Committee: Magnus Breidne (IVA Vice President)

Progress	The First 100 Years Internet – Engineering for Society LIGO – Engineering for Science
Challenges	Energy System of the Future – Evolution or Revolution Antibiotic Resistance – a Multiple Systems Failure Water as Leverage – from Risk to Reward
Creative Chaos	Engineering the Climate? Future Health – are New Business Models Required? Sustainable Transition Pathways for Plastics
Digital Dawn	Productivity and Performance in a Digital Age
Effective Education	The Changing Face of Global Engineering Education Logic and Landscape of the Knowledge System
Inclusive Infrastructure	The All-Embracing Transportation System Design and Engineering for Sustainability Transitions Society 5.0 – a Human-Centric Strategy

Engineering a Better World — the Next 100 Years

Chair of the Program Committee: Magnus Breidne (IVA Vice President)

Conclusions

Policy Advice for the Future

Tuula Teeri, President of CAETS and IVA
Darja Isaksson, General Director at Sweden's Innovation Agency Vinova
Li Jinghai, President of National Natural Science Foundation China (NSFC)
Dan Arvizu, Chancellor of the New Mexico State University

Industry-Academy Collaboration for the Future

Carl-Henric Svanberg, Chair of the European Round Table
Alton D. Romig, Jr., Executive Officer of NAE
David Thomlinson, Member of RAEng
Hideaki Koizumi, Executive Vice President of EAJ
Sanja Vranes, Director General of Institute Mihajlo Pupin

CAETS Convocation 2019

IVA 100th Anniversary

Photo by K. Oeda

Photo by H. Koizumi

IVA 100 YEARS · 1919-2019

IVA

Royal Swedish Academy of Engineering Sciences

Invitation

The 100th Annual Meeting Activities of the Royal Swedish Academy of Engineering Sciences (IVA)

24–25 October 2019

Programme

THURSDAY, 24 OCTOBER

14:00–17:00
IVA Science & Society Forum
Venue:
IVA Conference Center,
Grev Turegatan 16, Stockholm

18:00–21:00
International Guests' Dinner
Host: Dr h c Carl-Henric Svanberg, Chairman of IVA
Venue:
IVA Conference Center,
Grev Turegatan 16,
Stockholm

FRIDAY, 25 OCTOBER

14:50
Seats should be taken
Venue: Aula Medica

15:00–16:45
Annual Meeting

17:45
Banquet
In the presence of Their Majesties King Carl XVI Gustaf and Queen Silvia and His Royal Highness Prince Daniel
Venue: The Stockholm City Hall

The Royal Swedish Academy of Engineering Sciences (IVA)

is honoured to invite

Dr.
Hideaki Koizumi

and accompanying spouse to attend

the Annual Meeting Activities 2019

100th Anniversary

Practical Information

Please note that this is a personal invitation. The Academy will cover the fees for the Annual Meeting Activities, but not costs for international travel and accommodation in Stockholm. Guests are requested to arrange their own accommodation in Stockholm.

Dress: White tie, tails and decorations/long evening gown at the Annual Meeting and Banquet.

Rental of formal clothing: Guests who wish to rent formal clothing (i. e. white tie and tails) in Stockholm could, for example, contact AB Hans Allde, Birger Jarlsgatan 58, Stockholm, E-mail: shop@hansallde.se, phone: +46 8 20 71 91.

R S V P via **http://hs.iva.se** before August 23. Please enter your personal code for registration: **34103**

If you have questions, please contact **Ms. Ingrid Jansson** at IVA, e-mail ingrid.jansson@iva.se, mobile +46 70 764 69 00.

IVA100th Anniversary

Photo by H. Koizumi

IVA100th Anniversary

Photo by H. Koizumi

STS *forum*

Science and Technology in Society Forum 2019

Kyoto International Conference Center

Photo by H. Koizumi

Vision of STS *forum*

1. Lights and Shadows
2. Collaboration among Academia, Industry and Government
3. Long-Term Perspective

Photo by H. Koizumi

Academy of Engineering Presidents' Meeting (AEPM)

AEPM Kyoto Statement 2019

Research and Development Aiming for Continual Creation of Innovation toward Human Security and Well-Being

List of Participants in the AEPM 2019 (Representatives from 10 countries)

Hiroyuki Abé (Chairman, Japan)	President, The Engineering Academy of Japan
Hideaki Koizumi (Co-chairman, Japan)	Executive Vice President, The Engineering Academy of Japan
Brian P. Schmidt (Australia)	Vice-Chancellor, The Australian National University (Nobel Laureate)
Margaret Sheil (Australia)	Senior Fellow, Australian Academy of Technology and Engineering
Reinhard F. Hüttl (EU, Germany)	Chairman, The European Council of Academies of Applied Sciences, Technologies and Engineering (Euro-CASE)
Yves Bamberger (France)	Member, National Academy of Technologies of France
Oh-Kyong Kwon (Korea)	President, National Academy of Engineering of Korea
Martijn Ridderbos (The Netherlands)	Deputy Chairman Executive Board, Leiden University
Eng Chye Tan (Singapore)	President, National University of Singapore
Ole Petter Ottersen (Sweden)	President, Karolinska Institutet
Willy R. Gehrer (Switzerland)	President, Swiss Academy of Engineering Sciences
Paritud Bhandhubanyong (Thailand)	Acting Dean, Panyapiwat Institute of Management
Hiroshi Nagano (Japan)	Senior Executive Director, The Engineering Academy of Japan
Kenji Oeda (Japan)	Executive Director, The Engineering Academy of Japan
Terutaka, Kuwahara (Japan)	Member, The Engineering Academy of Japan
Miyuki Tanaka (Secretary, Japan)	Secretariat, The Engineering Academy of Japan

AEPM Kyoto Statement 2019

Research and Development Aiming for Continual Creation of Innovation toward Human Security and Well-Being

「人類の安寧とより良き生存」へ向けて、イノベーションの連続的（Continual)な創造を目指した研究開発

Preface

In today's world, people aspire to pass on the natural environment and their cultural heritage to future generations. In line with the digital transformation in society, there is an urgent need to develop appropriate scientific technologies and determine the best direction to apply such technologies in society. Society hopes that the world's scientific academies will play a leading role as a compass in determining the right direction.

For sustainable economic development to enrich people's lives, an ecosystem that facilitates continuous changes/transitions through powerful innovations is needed (i.e., disruptive technologies). Engineering academies have a mission to strive for innovation-driven economic development that contributes to human security and well-being based on ethics.

To fulfill the expected mission, the Engineering Academy of Japan (EAJ) submitted an "Urgent Proposal" to the Japanese government to stop the decline in Japan's level of engineering and technological sciences. At the Academies of Engineering Presidents' Meeting (AEPM) 2019, the "Urgent Proposal" was further discussed by overseas organizations and experts from a global perspective, through which a lot of insightful views and useful information were shared among the participants.

EAJ「緊急提言」2019　そして倫理

The essential points of the meeting are summarized in this "AEPM Kyoto Statement 2019."

I. Necessary Points of View for New Research and Development (R&D)

1. Efforts of Universities under Fierce Competition

先端大学のグローバル化

As with business entities, universities are exposed to fierce global competition. Globalization has increased the mobility of students and professors beyond national borders. At some major universities, most of the professors are from foreign countries (e.g., Eidgenössische Technische Hochschule (ETH) (Switzerland)). As the next step, universities are encouraged to develop unique programs to attract both students and professors (e.g., Universiteit Leiden (The Netherlands), University of Strasburg (France)). Having such innovative programs is effective in attracting superior professors and students beyond national borders.

2. Evaluation System for Research and Education

国際的なPeer Review が必須

A reliable evaluation system for research and education is important. For this purpose, in-house evaluation alone should be avoided because the insiders would have similar concepts and basis for judgment. Evaluation should rather be made from an outsider's perspective. In other words, in today's global era, international peer review is essential (e.g., The European Research Council (ERC)).

3. English as the *Lingua Franca* (Common Language) in Science and Technology

*Lingua Franca*としての英語

To conduct evaluation and judgment from a global perspective, the use of English, the *lingua franca*, is essential in today's academic R&D fields. Therefore, it is necessary to establish a system that supports evaluation in English. At the world's leading universities and administrative organizations (including experts' conferences and top-level forums), discussions and evaluations are conducted in English respecting a common global standard regardless of one's native language (e.g., entities in Switzerland, Sweden, Germany, France).

4. Need for Long-Term Research

長期研究と中間評価による選別

Concerning R&D projects, both short- to medium-term projects (2–5 years) and long-term projects (10–15 years) are important. For long-term projects, a fair interim evaluation must be conducted and projects with low evaluations should be suspended. (In Germany, approximately 5% of low-evaluated projects are suspended.)

5. Close Collaboration among the Government, Universities, Corporations and Citizens

産・官・学・民の協創

It is important to carry out R&D via deep collaboration among the government, universities, corporations and citizens (NPOs/NGOs). Especially, the involvement of corporations in university R&D planning is desirable (e.g., in Germany, R&D investments made by corporations exceed $100 billion; two-thirds of national R&D expenses are paid by corporations; half of the holders of doctorate degrees in engineering are from the corporate sector; and most university professors in the engineering field have working experience in industry).

6. Diversity and Inclusivity

女性主導の政府の例

It is an important issue to improve the female ratio of graduate students and professors. Countries in Northern Europe are ahead in this respect. Men and women, sharing a common comprehensive vision, should collaborate toward such a vision, which thereby leads to diversity and inclusivity. (The incumbent President and most of the cabinet members in Finland are female.)

7. Positioning of Career Development

認知されたキャリアパス

To develop scientific technology, it is important to ensure career development for scientists and engineers (a career path to raise public recognition of their societal positions and guarantee their high living standard based on performance). In education as well, career development for educators (in early child education, primary to middle and high schools) is a high priority (e.g., the career development structure in Sweden).

大学での教育と探索研究

8. University Education, Exploratory Research at Universities and Corporate Research for Practical Application

In addition to ensuring education and exploratory research as an inherent mission of universities, universities must strive and thrive through healthy competition utilizing grants from the government and the industrial sector, which become the financial sources of innovation (e.g., as implemented in many advanced countries).

Corporations, on the other hand, want universities to nurture human resources with solid basic knowledge and engage in exploratory research that cannot be handled easily by corporations. Universities and government ministries and agencies should not focus solely on practical and extended applications, even though that might be what corporations want.

9. Quantitative Planning and Evaluation

計画の定量性（漠然制の排除）

In applying for competitive funds, basic plans must include target metrics as well as numerical and quantitative analysis. It is difficult to achieve goals described only in the abstract. The accuracy of the metrics and a quantitative road map should be improved in line with the progress of a plan.

多数の大学を峻別して議論

With universities, it is crucial to discuss not only a broad range of universities in general but also universities by role and standard category.

10. Inspire Enthusiasm and Passion in R&D

執念と情熱

Although corporations have tried to apply the concept of design, which is the generalized concept of art, such efforts have not yet born substantial fruit because corporations rely on market- and demand-oriented linear R&D models. A recently observed trend is a return to the concept of art, a point of origin, and inspiring enthusiasm and passion in researchers.

アート思考への回帰

II. Importance of R&D for Bridging and Fusion of Different Fields

1. Ecosystem of Innovation

領域架橋・融合型研究開発の緊急性

The original meaning of "innovation" is the concept of "*neue Kombination* (new combination)" as advocated by Joseph A. Schumpeter in his *Theorie der wirtschaftlichen Entwicklung* (Theory of Economic Development) in 1912. It is important to establish an ecosystem for innovation based on the unity of industry, government, university and citizens. Although nurturing individual specialty fields is a basic function, there is an urgent need to utilize R&D for the bridging and fusion of different fields ("bridging and fusion-type R&D"). Bringing together large and small companies and start-ups with universities and local authorities in a region to innovate industrial sectors led by the region a good way of building an ecosystem of innovation (e.g., pôles de compétitivité in France).

2. Social System that Enables Continual Transitions

イノベーションのアイデアは遷移性

Although the concept of bridging and fusion-type R&D has been advocated, it is not easy to achieve actual results from such R&D. Innovation itself is referred to as transitions through "new combinations," which is called disruptive technology. Because transitions are non-continuous, such R&D differs from the linear model of R&D in which the results are obtained by incremental improvements. A system to continuously create non-continuous transitions becomes an ecosystem for innovation, and the ecosystem needs an unconventional R&D based on co-creation.

3. Bridging and Fusion-Type R&D

研究開発の線形モデルから脱却　　環学的（Trans-disciplinary）研究開発

Bridging and fusion-type research originated at the crossover point of two academic fields. Early interdisciplinary research started with biophysics. Multidisciplinary research was developed from crossover points of more than two different academic fields. This trend is further progressing to transdisciplinary research (creation of a new field by combining many different fields).

III. Establishment of Bridging and Fusion-Type R&D

領域架橋型研究（イノベーション）の構造的困難性

1. Efforts by Universities to Voluntarily Establish Their Own In-House Framework for Bridging and Fusion-Type Research

As the government naturally forms silos, it is difficult for government to propose specific themes and projects for bridging and fusion-type R&D. Therefore, research institutes and universities need to individually secure budgets for bridging and fusion-type research. Some forward-looking universities put aside part of their budget for their own framework of bridging and fusion-type research (e.g., Universiteit Leiden and The Australian National University, among others).

架橋融合型研究資金の独自プール

2. Bridging and Fusion-Type R&D in Corporations

In R&D at large corporations, a vertical structure by product naturally exists in the research administration department. Therefore, an R&D structure with a separate budget for bridging and fusion-type R&D is needed.

企業での研究開発も同様

3. Setting Specific Purpose- and Value-Oriented Themes

In many cases, bridging and fusion-type R&D arises in the process of promoting purpose- and value-oriented research to address social challenges. As the original meaning of innovation is referred to as transitions driven by new combinations, bridging and fusion-type research that aims for a new combination from the beginning rarely succeeds. In the process of engaging in sincere and down-to-earth R&D toward useful goals for humanity and society, new combinations are naturally created to address issues (e.g., such as the R&D developed by The Australian Academy of Technology and Engineering (ATSE)).

領域架橋融合型研究には価値・目的志向が重要

領域架橋融合型研究にSDGsは有効

4. The Sustainable Development Goals (SDGs) and Bridging and Fusion-Type R&D

The SDGs, which were established based on humanity's values to achieve "Human Security and Well-Being," are suitable themes for bridging and fusion-type R&D.

芸術と科学技術の架橋融合

5. R&D on Scientific Technology via Collaboration among the Social Sciences, Humanities and the Arts

As shown by the R&D history of a digital synthesizer in music, art and scientific technology have had a deep relationship (e.g., The Australian National University).

Innovation is a process of co-creation that is similar to art in one aspect. Inspiring passion in researchers and developers is a key.

情熱の鼓舞が決め手

Moreover, engineering ethics and engineering education lie at the basis of innovation. Co-creation via collaboration with the social sciences and humanities is important (e.g., the AEPM Kyoto Declaration).

工学教育・工学倫理に関してははAEPM京都宣言2018

第2回田中正平記念フォーラム｜対談 「脳科学と音楽」(2012)

冨田勲(Isao Tomita, 1932~2016)
MOOG IIIP Synthesizer を個人輸入して
作曲開始(1971)

Brian P. Schmid＊による上記III 5.項
(芸術と科学・技術の架橋融合)

＊天体物理学者:ノーベル物理学賞受賞(2011)

Appendix

政策決定への国際視座

Background of This Statement

1. Review of the Content of the "Urgent Proposal" by Specialists from a Global Perspective

Many governmental policies of Japan are developed into actual administrative policies based on the results of specific experts' meetings held by the Cabinet Office of Japan or individual ministerial agencies. Although the results of in-depth discussion by members with excellent specialist knowledge should be respected, the current members of such meetings are mostly limited to those with Japanese nationality. In view of today's rapid globalization and drastic changes, there is an urgent need to acquire overseas cutting-edge knowledge directly from foreign members and obtain highly objective perspectives at a global standard. In other countries, high-level forums consisting of outstanding experts from around the world are common, and there are public organizations specializing in searching for overseas human resources (e.g., China). In Japan as well, some corporations, universities and university research institutes have been implementing a peer review by foreign reviewers.

Moreover, the "Urgent Proposal—to stop the decline in Japan's level of engineering and technological sciences (April 8, 2019)" by the Engineering Academy of Japan (EAJ) has been gradually recognized in related ministerial agencies in Japan. This "Urgent Proposal" has been released to the public via the EAJ Web site:
<https://www.eaj.or.jp/app-def/S-102/eaj/wp-content/uploads/2019/04/Teigen-20190408_wagakuninokogaku.pdf>
The English version of the "Urgent Proposal" is attached to this Statement.

2. AEPM Kyoto Declaration

At the last AEPM (the 8th Academy of Engineering Presidents' Meeting) held at the STS *forum* 2018 (the 15th Annual Meeting of Science and Technology in Society Forum), the results of the discussion on engineering ethics and engineering education were summarized as the "AEPM Kyoto Declaration." The declaration has been released to the public via the EAJ Web site and the CAETS Web site (members only).
<https://www.eaj.or.jp/app-def/S-102/eaj/wp-content/uploads/2019/02/PP-20181125EJ.pdf>
<https://www.newcaets.org/>