

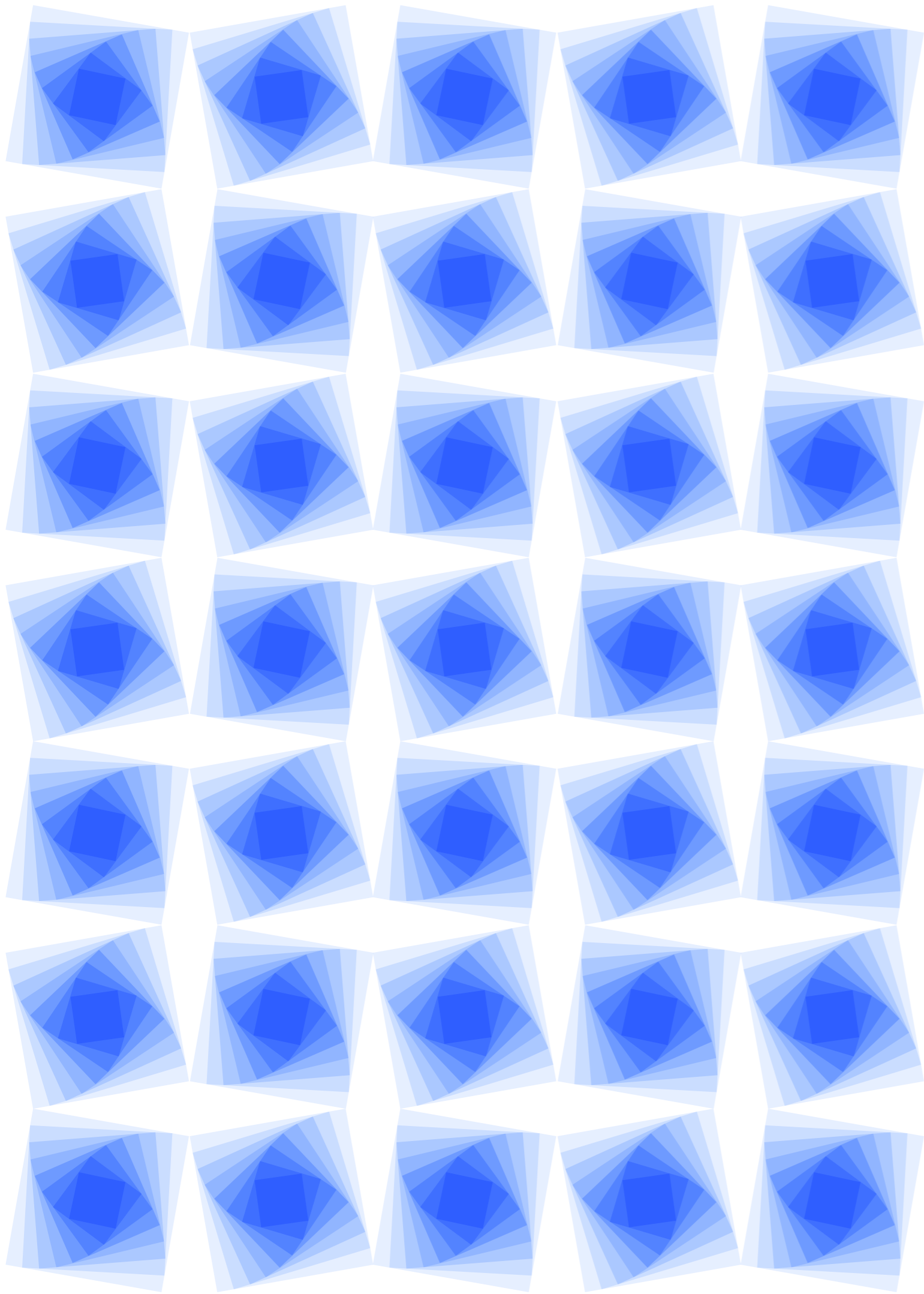


wind tunnel bulletin

147	Editorial
148 – 149	Frontispiece: Laura Bassi
150 – 153	Update
154 – 155	Models
156 – 159	People
160 – 161	Cameras and Light
162 – 163	Instruments
164 – 165	Wind
166	Interview

erse pedestrian conditions

n°08 Action, please!



Imprint

The Wind Tunnel Bulletin is published by the Research Focus in Transdisciplinarity at Zurich University of the Arts.

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Cover: Golliger, A. M.: *Wind-tunnel testing of sports stadia to optimise their use and safety*, in J. S. Afr. Inst. Civ. Eng. 52.1 Midrand 2010.

P. 148: Portraitsammlung Herzog-August-Bibliothek, Wolfenbüttel.

P. 154, 155: Intermediatheque Tokyo; Cabinet 34, 31/05/2010; Zentrales Archiv des DLR (Deutsches Zentrum für Luft- und Raumfahrt); GK-0406 and GOAR FA 5; NASA/JPL/Pioneer Aerospace; ETH Bildarchiv Ans 06437-10 and Ans 06437-12.

P. 157: AP Wirehouse, 1944; NASA Images: GRC-1949-C-23884.

P. 158, 159: Zentrales Archiv des DLR; FS-0752; NASA Images: ARC-2008-ACD08-0187-003 and LRC-1959-B701.P-04333 and GRC-1976-C-03429.

P. 160, 161: Universitätsarchiv Göttingen; Koenig, D.L.: *V/STOL Wind-Tunnel Testing*. NASA Report TM-85936. Moffett Field 1984, p. 50.

P. 162, 163: from Dryden, H.L. and Kuethe, A.M.: *The Measurement of Fluctuations of Air Speed By The Hoire Anemometer*. NACA Report 320, Washington 1929,

P. 17: Zentrales Archiv des DLR: GOAR KPAR A1118; Dryden and Kuethe 1929, p. 20; Caldwell, F. W. and Fales, E.N.: *Wind Tunnel Studies in Aerodynamic Phenomena at High Speed*. NACA Report 93, Washington 1920, p. 24.

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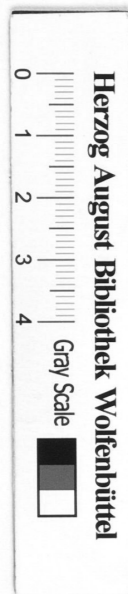
Wind Tunnel Bulletin No. 8
Research Focus in
Transdisciplinarity at Zurich
University of the Arts
ISBN 978-3-9524260-7-4

wind tunnel bulletin n° 08, june 2018

Today, time means schedules, clamped into a grid of days, hours and minutes. Instead, the ancients saw time as a river. But maybe time is wind?

We dedicate our new bulletin to the many actors in and around a wind tunnel and particularly in our own wind tunnel. A new team has been formed; three new members have joined the Research Focus in Transdisciplinarity; a scientist was in residence; and an associate doctorate is underway (*Update*, pp. 150–153). A new group also means a new network of actors producing a new idea of the wind tunnel. That is what the ANT, a prominent methodology in science theory, implies with its famous slogan “Follow the actors”. Yes, we follow the actors of the wind tunnel: the *Models* that resist the wind (pp. 154–155) and the *People* who set up the wind (pp. 156–159). The *Camera*, which is the subject of our new research project, and its twin sister *Light* (pp. 160–161), which might be the most underestimated actor in the wind tunnel. Surely *Instruments* act in wind tunnels (pp. 162–163), since they measure the wind, and – invisibly, but everywhere – the *Wind* itself (pp. 164–165). In this issue we also want to point out the blatant gender imbalance in the wind-tunnel business. Therefore we dedicate our *Frontispiece* to the first female professor of physics in Europe, who studied and published mostly – quelle surprise! – on fluid dynamics (pp. 148–149). All these actors, including us, form a family of sisters and brothers. And so we say “Action, please!” to let us all come together and to become ourselves in front of and behind the camera. “Action, please!” Our metaphor and time machine, the wind tunnel, will sync us.

Florian Dombois and Mario Schulze



“Laura Bassi, in full Laura Maria Catarina Bassi, (born Oct. 31, 1711, Bologna, Papal States – died Feb. 20, 1778, Bologna), Italian scientist who was the first woman to become a physics professor at a European university.”
Encyclopedia Britannica

The list of Laura Bassi’s presentations at the Academy of Bologna on topics related to fluid dynamics (In *Catalogo dei lavori dell’Antica Accademia raccolti sotto i singoli Autori a cura di Domenico Piani*, prepared in 1852, pp. 15–17).

April 28, 1746

On the compression of air

April 27, 1747

On the air bubbles which are observed in fluids relieved from air pressure

April 29, 1751

On two problems of hydrometry

April 19, 1753

On the exit of water from the holes of one container

April 25, 1754

On the evacuation of water through various holes

April 24, 1755

On hydrodynamics

April 25, 1756

On a problem in hydrodynamics

April 26, 1759

On different fluids exiting from one hole

April 24, 1760

Dissertation on hydrodynamics

May 2, 1764

On the phenomena of liquids in thin tubes of various materials

June 14, 1765

On experiments and observations in hydrometry and hydrostatics

May 1, 1766

Some hydrometric experiments dealing with Genette’s observations

May 7, 1767

On the speed of a water jet in a container

May 14, 1773

On the repulsion of fescues on the surface of the water produced by a drop of spruce juice

All other presentations:

April 25, 1748

On the centre of gravity

April 30, 1750

Latin dissertation (topic not known)

April 13, 1752

Mathematical dissertation

April 28, 1757

Algebraic dissertation

April 20, 1758

On analytical problems

May 2, 1761

On experiments on electricity

April 29, 1762

On island glass used for refraction experiments

April 28, 1763

On a manner to correct in telescope the inconvenience derived from the different refraction of rays which unite at different points in the axis depending on their colour

May 8, 1768

On electricity

May 6, 1769

On a series of experiments to improve the art of dyeing

May 17, 1770

On electricity

June 7, 1771

On vindex electricity

May 7, 1772

On an experiment proposed by Villanova Spagnolo

April 28, 1774

On electricity, especially on some experiments by Halles

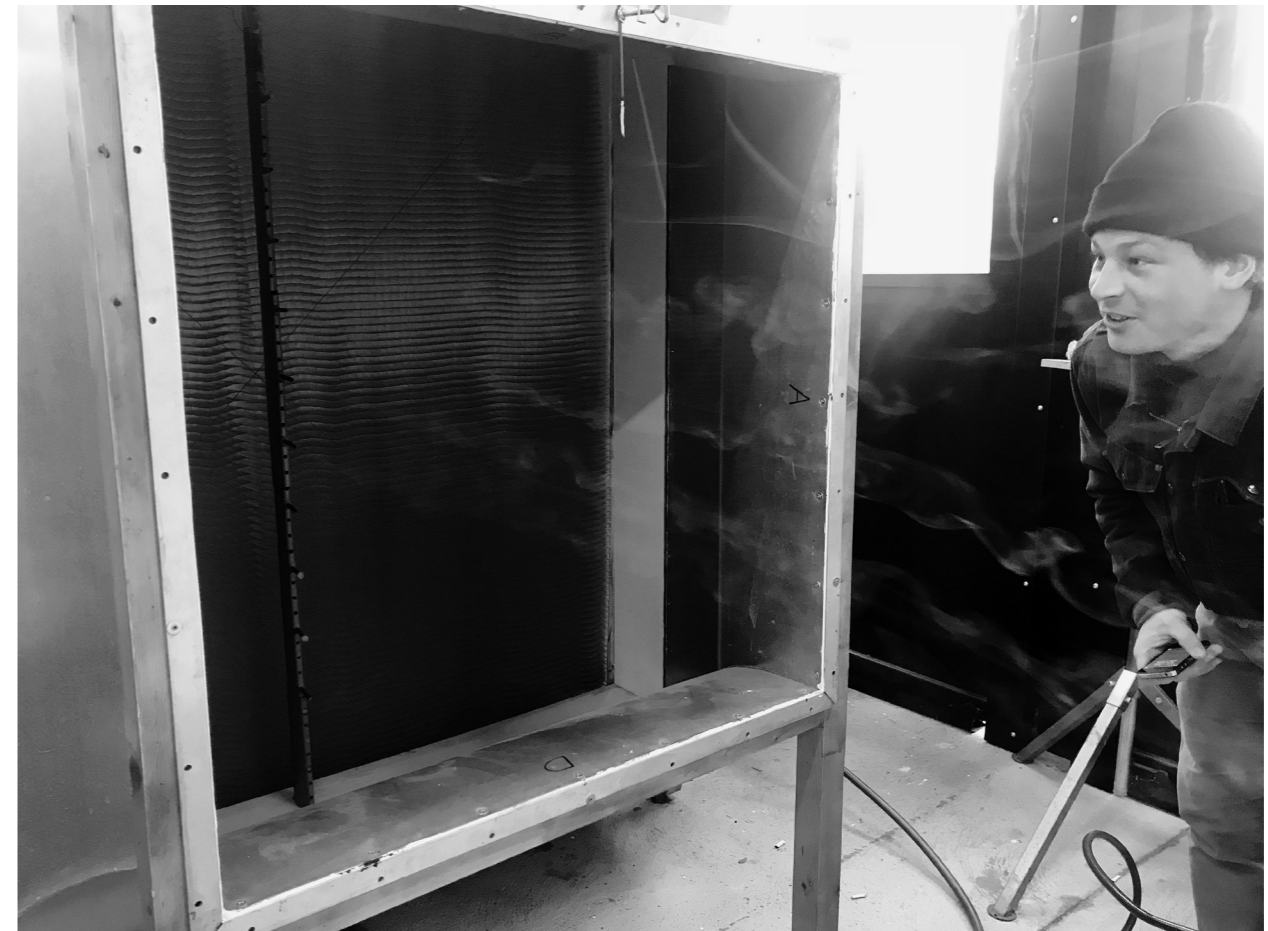
May 11, 1775

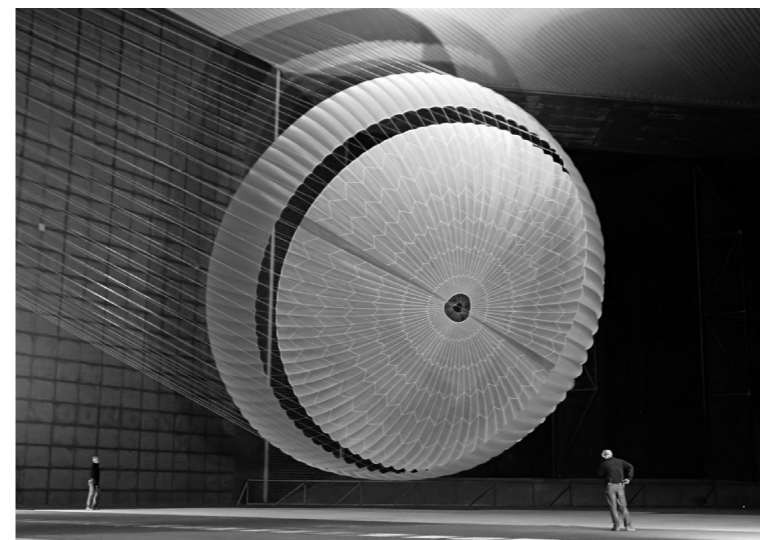
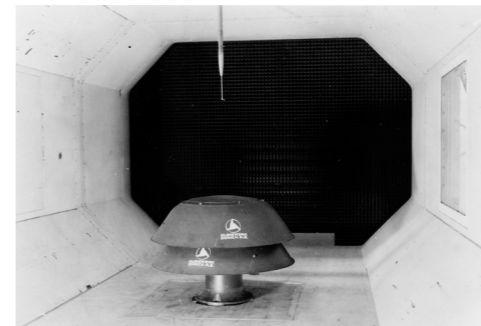
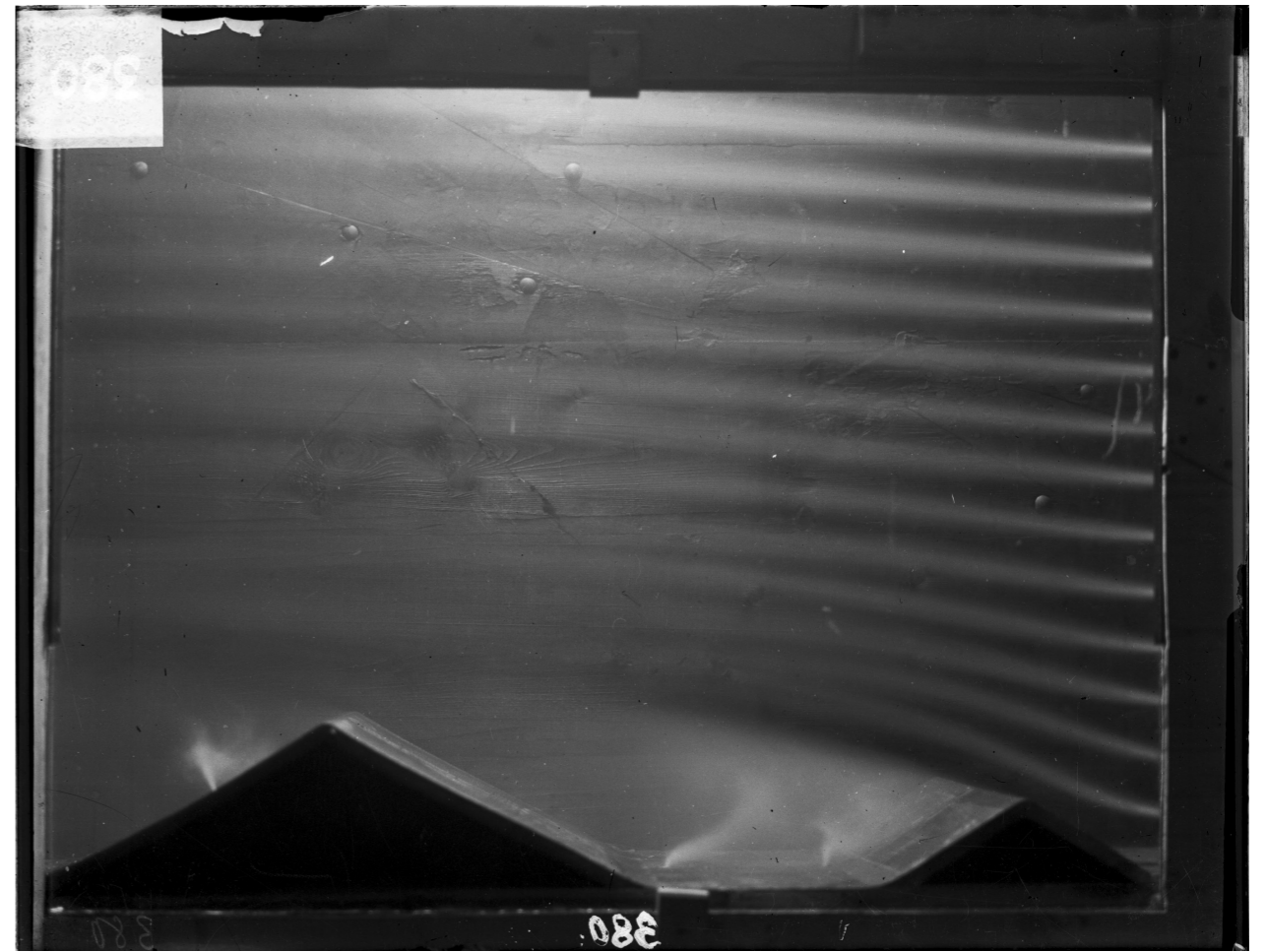
On fire and the facility of various fluids to receive it

May 2, 1776

The relation of flame to fixed air (carbon dioxide)







Many Men and a Few Women in the Wind Tunnel

A search on NASA's public image database for the keyword "wind tunnel" results in 1053 hits (last time checked on February 5, 2018). Of the photos found, 347 show people – amidst of the experimental facilities and instruments that are part of the NASA wind tunnels. In 333 of the pictures you can see people whose sex and gender identity seems to be male (hereinafter referred to as men), while only in 28 of them people are shown who appear to be of female gender (hereinafter referred to as women). If you subtract from these 28 images both the eight photos with either large groups or in one case a married couple, as well as the eight photos in which so-called "human computers" (i.e. female mathematicians, who did mathematical calculations before electronic computers became available) can be seen, only twelve photos remain that show female technicians or scientists. Of these twelve, only two photos were taken before 2005, to be precise in 1959. In both photos, women are assigned a supporting role at most or even just a decorative role.

A categorization of the NASA wind tunnel images according to gender thus provides a hardly surprising and almost self-evident insight: the wind tunnel is historically and still at present a predominantly male space (and indeed also a very white space – one single black man can be found in all of the pictures). Further image searches on other wind tunnel research institutes underline this finding, even though a specific search for "other pictures" can provide very few counterexamples (e.g. the 2016 film *Hidden Figures*). Therefore it can be said about the wind tunnel what was often criticized about the art museum: women only got access as models. The reasons are obvious: Both the sciences – especially physics – and the technologies – in particular aerospace technology – have been for a long time exclusively the result of professional work by men and remain so largely until today.¹ In the wind tunnel, which is historically and inextricably intertwined with the military, the gender imbalance is even more pronounced. So far so trivial.

However, could these photos also help to make an argument which goes

beyond the obvious fact that predominantly men do research in wind tunnels? In my opinion, they can. The crucial point is that they might challenge the still very common belief that the contents and methods of the sciences (e.g. aerodynamics) are universal and therefore gender neutral. A closer look at these pictures rather suggests that the gender-specific thinking of our society cannot have remained without consequences for content and methods of, for instance, the scientific work in the wind tunnel. On a very small scale they can indicate that it is not just a fact that predominantly men work in wind tunnels but that in the selection of topics and objects of aerodynamic research and engineering itself, as well as in their evaluation, consideration and use, we can find certain modes of masculinity. To put it differently, these images which were made to document research and popularize it for an interested public may also have communicated and affirmed a particular masculine identity of wind tunnel research and therefore of our knowledge about the wind. One of many possible questions to pose would therefore be: Could these photos give us a hint why wind tunnel research has for a long time been obsessed with building ever faster wind tunnels and testing ever faster machines, and why other fields of research such as civil engineering which requires wind tunnels to simulate natural winds like the aerodynamics of buildings and cities have seen so little effort for a long time?

The rationale behind this way of asking is illustrated in the following: if we could identify which particular images of masculinity these photos depict, we might be able to deduce which wishes and phantasies have affected the scientific and technology-related creativity of wind tunnel researchers and therefore have guided and shaped the work in the wind tunnel. Furthermore, we may even be able to say which kind of male energies have influenced the epistemology of the wind tunnel and thus our knowledge of the wind.

As an attempt of a preliminary interpretation, I would begin by saying that most of the photos of the many men and few women in the wind

tunnel follow a certain tradition of portraying scientific heroes. However, they do not depict the type of confused professor or absent-minded scholar that can be found in Newton's portraits, for example, where scientists are represented as frail figures with a pale and narrow face, thinning hair and fine fingers – implying that they have an analytical, ingenious mind. The wind tunnel pictures on the other hand, stage a type of engineer who emerged at the end of the nineteenth century, a tough "man of action" facilitating the progress of nations.² The photos convey therefore, among other things, the desire to conquer machines, fantasies of speed and (phallic) power and they idealize combat readiness. Would it then go too far to assume that these photos most probably have not motivated a lot of women or feminist men to work in a wind tunnel? Even more importantly, would it go too far to claim that these desires, fantasies and ideals have contributed to making the wind tunnel world crave for the most destructive machines?

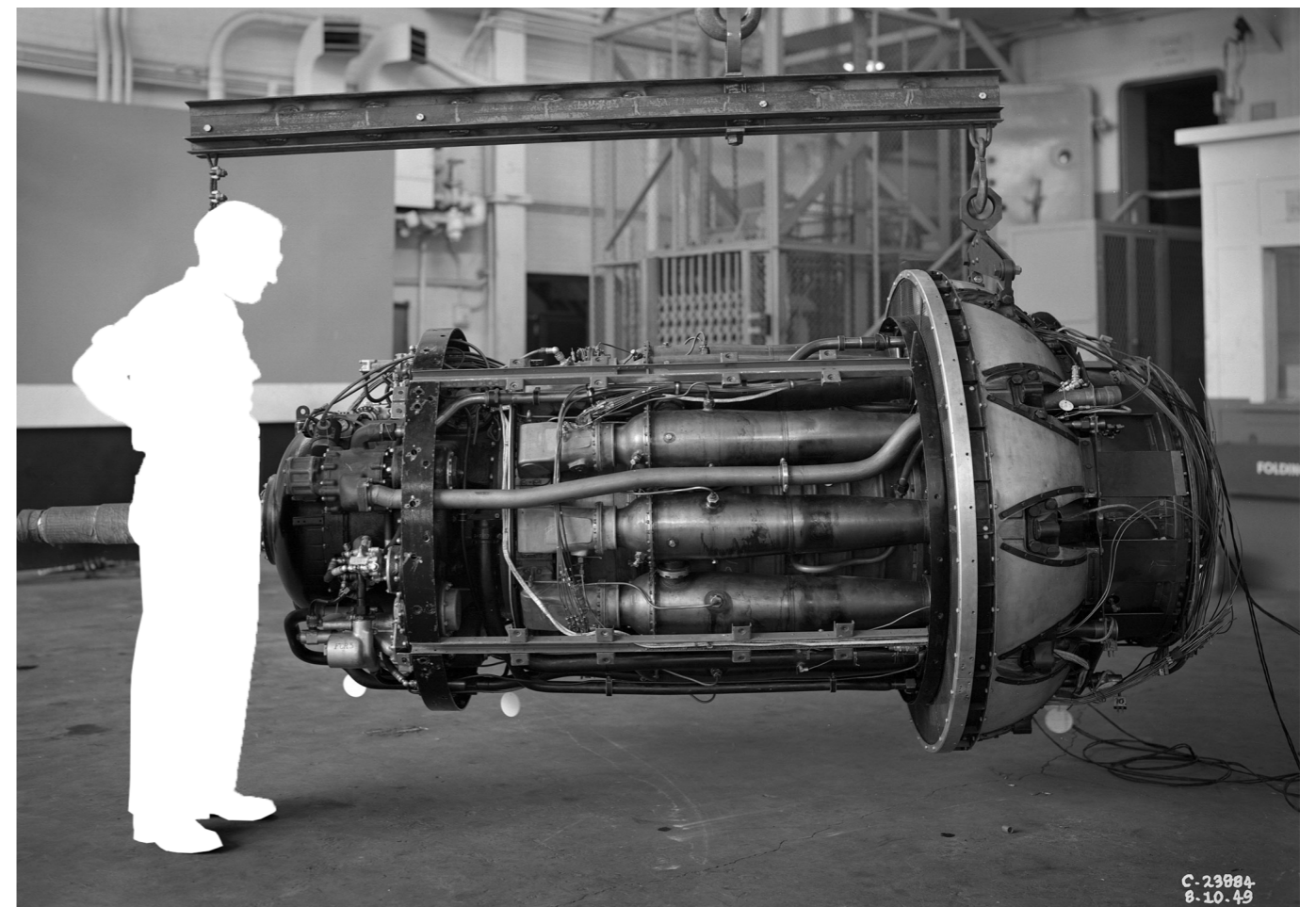
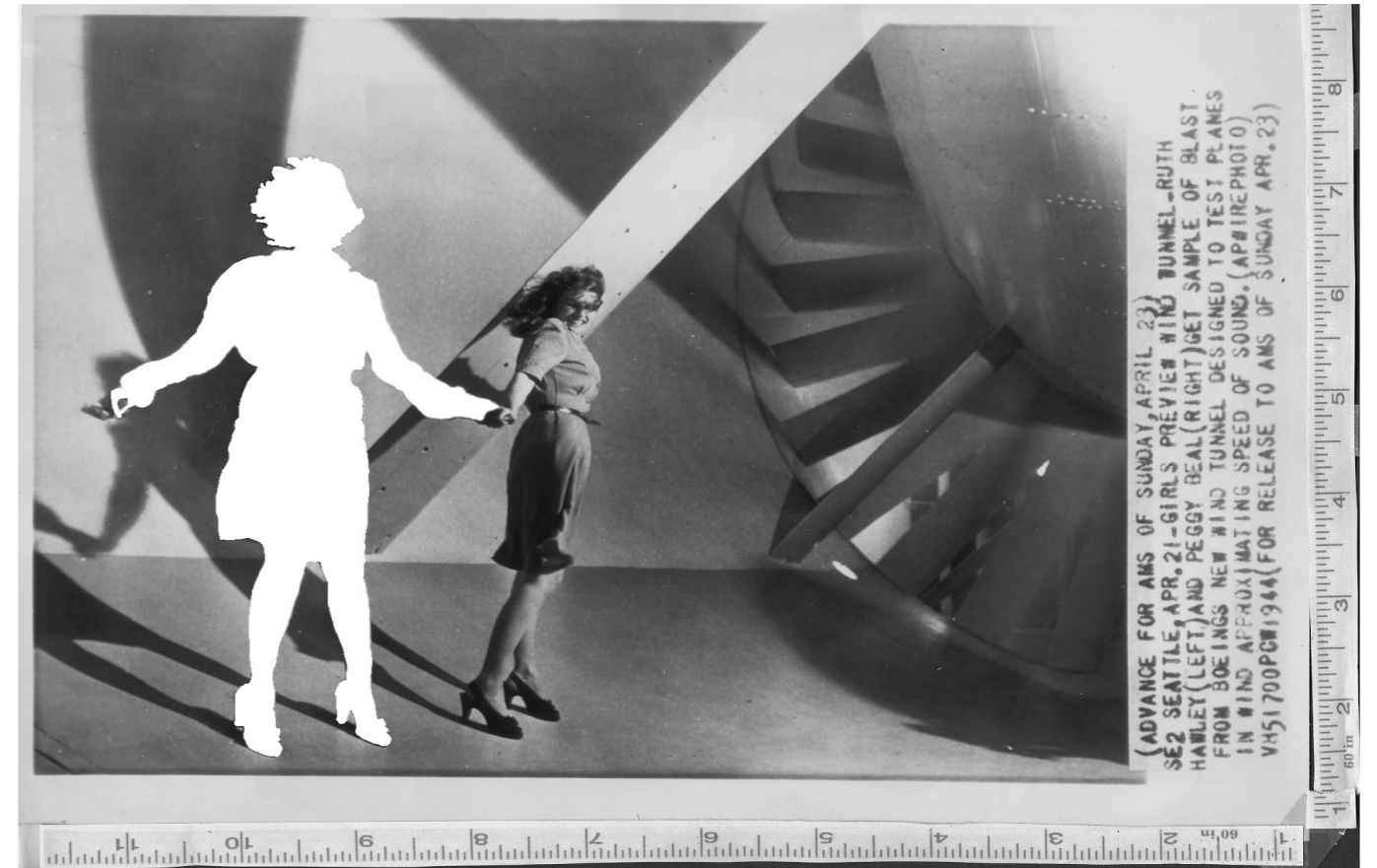
The question remains whether there is any hope for an "other" wind tunnel and an "other" knowledge of the wind, for a "feminist" wind tunnel, as has already been demanded in a previous edition of the *Wind Tunnel Bulletin*? Even when it comes to this challenging question, an interpretation of the pictures may contribute on a small scale. If it is true that the wind tunnel represent, establish and promote a certain type of masculinity as an implicit ideal of a fluid mechanic, then it would also be true that these images – since they are highly staged and readable – help to understand that gender differences are not fixed, but are susceptible to change and never completely immutable in their meaning. Hence, other images could be produced that show other types of masculinities in the wind tunnel. Masculinities that are not based on phallic power and male desires of conquering the machine (analogous to the female body).

Who, if not we, could make these pictures?

Mario Schulze

¹ Nevertheless, a change in the gender imbalance slowly becomes apparent. The percentage of women in traditional engineering classes in Switzerland in 1986 was at 2%. According to the Federal Statistical Office it is meanwhile at about 12%. In physics, the percentage has risen in Switzerland and Germany from less than 10% to over 20%. Cf. Bundesamt für Statistik: *Frauen und Männer an den Schweizer Hochschulen, Indikatoren zu geschlechtsspezifischen Unterschieden*. Neuchâtel 2011.

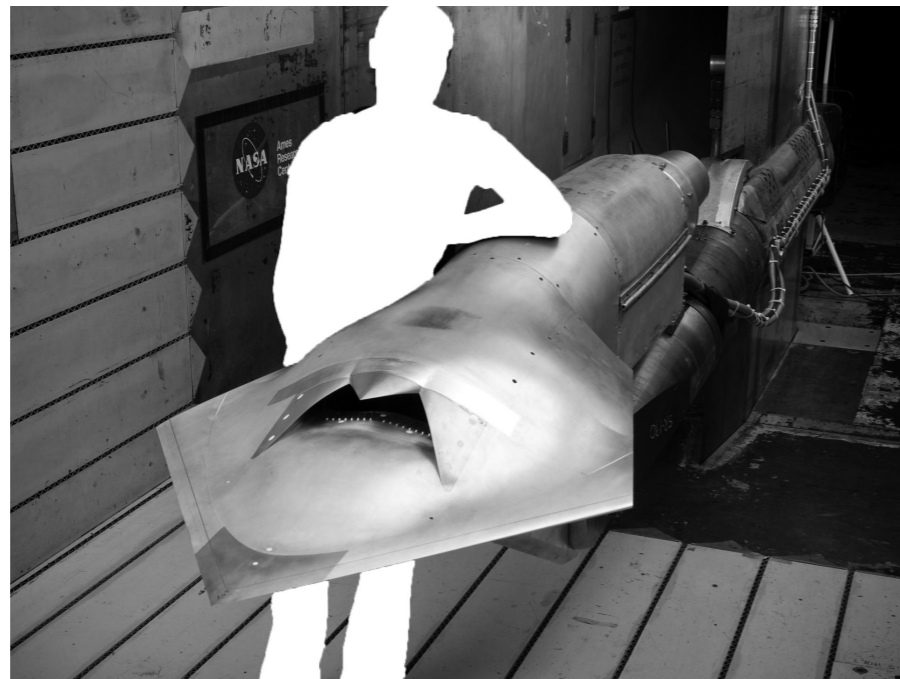
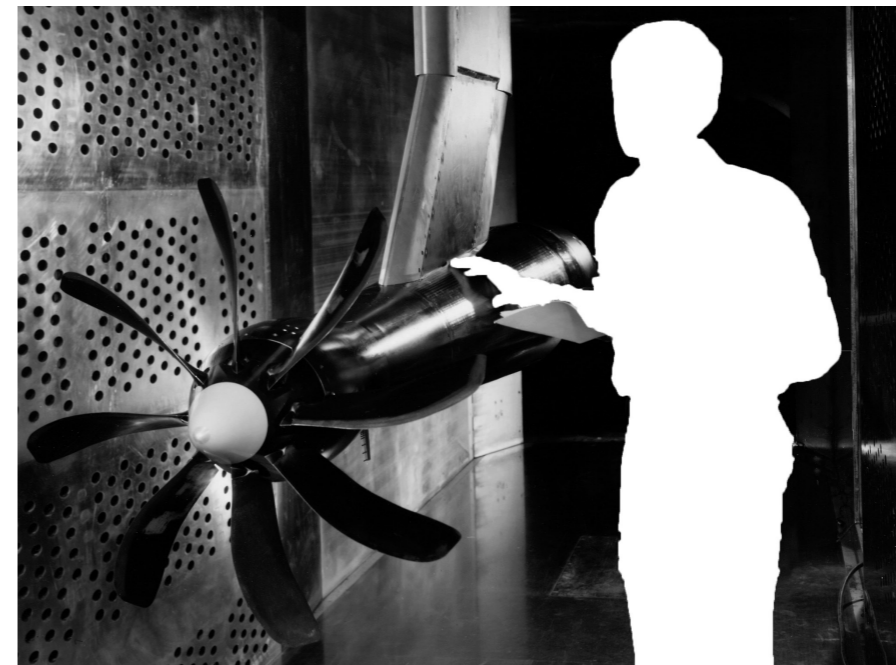
² Paulitz, Tanja: *Mann und Maschine. Eine genealogische Wissenssoziologie des Ingenieurs und der modernen Technikwissenschaften, 1850–1930*, Bielefeld 2015, pp. 171–186. Cf. for portraits of scientists: Jordanova, Ludmilla: *Defining Features. Scientific and Medical Portraits 1660–2000*, London 2000.

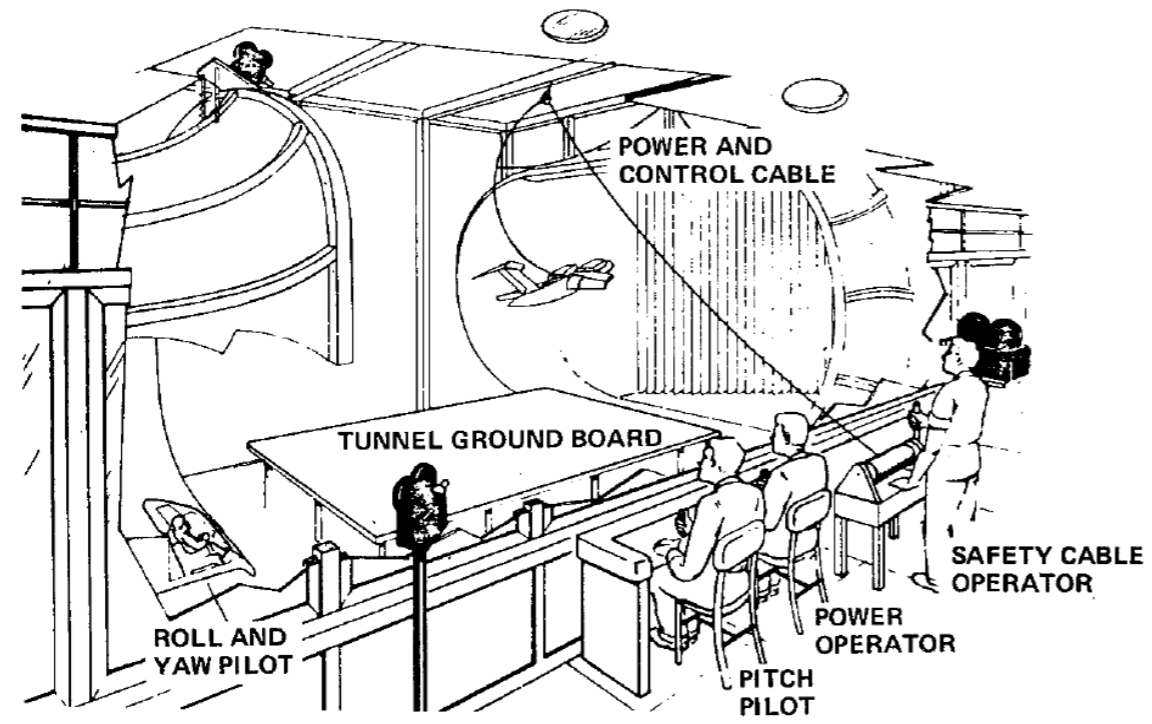




Büropersonal der Aerodynamischen Versuchsanstalt.

1. Grote. 2. Frl. Kreibohm. 3. Frl. Wolf. 4. Frl. Querfurt. 5. Frl. Kreibohm.
6. Herzberg. 7. Saul. 8. Ackeret. 9. Professor Prandtl. 10. Dr. Betz.
11. Nagel. 12. Helmboldt. 13. Müller. 14. Seiferth. 15. Weis. 16. Siems.
17. Dahnke. 18. Hennecke. 19. Göbel. 20. Becker. 21. Dierking.





(a) Test setup in test section.



160, 161 Cameras and Light



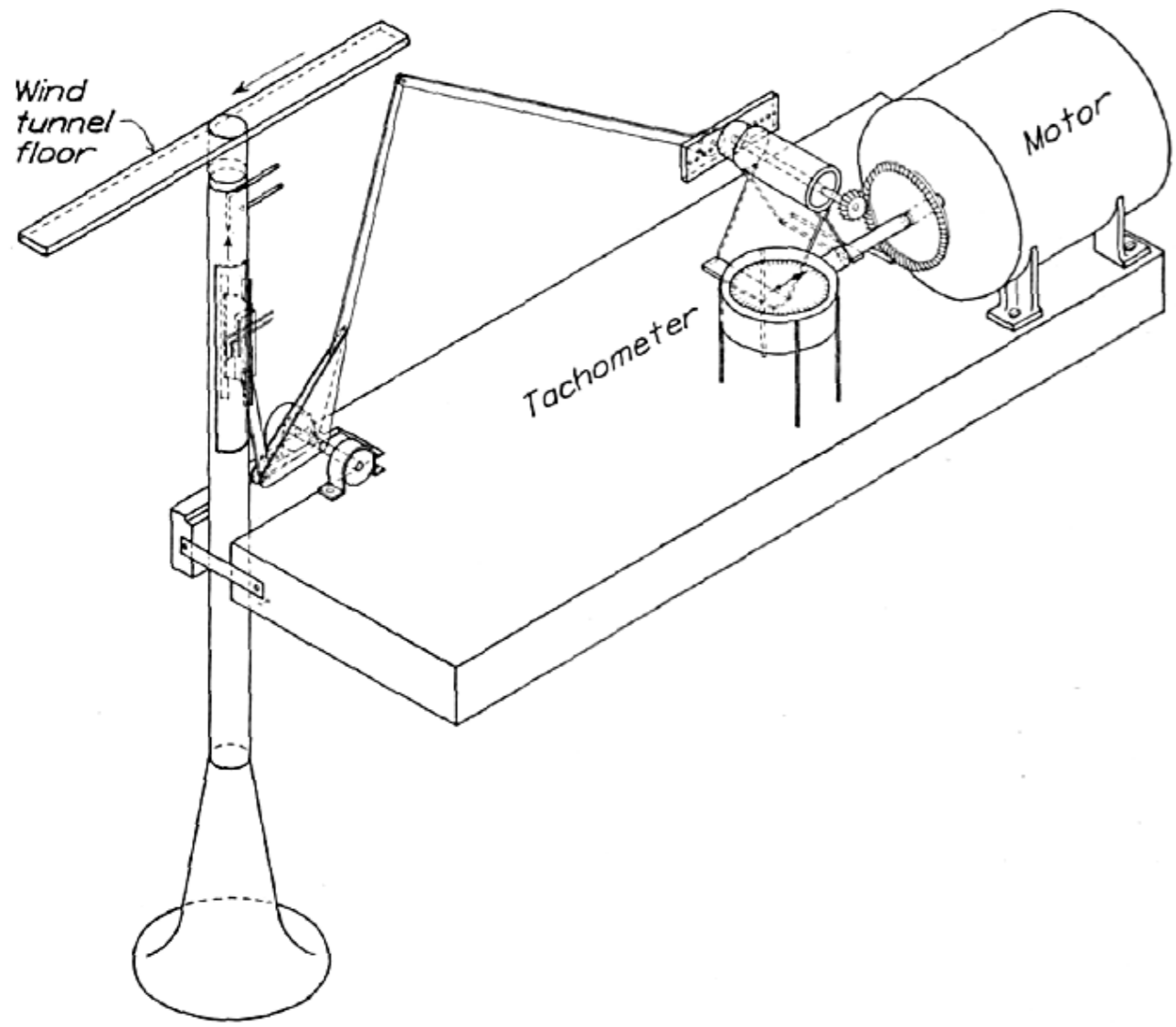


FIGURE 6.—Apparatus for experimental test of compensation

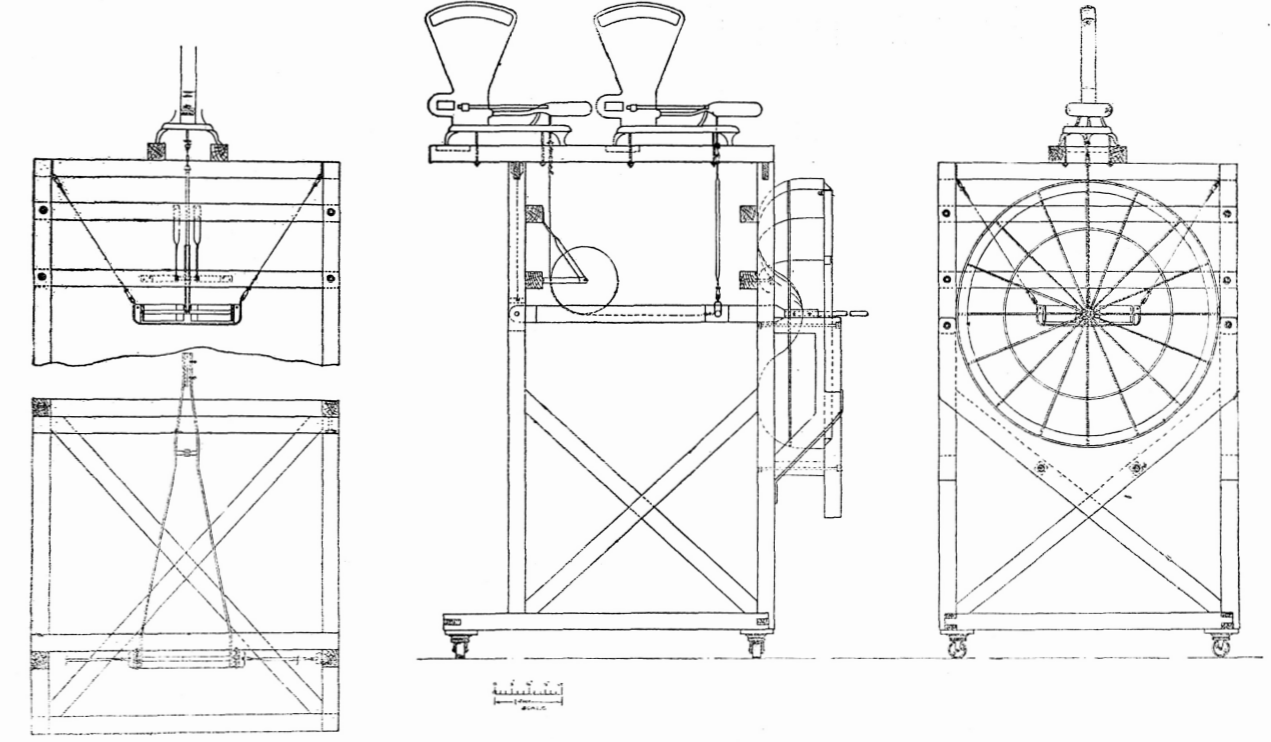


FIG. 9.—Weighing mechanism and entrance vanes for high-speed wind tunnel

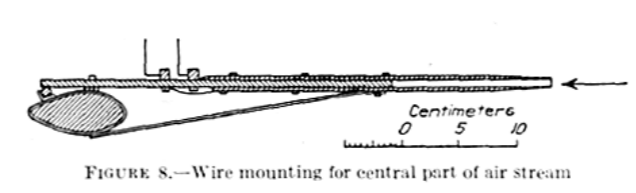


FIGURE 8.—Wire mounting for central part of air stream

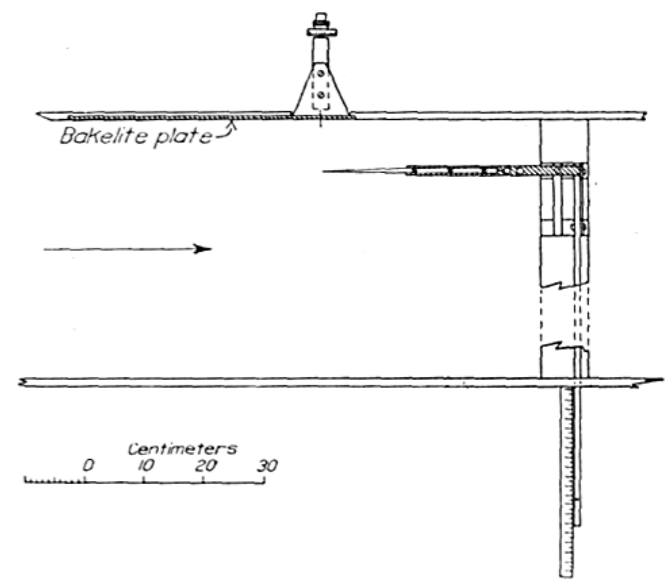


FIGURE 10.—General relation of the two wire mountings

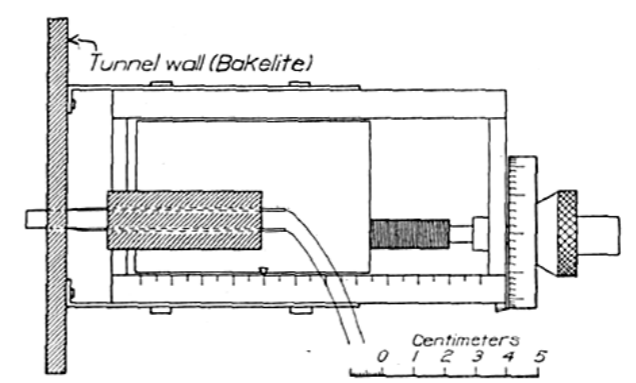


FIGURE 9.—Wire mounting for use near the tunnel wall

MEASUREMENTS OF WIND TUNNEL TURBULENCE

162, 163 Instruments



Multiple recording manometer of the Deutsche Versuchsanstalt für Luftfahrt

**Different actors in the wind tunnel are asking.
Members of the fsp-t are answering:**

The Model: How do I look?

Reduced. (SW)

I love you, my dear! (FD)

You are the alpha and the omega. You suck and blow ... Circle of life. (FG)

Come up and see me. (CO)

The People: Who do you talk to, when you are in the wind tunnel?

To the air. (SB)

I prefer to talk to the tunnelmakers. They know where the wind blows ... (KK)

When I stand in the WT I usually talk to myself. Lately I started talking to the smoke. (FG)

I talk to the echo. (CO)

The Camera and the Light: What do you see when you see me?

I rather *think*. And I think there is still a lot of work to be done. (SW)

The reflection of myself. (SB)

You bend my eye beams through your lenses. (FD)

In front or behind the camera? Both make me nervous. (KK)

The more light, the less I see; the more light, the more the camera sees. (CO)

The Instrument: Are you touched by me?

See Me
Feel Me
Touch Me
Heal Me (*The Who*) (SB)

I think you are the most important tool in the wind tunnel. But nonetheless I have to admit that I am not touched by you. (MS)

The Wind: Can you hear me?

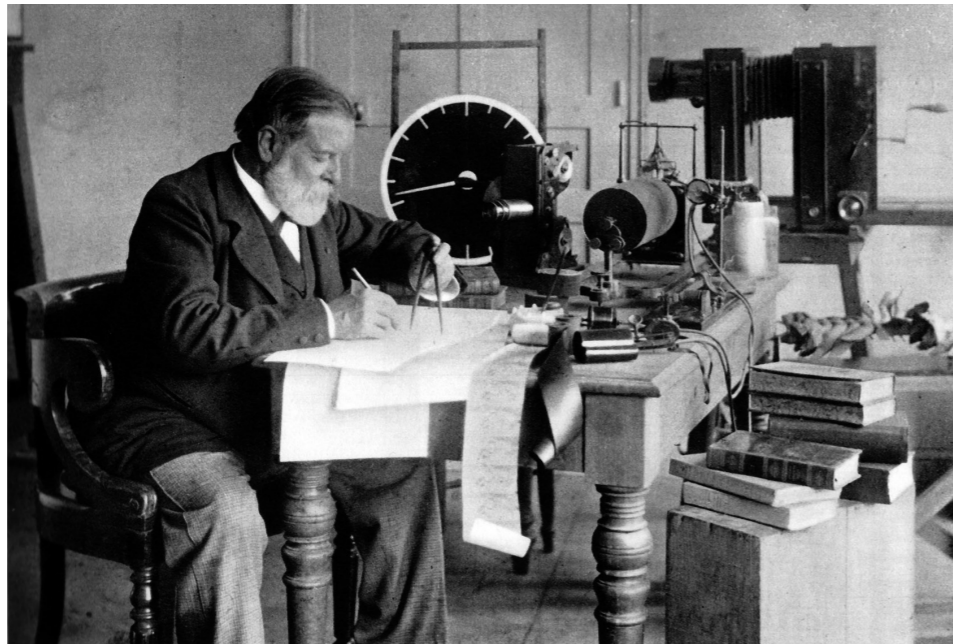
Not now. (SW)

The eyes are the windows of the soul. (SB)

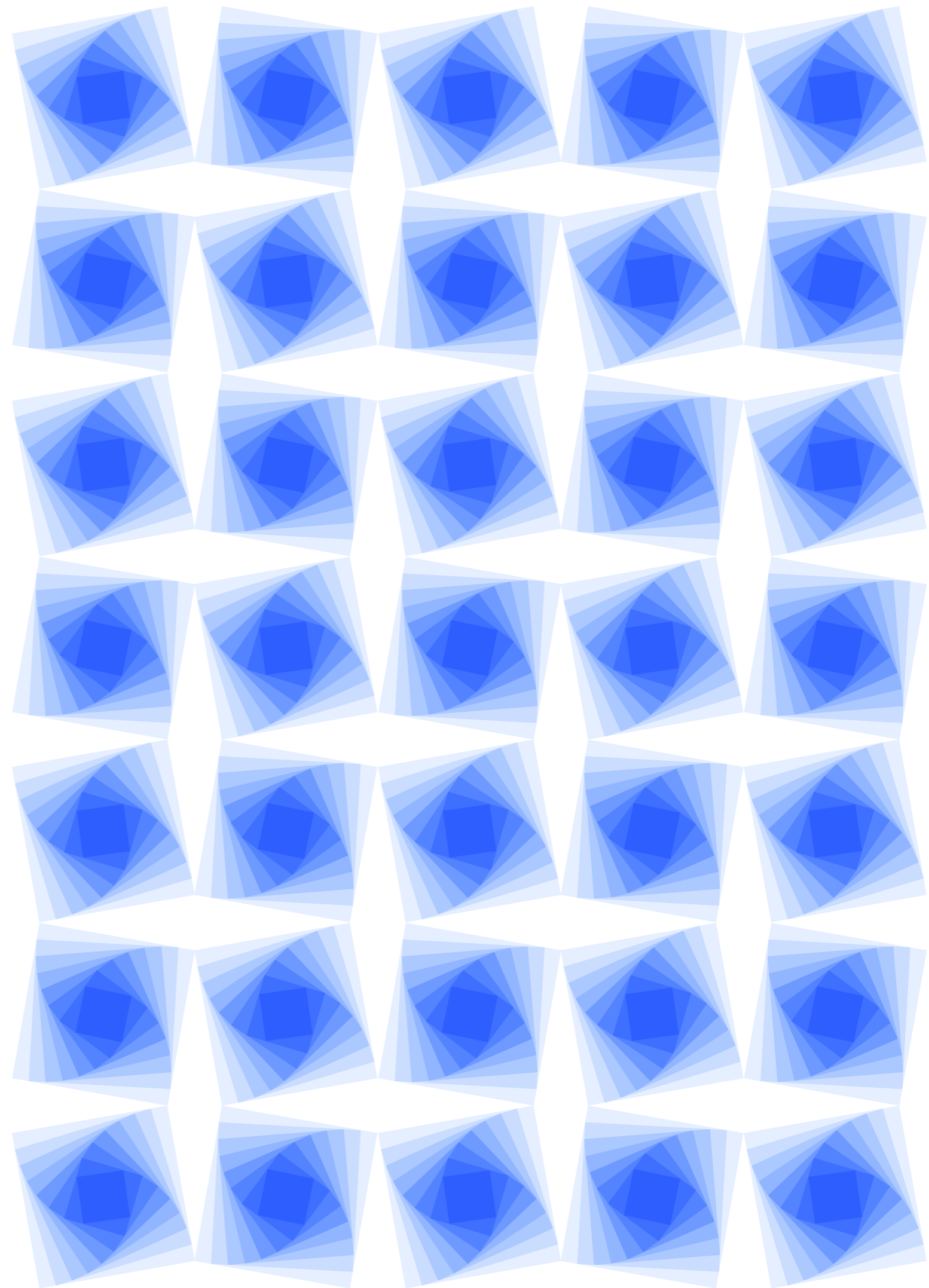
Say again? (FD)

I do. I hear your absence only. When you disappear I understand that you were there before. (FG)

Hush, be quiet now! (CO)

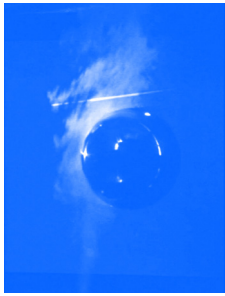


SB: Sibylle Boppart
FD: Florian Dombois
FG: Fabian Gutscher
KK: Kaspar König
CO: Christoph Oeschger
MS: Mario Schulze
SW: Sarine Waltenspül

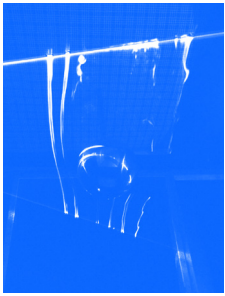


- 001 26.02.2018 Theater Light
- 002 26.02.2018 Hands and Four People
- 003 08.03.2018 Green Laser
- 004 08.03.2018 Incense Stick
- 005 12.03.2018 Lots of Smoke
- 006 12.03.2018 Dirty Sphere
- 007 24.04.2018 Seven Lines of Smoke (Slomo)
- 008 24.04.2018 Seven Lines of Smoke (Realtime)
- 009 24.04.2018 From an Angle
- 010 24.04.2018 From an Angle, Too
- 011 24.04.2018 Von Kármán Vortices
- 012 24.04.2018 More Vortices
- 013 24.04.2018 Three Incense Sticks, and Go
- 014 24.04.2018 Back Bone
- 015 24.04.2018 Three Incense Sticks

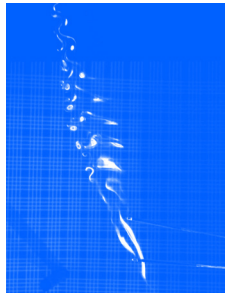
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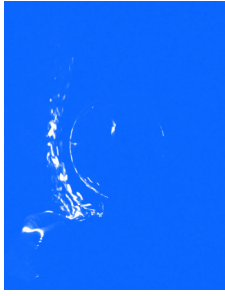
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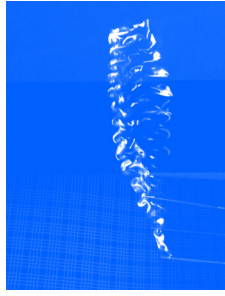
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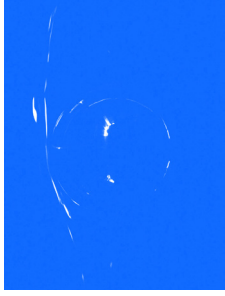
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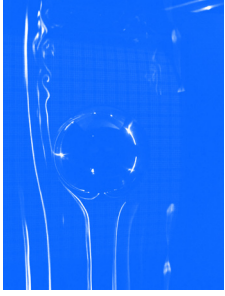
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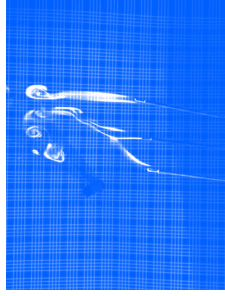
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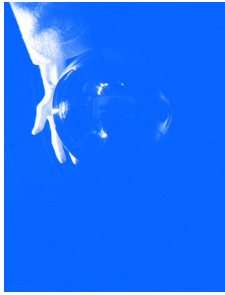
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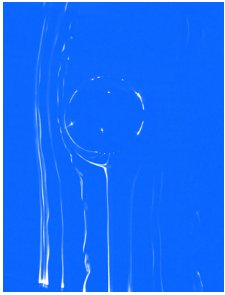
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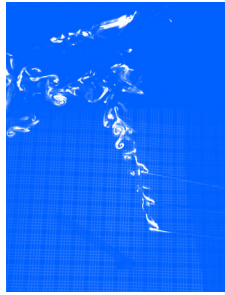
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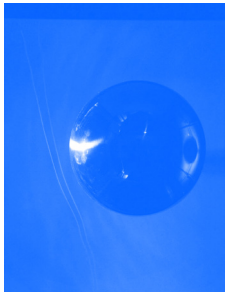
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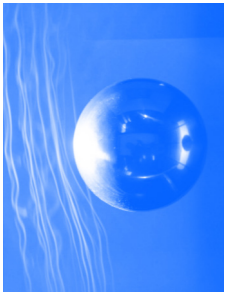
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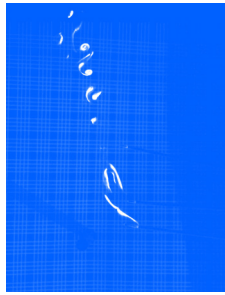
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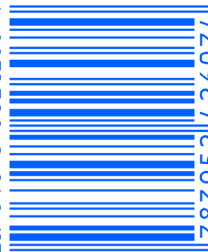
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ISBN 978-3-9524260-7-4



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