Jahresber Dtsch Math-Ver (2017) 119:187–199
DOI 10.1365/s13291-017-0159-4

OBITUARY

Konrad Jacobs (1928–2015)

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Published online: 10 February 2017
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Konrad Jacobs, who passed away on July 26, 2015, at the age of 86, was an outstanding mathematician who had a tremendous impact in building a tradition of probability and statistics in Germany after the war and in connecting it with the scientific world at large. His lasting influence is not due solely to his own research contributions, mainly in ergodic theory and information theory. It is also caused by his superb qualities as an academic teacher: his impressive ability to identify important new developments at a very early stage, his capacity to encourage and inspire his students to move into such areas on their own, and his strong and efficient support at the early stages of their academic careers. As a result, a number of his 25 doctoral students became authorities in a wide range of areas, not only in probability and statistics but also in fields such as information theory, complexity theory, combinatorics, game theory, mathematical biology, and mathematical economics. As of November 2016, the Mathematical Genealogy Project lists 785 of his descendants.

In this article, the research contributions of Konrad Jacobs are illustrated by his version of Poincaré's recurrence theorem and by his work on Toeplitz sequences, on mean ergodic theory, on strict ergodicity, and on information theory. To give some impression of his rich personality and the encyclopedic range of his intellectual inter-

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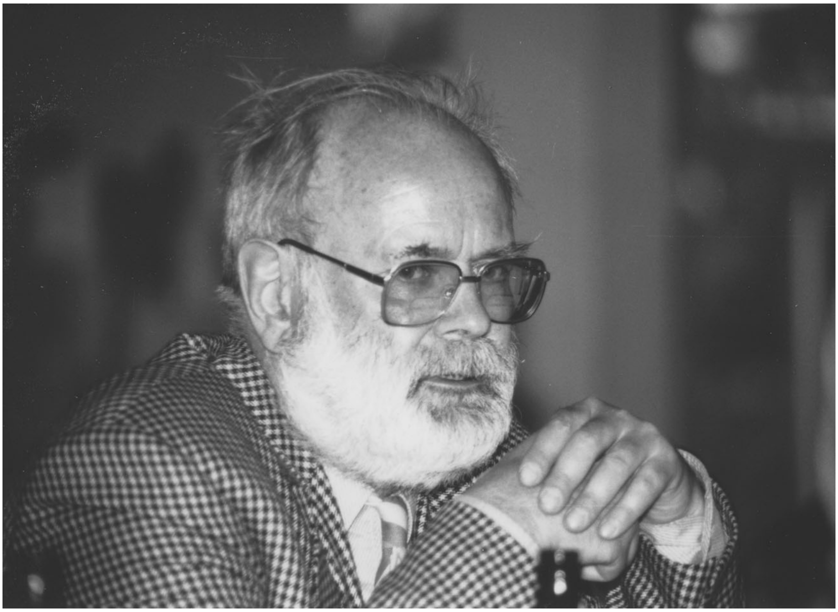
ests, we also describe some of his activities outside of mathematics. We begin with a short sketch of his biography.

1 Biography

Konrad Jacobs was born on August 24, 1928, in Rostock. His parents, Werner and Waldtraut Jacobs, were both doctoral students of the zoologist Karl von Frisch, who had accepted an offer from the University of Munich in 1925. Werner Jacobs followed him as *Assistent*, and the family moved to Munich in 1929. Konrad Jacobs attended Wilhelmsgymnasium in Munich from 1938 to 1946; during the last year of the war, he served as *Flakhelfer* (anti-aircraft auxiliary). In 1947 he began to study mathematics, physics, and philosophy at the University of Munich. On the side, he took advanced violin lessons and courses in Sanskrit, and he became a member of the Joseph Haydn Choir and the Munich Choir. He also organized an interdisciplinary series of lectures on “The Infinite”, given by renowned professors such as the philosopher Romano Guardini and the physicist Arnold Sommerfeld. After spending the year 1950/51 at the University of Hamburg, he passed his *Staatsexamen* in 1952. Supported by a stipend for prospective university teachers, he went on to write his thesis “Ein Ergodensatz für beschränkte Gruppen im Hilbertschen Raum” under the supervision of Wilhelm Maak. He passed his doctoral exam in June 1954, and then spent one year as *Assistent* at the “Mathematisches Forschungsinstitut Oberwolfach”. Having returned to Munich as Maak’s *Assistent*, he completed his *Habilitation* in Munich in the summer of 1957. In 1958 he began to teach as *Dozent* at the University of Göttingen.

The impact of Konrad Jacobs on the development of the field of stochastics can best be judged if we remind the reader of its state in West Germany after the war. The tradition in probability and statistics had been completely broken in the thirties when Jewish mathematicians such as Richard von Mises, William Feller, and Felix Bernstein were forced into exile. From 1945 to the mid-fifties, there was not a single West German university with a professorship in Probability or Mathematical Statistics. In 1955, the first chair in Mathematical Statistics was created in Munich, and Hans Richter began to give courses in Probability. In 1956, Leopold Schmetterer got a chair for “Versicherungsmathematik und Statistik” in Hamburg, and in 1958 Klaus Krickeberg became professor in Heidelberg. Konrad Jacobs received an offer from the University of Cologne in 1959. In order to retain him in Göttingen, the former position of Felix Bernstein was recreated, and Konrad Jacobs became full professor in 1959 at the age of 30.

In 1960 Konrad Jacobs published his first book, the volume “Neuere Ergebnisse und Methoden der Ergodentheorie” in the Springer series “Ergebnisse der Mathematik und ihrer Grenzgebiete”. This was followed by two volumes of “Lecture Notes on Ergodic Theory”, based on a course that he taught as Visiting Professor at the University of Aarhus in 1962/63. Throughout the sixties, these two volumes of 500 pages served as a standard reference and were found on the bookshelves of ergodic theorists across the world.



Oberwolfach-Sammlung

In 1965 both Konrad Jacobs and Heinz Bauer accepted offers from the University of Erlangen. Through their joint effort, Erlangen soon emerged as a vibrant mathematical centre in Analysis and Probability. Many students were attracted to these areas, and leading probabilists spent time in Erlangen as visiting professors, including Robert Blumenthal, Rafael Chacon, Alexandra Ionescu-Tulcea (Bellow), Kyoshi Itô and Shizuo Kakutani.

Konrad Jacobs had 25 doctoral students, 6 in Göttingen und 19 in Erlangen. A list containing their names and the titles of their dissertations is attached, documenting the wide range of topics that Konrad Jacobs had proposed. Throughout the years in Erlangen up to his retirement in 1993, Konrad Jacobs also contributed in many ways to the public understanding of Mathematics, giving expository lectures and writing articles and books that reached out to a wide audience. This is illustrated by the four volumes “Selecta Mathematica” and the two volumes “Resultate, Ideen und Entwicklungen in der Mathematik”. Another example is his “Invitation to mathematics”, published by Princeton University Press in 1992. It is designed for philosophy students and offers a non-technical introduction to a great variety of topics including knot theory, dynamical systems, mathematical economics and foundational issues.

Konrad Jacobs died on July 26, 2015, in Bamberg. His funeral was attended by a large group of family members, friends, colleagues, former doctoral students and other admirers of his impressive personality.

We are among those who remember Konrad Jacobs with a feeling of deep gratitude. He has touched our lives in more ways than one: not only as a teacher and supervisor, but also as a mentor and, increasingly over the last decades, as a friend who was always ready to share his thoughts, to listen, and to offer advice. We will continue to miss him.

2 Mathematical Contributions

2.1 Recurrence

One of the most charming aspects of mathematics and mathematical physics consists in fundamental theorems with very simple proofs, such as Poincaré's Recurrence Theorem. In the year 1890, Poincaré found this theorem while working on the three body problem of celestial mechanics. Its formulation for discrete-time dynamical systems is the following: Let Ω be a compact metric space endowed with a finite non-negative measure μ on the Borel sets of Ω as well as a measure preserving transformation $T : \Omega \to \Omega$. (In physics, Ω would be a compact hypersurface of constant energy of a conservative mechanical system, μ would be the Liouville measure and T the time evolution of the system observed at discrete times.) Then the Recurrence Theorem says that μ-almost every point $\omega \in \Omega$ is a limit point of its own orbit, that is, the orbit $(T^i\omega)_{i\geq 0}$ of ω comes arbitrarily close to ω infinitely often. Such points are called *recurrent*.

This result has aroused great interest and controversy, since it seemed to support the idea of "Ewige Wiederkunft des Gleichen" in the philosophy of Friedrich Nietzsche and others.[1]

Among the known generalizations of Poincaré's Recurrence Theorem we think that the one of Konrad Jacobs is the most elegant and natural; it also allows the simplest proof. Let $T : \Omega \to \Omega$ be a continuous map of a compact metric space into itself. A finite Borel measure on Ω is called weakly recurrent, when for any continuous real function f on Ω the "orbit" $(\int_\Omega f T^i d\mu)_{i\geq 0}$ has $\int_\Omega f d\mu$ as a limit point.

Theorem (K. Jacobs [4]) *When μ is weakly recurrent then μ-almost every point in Ω is recurrent.*

Proof Let $U \subset \Omega$ be open. Then $G = \bigcup_{i\geq 0} T^{-i}U$ is the set of points in Ω that visit U at least once after successive applications (including none) of T. The set G is open and $T^{-j}G = \bigcup_{i\geq j} T^{-i}U$ is the set of points in Ω that visit U after j or more applications of T. Clearly $T^{-j}G \subset G$ for any $j \geq 0$. We claim that $\mu(T^{-j}G) = \mu(G)$. Indeed, let $\varepsilon > 0$ and $f \in C(\Omega)$ be such that $0 \leq f \leq 1_G$ and $\int_\Omega f d\mu > \mu(G) - \varepsilon$. Using the weak recurrence of μ, find $k > j$ such that $\int_\Omega f T^k d\mu > \int_\Omega f d\mu - \varepsilon$. Then

$$\begin{aligned}\mu(G) &\geq \mu\big(T^{-j}G\big) \geq \mu\big(T^{-k}G\big)\\ &= \int_\Omega 1_G T^k d\mu \geq \int_\Omega f T^k d\mu > \int_\Omega f d\mu - \varepsilon > \mu(G) - 2\varepsilon. \qquad (1)\end{aligned}$$

[1] See the article "Ewige Wiederkunft" in the German Wikipedia.

Since $\varepsilon > 0$ is arbitrary, the claim follows. Now $U \setminus T^{-j}G \subset G \setminus T^{-j}G$ is the set of points in U that do not return to U after j or more applications of T. By the claim it is a set of measure zero. Therefore the set $\bigcup_j (U \setminus T^{-j}G)$ of points in U that return to U only finitely often is a set of measure zero, too.

Let V be the union of all these sets, when U varies over the open balls of positive rational radius about the points of a countable dense set in Ω; call these balls *special*. Then V is a set of measure zero and any point $\omega \notin V$ is recurrent, since ω will return infinitely often to any special ball U that contains ω, and there are such balls of arbitrary small diameter. □

2.2 Toeplitz Sequences

Konrad Jacobs recognized early the importance of Shizuo Kakutani's work describing the intricate spectrum of the Thue–Morse strictly ergodic system. In order to understand more clearly, he created the concept of Toeplitz sequences. Already the first publication in [6] led to wide recognition at home and abroad. The idea is surprisingly simple; here is a brief explanation.

The goal is to produce interesting and illuminating dynamical systems using finite data. There is a general way to describe the procedure, but here it suffices to give a description of the original Toeplitz sequences. For this, let us choose two different symbols, usually denoted by 0 and 1. The result will consist of a collection of doubly infinite sequences of 0's and 1's, obtained in the following fashion. In the first step, one writes down a doubly infinite sequence of 0's, leaving between each two neighbouring 0's a "hole" to be filled later with a yet to be determined symbol, either 0 or 1. The second step consists in filling in half of the holes, this time writing in every second hole the symbol 1. At the end of this step, one sees a sequence of the form

$$\dots 010 * 010 * 010 * \dots$$

in which the symbol * has been used to designate a hole. Now, repeat the procedure, by filling in the subsequent holes again in an identical manner, first with 0, then with 1, and leaving less holes. Thus after countably many fillings, either a sequence remains with no holes or, exceptionally, a sequence with only one remaining hole, which is then filled either with 0 or 1. Any sequence resulting from this procedure is called a *Toeplitz sequence*, in honour of Otto Toeplitz and his work on alternating zeroes of sines and cosines. The collection of all such Toeplitz sequences is easily shown to be a compact dynamical system under the operation of translation, called the *Toeplitz dynamical system*. It is one of the simplest (but not the first) examples of an infinite strictly ergodic symbolic system, being stationary in the sense of having only one invariant probability measure. In this way, the probabilistic nature of the system is completely specified, although there are uncountably many sequences, all having the same frequencies of finite subsequences, which belong to it.

From here on, many different versions of similar constructions have appeared and general theories of such systems developed—the development continues, seemingly unabated, today. This contribution of Konrad Jacobs was essential and certainly one of his major contributions to mathematics. It is also an example of mathematical beauty. To conclude these short remarks, here is another beautiful example, based on alternation with period three

$$\dots 001\ 001\ 110\ 001\ 001\ 110\ 110\ 110\ 001 \dots$$

Konrad Jacobs called this sequence the *Mephisto Waltz*.

2.3 Mean Ergodic Theory

In his doctoral thesis and in the first years thereafter, Konrad Jacobs worked on problems in mean ergodic theory, the study of orbits and their averages for semigroups $\mathcal{S}$ of operators in Banach spaces $\mathfrak{X}$ when the focus is on weak and mean convergence. In his thesis "Ein Ergodensatz für beschränkte Gruppen im Hilbertraum", he considered groups $\mathcal{S}$ of continuous linear operators in a Hilbert space. Such a group is called bounded if there exists a bound for the norms of all $T \in \mathcal{S}$. He proved that the closed convex hull of the orbit of each element of the space contains a unique fixed point. This had been shown by his advisor Wilhelm Maak and by Roger Godement in the case of unitary operators. Their methods did not apply to the general case. In the years 1954–1957, Jacobs studied much more general settings for semigroups $\mathcal{S}$ in Banach spaces $\mathfrak{X}$. His theory was completed by the American mathematicians Karel Deleeuw and Irving Glicksberg in 1961. Today, these results are called Jacobs–Deleeuw–Glicksberg Theory.

If $\mathcal{S}$ is abelian, the results have a relatively simple form: $\mathcal{S}$ is called almost periodic if the orbits $\mathcal{S}x$ of all $x \in \mathfrak{X}$ are conditionally weakly compact. If $\mathfrak{X}$ is a Hilbert space, this is always true for bounded semigroups $\mathcal{S}$. If $\mathcal{S}$ is an abelian weakly almost periodic semigroup, $\mathfrak{X}$ is the direct sum of two linear subspaces $\mathfrak{X}_{fl}$ and $\mathfrak{X}_{uds}$. $\mathfrak{X}_{fl}$ consists of all flight vectors. A vector is called a flight vector if 0 belongs to the weak orbit closure. $\mathfrak{X}_{uds}$ is spanned by the eigenvectors for which the eigenvalue has modulus 1. $\mathfrak{X}_{uds}$ is identical with the space $\mathfrak{X}_{rev}$ of reversible vectors. Let $\overline{\mathcal{S}}$ denote the closure of $\mathcal{S}$ in the weak operator topology. A vector is called reversible if for any $T \in \overline{\mathcal{S}}$ there is an $R \in \overline{\mathcal{S}}$ with $RTx = x$. Jacobs showed that even in the case when $\mathfrak{X}$ is the two-dimensional Euclidean space the sets $\mathfrak{X}_{rev}$ and $\mathfrak{X}_{fl}$ need not be linear subspaces if $\mathcal{S}$ is non-abelian. One of the principal results of the Jacobs–Deleeuw–Glicksberg Theory in the non-abelian case is the following

Theorem *Assume that $\mathfrak{X}$ and $\mathfrak{X}^*$ are strictly convex. If $\mathcal{S}$ is a weakly almost periodic semigroup of operators of norm less than or equal to 1, $\mathfrak{X}_{fl}$ and $\mathfrak{X}_{rev}$ are closed $\mathcal{S}$-invariant linear subspaces, $\mathfrak{X}$ is their direct sum, and $\mathfrak{X}_{rev}$ is the space of almost periodic vectors.*

Konrad Jacobs gave the proof under stronger convexity conditions. For more results and references we refer to [8].

2.4 Strict Ergodicity

The aesthetic appeal or aesthetic properties of a mathematical object played always an important role in Konrad Jacobs' work. Sometimes one could get the impression that this was the dominant reason to study a certain object. A typical example was his interest in 0–1-sequences such as the Morse–Thue sequence or Toeplitz sequences. These sequences are generated by beautiful patterns such that one ends up with almost periodic elements of the basic probability space for Bernoulli trials. Almost periodicity is in fact a theme with a number of variations in his work. This is not really surprising since almost periodic functions constitute a major research topic of his mentor Wilhelm Maak.

The closure of the orbit of a Toeplitz sequence under the shift transformation is an example of a strictly ergodic dynamical system. This means it carries a unique shift invariant probability measure. The interplay between measure-theoretic and topological dynamical systems in general and strictly ergodic systems in particular attracted a lot of interest in ergodic theory in the sixties and seventies. In his sabbatical in 1969/70 which he spent at The Ohio State University, Columbus, Jacobs investigated strict ergodicity for flows. A continuous-time abstract dynamical system or a flow for short, is given by a probability space $(\Omega, \mathcal{A}, m)$ and a one-parameter group $(T_t)_{t\in\mathbb{R}}$ of m-preserving transformations of Ω onto itself. The topological equivalent of a flow is given by a compact metric space Ω and a one-parameter group of homeomorphisms $(T_t)_{t\in\mathbb{R}}$ where $(\omega, t) \to T_t(\omega)$ is assumed to be continuous. $(T_t)_{t\in\mathbb{R}}$ is then called a continuous flow. A continuous flow restricted to a minimal invariant subset Ω_0 is called a strictly ergodic system if there is a unique $(T_t)_{t\in\mathbb{R}}$-invariant probability measure on the Borel sets of Ω_0. A convenient criterion for strict ergodicity is that for continuous functions f on Ω and every $\omega \in \Omega_0$ the time averages

$$\frac{1}{t}\int_0^t f(T_{u+s}\omega)du$$

converge uniformly in $s \in \mathbb{R}$ to a constant which is then nothing but the space average $\int f dm$ under the $(T_t)_{t\in\mathbb{R}}$-invariant measure m.

Let us sketch the output of this sabbatical [5] and indicate some of the subsequent results which were inspired by his paper. After a number of discrete-time examples had been constructed in the sixties, the question was to extract assumptions which guarantee that an abstract flow is isomorphic to a strictly ergodic one. The starting point was a result by R. Jewett (1970) [7]. He proved that every discrete-time dynamical system which is weakly mixing, is isomorphic to a strictly ergodic system given by a homeomorphism on a compact metric space. The canonical space in discrete time is the two-sided countable product of unit intervals [0, 1] endowed with the shift transformation. What could be the appropriate space in continuous time? Jacobs chose the space L^A of [0, 1]-valued functions on $\mathbb{R}$ satisfying a Lipschitz condition given by the Lipschitz constant $A > 0$. This space provided with the appropriate metric is compact and the shift

$$S_t f(s) = f(s+t) \quad (s, t \in \mathbb{R})$$

is a continuous flow. There are deeper mathematical reasons why L^A-spaces represent an excellent choice. The topological entropy $h((S_t)_{t\in\mathbb{R}})$ of the shift flow on this space is infinite. This is even true for the d-dimensional flow on the corresponding L^A-space of functions on $\mathbb{R}^d$. The entropy of a system is an isomorphism invariant. (The opposite direction, namely that it is a complete isomorphism invariant is the famous Kolmogorov conjecture on entropy which was confirmed for Bernoulli shifts by D. Ornstein in a series of papers starting 1970.) Since the topological entropy represents the upper bound for the entropies of measure preserving transformations on the same space, any compact space with a continuous flow into which one wants to embed an abstract flow has a priori to be rich enough in order to carry this system. With topological entropy being infinite this is the case for L^A. Another appealing property of the shift flow on L^A is that it has bounded speed which is given by the Lipschitz constant A. It is obvious that the speed of the corresponding flow on the space of all continuous functions with the same metric is no longer bounded.

In [5] Jacobs showed that any weakly mixing flow is isomorphic to a strictly ergodic one. To be precise, he did not succeed to embed weakly mixing flows isomorphically in a strictly ergodic subset of some L^A-space, but only in a countably infinite product of L^A-spaces. That aperiodic measure-theoretic flows in general can be embedded in L^A together with the shift, where $A > 0$ can be chosen arbitrarily, was shown in a Ph.D. thesis which was written under his supervision (see [3]). The latter embedding is based on the construction of a countable generator of the σ-field which is transversal relative to the orbits of $(S_t)_{t\in\mathbb{R}}$. These so-called generators of finite type have the property that the flow stays in any generator set P_i at least for a positive time span $l(P_i)$ and any finite section of an orbit intersects only finitely many generator sets. If the aperiodic flow has finite entropy then one can in addition achieve that the generator has finite entropy as well. Based on the embedding into L^A itself, the result from [5] could be improved further. Via a continuous-time coding technique it is shown in [2] that only ergodicity of the flow $(T_t)_{t\in\mathbb{R}}$ is needed for the isomorphism to a strictly ergodic shift flow in L^A. This is the definite result since strictly ergodic flows are ergodic.

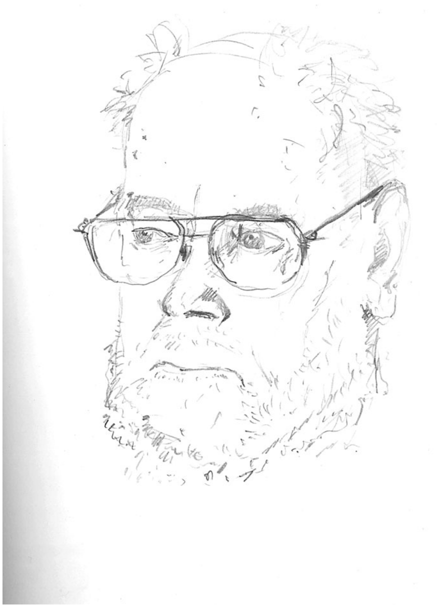
2.5 Information Theory and Combinatorics

In the beginning of the sixties, Konrad Jacobs briefly worked in information theory. At that time, he was probably the only German professor of mathematics who realized the importance of this emerging field. He introduced the notion of an "averaged channel", and he used it to show that there are channels for which the coding theorem and its weak converse are valid, yet the strong converse fails. These results have recently been presented in chapter 1 of [1].

During his time in Göttingen, Konrad Jacobs supervised three dissertations related to information theory, in particular the thesis "Beiträge zur Shannonschen Informationstheorie im Fall nichtstationärer Kanäle" by Rudolf Ahlswede (15.8.1938–18.12.2010), who soon became one of the leading experts in this field. After working for some years in Columbus/Ohio and then as Visiting Professor in Göttingen, Rudolf Ahlswede was full professor in Bielefeld from 1975 to 2003. He published six books and 242 articles in information theory, combinatorics and search theory, and he advised 32 doctoral students. Famous results of Ahlswede are the Ahlswede–Zhang-identity and the Ahlswede–Daykin-inequality. In 1988 and in 1990 he received the Prize-Paper-Award of the IEEE Information Theory Society, and in 2006 the Claude–Elwood–Shannon-Award. His paper "Network information flow" with N. Cai, which opened up a new branch of information theory, has been quoted in more than 7700 articles.

After his move from Göttingen to Erlangen, Konrad Jacobs also supervised several dissertations in Combinatorics, among them the thesis of Thomas Beth (16.11.1949–17.8.2005). After studying in Göttingen, Thomas Beth briefly joined the combinatorics group of Ray Chaudhuri in Columbus/Ohio and then completed his thesis "On Resolutions of Steiner Systems" in 1978 under the guidance of Konrad Jacobs. In 1984, he obtained the *Habilitation* for Computer Science in Erlangen. In the same year he accepted a professorship in London, but already in 1985 he moved on to Karlsruhe. He published books on Cryptography, on the Fast Fourier Transform, on Design Theory and on Quantum Information Processing, (partly with coauthors) He supervised 32 doctoral students, and he was head of a DFG-Program on "Quanteninformatik".

3 Out of Mathematics



By Jochen Schwemm

Neither the original mathematical work of Konrad Jacobs nor his tremendous impact in building up a tradition of probability and statistics in Germany do full justice to his rich personality. Hardly a major cultural phenomenon of the past to which he has not given his attention and sympathy by learning languages, travelling, communicating with people, reading books and surfing the internet, by writing, drawing and playing the violin. His knowledge of culture appeared to be encyclopedic. Once asked, how he could memorize so much material, he answered: "In my experience knowledge resembles a coral reef: the larger it has grown, the faster it grows." It should be added that his knowledge was as lively as a coral reef, too: It was structured and coloured by memories of personal contacts.

Such contacts reach back to Konrad's student years. As a member of the Fachschaft Mathematik of the University of Munich Konrad had organized a series of lectures on "The Infinite" ("Das Unendliche") and had succeeded to win Romano Guardini, the well known philosopher and catholic theologian, and the famous physicist Arnold Sommerfeld as lecturers. In the course of his preparation Guardini asked Konrad how the infinite was defined in mathematics. Konrad answered: "A set is infinite exactly when it can be mapped in a one-to-one way onto a proper subset of itself." At that Guardini: "What a pitiful infinite!" ("Was für ein erbärmliches Unendlich!")

Konrad was an excellent violinist. As an assistant in Oberwolfach he made a bet with a mathematical colleague that in an agreed period of time he would be able to play Johann Sebastian Bach's whole work for solo violin by heart. Of course, he had no chance of winning the bet, but the anecdote shows his vigour, his optimism as well as his enthusiasm for Bach's musical cosmos.

Konrad was an ardent collector of graphic arts, who had close relations to artists such as Malte Sartorius. He was a passionate photographer and became the founder of the Oberwolfach photo collection.

Konrad dabbled at drawing and calligraphy with considerable success, he composed a kind of cultural diary—the Bamberger Bote—for his family and friends, and he left behind hundreds of sonnets on religion, philosophy, politics and everyday life, which show his stupendous mastery of the German language as well as his poetic gift. Many of his sonnets are on religion. To Konrad Jacobs, religion was a cultural phenomenon that fascinated him greatly. Here is one example:

Für Augustinus noch der Wunder Wunder:
wie sich durch Jesus alles das erfüllte,
was in Propheten Rede einst sich hüllte.
Heut liest das unser nüchterner gesunder

Verstand als was es ist: *ex post* geklittert.
Was soll's – auf einem Feld, wo nur das gilt,
was Glaubens glühendes Verlangen stillt,
kämpft doch kein liebevoller Mensch erbittert

um, was historisch wahr, und was sich die
vom Geist getrieb'ne Urgemeinde dachte,
als sie enttäuschte Endzeitprophetie

in kühner Deutung zukunftsfähig machte.
Nur wer Religion nicht kennt, verzeiht es nie,
dass sie zu viel auf einen Nenner brachte.

Sonett CLXXIII
18.4.2001

Only a few sonnets available to us (of the years 2000 and 2001) are on mathematics or science, such as the following two, the first on the process of discovery in general, the second on the discovery of the process of Brownian Motion:

Der Groschen fällt – es dauert nur Sekunden.
Der Schleier fällt vorm Aug': es ist geschafft!
Im Handumdrehen hat dein Geist gerafft,
was sich im Takt geduld'ger Arbeitsstunden

nie fügen wollte. Euphorie der Schau
durch plötzlich klar gewordene Strukturen!
Sie währt nicht lang. Schon mahnen dich die Uhren
gedieg'nen Tuns: halt's fest, fass' es genau

in Zeichen, die Geschulte lesen können.
Erst wenn die gleichfalls sehen, was du sahst,
ist klar: nicht rein privat hast du gerast
im Selbstgenuss. Du darfst dir ehrlich gönnen,

das, was dir selbst zunächst wie angemasst
erschien, Entdeckung, Resultat zu nennen.

Sonett CXLIII
19./20.2.2001

Er sah die Bärlappsporen wimmeln, tanzen
im Wassertropfen unterm Mikroskop.
Was die – das konnte Brown nicht wissen – schob,
war'n die molekularen Stossbilanzen.

Er dachte an vitale Selbstbewegung;
doch dann sah man auch tote Stäubchen zittern –
die Physiker begannen was zu wittern.
Es kostet' siebzig Jahre Überlegung

bis Einstein die Idee zuende dachte –
noch ohne mathematische Schikanen,
für die Physik halt. Ganz in Ordnung brachte

erst Wiener das Gebräu. Frappant verzahnen
sich heut' Strukturen auf dem Feld, das lachte
als Neuland den Stochastik-Jungtitanen.

Sonett CXXVII
9.12.2000

The last sonnet stands for itself:

Zu festgefügten, klaren, dichten Gittern
wollt' ich die Fäden meines Lebens weben.
Nun muss ich seh'n: sie haben nachgegeben,
ich spür', wie sie im Zeitensturm verwittern.

Bald wird der Wind durch dünne Fetzen pfeifen
– wie sollt' ich auch, wenn ich so einfach stürbe,
zerrisse, ohne dass ich vorher mürbe
geworden wär, was vor sich geht, begreifen?

O ja, befreunde dich mit dem Gedanken,
dir selber zuzusehn, wie's an dir zehrt,
das Harte bröckelt, die Gerüste wanken,

bis sich, was von dir übrig, nicht mehr wehrt,
der Griff sich löst von letzten morschen Planken
und du entgleitest – endlich heimgekehrt.

Sonett CLIII
28.1.2001

4 Dissertations Supervised by Konrad Jacobs

Universität Göttingen

1. Strassen, Volker: Messfehler und Information, 11.5.1962
2. Brown, Clifford Caperton: Über schwach-kompakte Operatoren im Banachraum, 8.11.1963
3. Krengel, Ulrich: Über den Absolutbetrag stetiger linearer Operatoren und seine Anwendung auf ergodische Zerlegungen, 8.11.1963
4. Baldwin, Joe jr.: Die Abhängigkeitskapazität stochastischer Prozesse, 8.11.1963
5. Augustin, Udo: Gedächtnisfreie Kanäle für diskrete Zeit, 12.11.1965
6. Ahlswede, Rudolf: Beiträge zur Shannonschen Informationstheorie im Falle nichtstationärer Kanäle, 16.12.1966

Universität Erlangen-Nürnberg

7. Schmidt, Wolfgang: Die Verteilung der Adsorptionszeit und ihre Schätzung beim Markoffschen Prozess mit einem reflektierenden und einem adsorbierenden Rand, 25.2.1966
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