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SYMPOSIUM

à la mémoire de

François JAEGER

Grenoble, 31 août-4 septembre 1998

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organisé par

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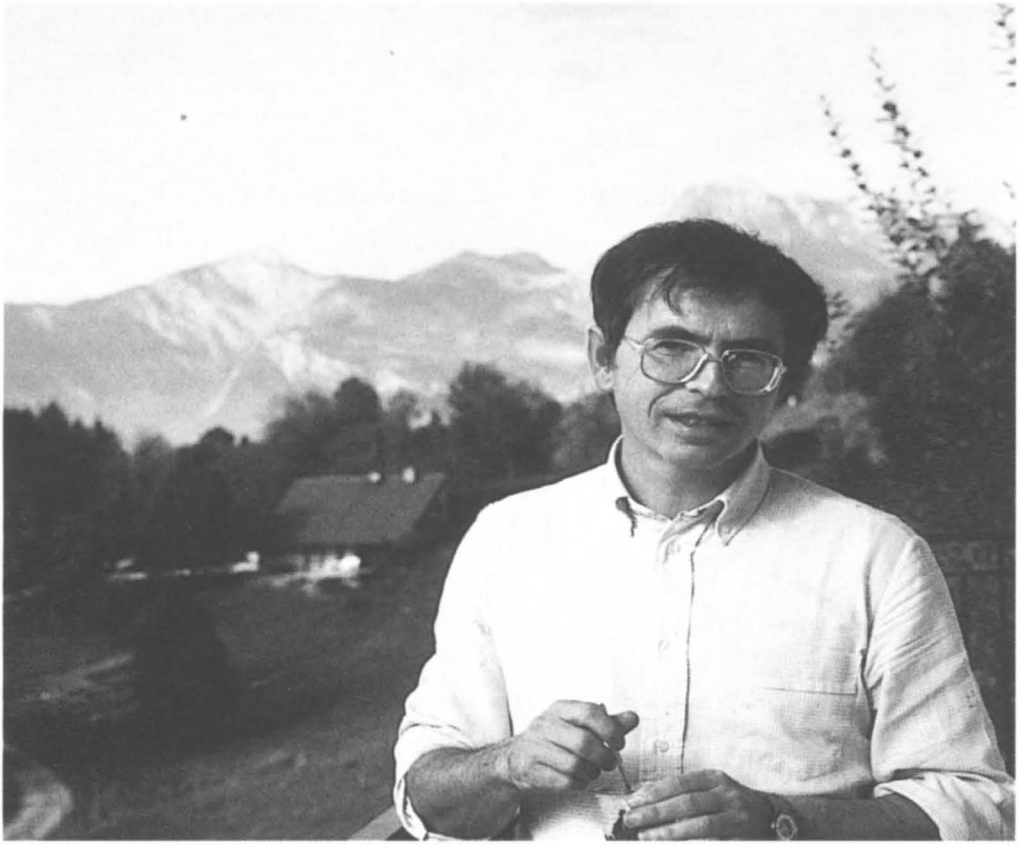

PREFACE

With emotion, we present this volume honoring the memory of François Jaeger. In August 1997 François left us. He was fifty years old and in full scientific creativity.

Following his untimely death, we decided to evoke François's memory by organizing a symposium. When the choices for the scientific program were to be made, our main viewpoint was to reflect the wide spectrum of François's scientific interest. The thirty-one speakers would have full freedom concerning their topic, and the length of time required by the lectures could also be chosen by the authors themselves.

Besides these talks, the symposium offered poster exhibitions and work sessions, where many of the participants other than the lecturers could contribute. The list of participants was an exceptionally high concentration of active discrete mathematicians, with a lot of interesting communications to present. Many of them came far from Grenoble as simple listeners, just to honor the memory of François.

Beyond the freedom granted to the lecturers, we could be assured of the general level of the contributions: this was guaranteed by the overall presence of François's high standards.

The meeting confirmed and even surpassed our expectations. In the lecture room, emotion, memory and higher mathematics were simultaneously present and made out of the symposium a real memorial, different from usual meetings.

We wish this volume to be an appropriate written image of the meeting, without being a photograph. We simply asked the invited speakers

who could prepare a manuscript in such a short time to do so. We did not require the papers to satisfy the strict rules of a journal. Consequently there is again place for high mathematics, memory and emotion. We thank the editors of Annales de l'Institut Fourier for giving us this possibility.

We thank the sponsors of the meeting:
Laboratoire Leibniz Grenoble,
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We thank also our colleagues of the program committee, namely

Stephan Ceroi, Sylvain Gravier, Jean-Marie Laborde, Frédéric Maffray, Christine Maïda, Pierre Manches, Charles Payan, Myriam Preissmann, Nguyen Huy Xuong, Ismaïl Zighem.

In the following we include five testimonies representing different aspects of François Jaeger's personal and scientific life, in the order they have been presented at the opening session. The first testimony was François' father's, who could not be present. The text was read by Professor Nash-Williams.

Claude Benzaken, Michel Mollard, András Sebő

Speeches

Address by Charles Jaeger

Ladies and gentlemen,

We are very grateful to you for this symposium, but I must present my apologies for the absence of my wife, because of bad health.

It is a great honour to meet preeminent scientists from so many famous universities, to speak about our son.

François Jaeger, born December 1947, was brought up by his parents: his father a medical practitioner, his mother a pharmacist who did not practise her profession in order to be free to bring up her three children.

François was also very close to his maternal grandfather with whom he shared a number of qualities.

As a small child François was very pleasant: always cheerful and in a good mood, full of vivacity, eager to know, questioning all the time - and trying also to see for himself! So he crawled and climbed wherever he could: on the tables, the stairs, on the piano. Always in movement he once had a narrow escape when a dresser fell back on him. We call him "casse-cou" (a little dare-devil). The only way to make him keep quiet was to tell him stories or to explain or teach him something. He seemed always glad to learn.

His first contact with Mathematics - or rather with numbers - took place when he was about three and a half. One day we saw him coming along, proudly, to show that he had learned to count. He started 1, 2, 3, 4, then he stopped before adding, in French of course: "Après, ça fait beaucoup" (afterwards, there are many).

He was already a very good pupil in nursery and primary school. His relations with teachers and schoolmates were excellent. He had an upright character, he never cheated, never told a lie. He loved nature. I have kept some little pieces of poetry about sunshine, spring, flowers and holidays, written when he was about 6 or 7 years old, showing a sensitive child. But while playing he still was a rather stormy boy. One day he seemed to be sorry about it and wrote me a little letter saying: "Dear Papa, for your birthday I have decided to behave well during our holiday". I don't remember whether he really kept this promise.

In the secondary school, the quality of his work was still very regular. Every year he received the prize for excellence in Mathematics and in Physics and was also good in the other subjects. He concentrated easily. It has always been difficult to get him out of his work or of a book. But in his games he was still not cautious enough. I think that he liked to take risks. No wonder there were some mishaps. Two examples:

– with a toy called "the little chemist's outfit" he got intoxicated with chlorine gas;

– Another time he manufacturated a little gun, or rather a little cannon. He charged it with some powder, you can easily guess until the whole thing explosed in his hands. The consequence was some lasting damage to a wrist-tendon. We may perhaps call this his first act of research - but it was not in Mathematics!

As a teenager he practised several sports: sailing, horse riding, judo and he was quite good at skiing. After 1970, living here in Grenoble he was captivated by the mountains, like many of his colleagues.

At the end of secondary school, François had known for some time what he wanted to do afterwards - his goal was to be admitted to the Ecole Polytechnique - in his view the most glorious of all institutes. He said once: "not to enter the Polytechnique would mean for me to start in adult life with a defeat". His grandfather explained to him in a long letter how many ways existed to realize a successful life without Polytechnique but in vain.

During the two preparatory years he worked hard, and hardest in Mathematics. Nevertheless his love of Mathematics started during these years. He said: "the more I work in Mathematics the more it attracts me".

It is difficult for me, a layman who knows nothing of Mathematics, to explain this. The mathematical mind remains a great mystery to me! What attracted François particularly in Mathematics: the abstraction, the

precision, rationality, universality? Perhaps also the logic. I remember having been told something by his professor who was my patient at the time: he has noticed that François showed a particular strength in logical demonstration. Was that sort of endowment an important factor? You are better judge than I on this point. What I know is that he made very great efforts in the higher mathematical studies, his obstinacy grew with the difficulty. May I be allowed to think that he has been captivated by the beauty of absolute logic which he found in Mathematics? I would add that his strong sense of logic was not so obvious in everyday because he avoided controversy. He rarely tried to persuade anybody that he was right. Above all he respected the opinions of other people whatever they were.

After he entered the Polytechnique François had another three years of intensive work but with more time for personal life and periods of instruction in the Army and in a company. Since through the school the time came to choose a profession. Normally he could have to face a career in the civil service or in public or private enterprises. As we know, this would not interest him at all. What he wanted now was pure sciences, which mean Mathematics, and of course research. Research because of his great curiosity, his love of adventure mental as well as physical, promising great efforts and perhaps also some reward through discovery. He decided rapidly on this orientation and was lucky enough to get a position in Grenoble. He was to keep it for twenty-seven years, and now I see in François the colleague you have known - better than his family in many respects.

I think that you will agree with me about some of his characteristics like his contempt of personal comfort, his love of effort, his warm friendship, his love of new experiences. Did you know that he made a parachute jump, just for fun, in quite recent years? You know how he liked to organise mountain tours for his friends. His temptation to take risks disappeared when other people were involved. He always planned everything with great care. François liked also his travels abroad. He liked your work together, your walks and your talks, your dinners. He liked to know your countries, your food and your drinks. He worked very hard with passion, often late into the night. He felt really at rest. He said that he would go on like this as long as he could get some results. The more he worked the more he was caught up. Each result brought him new ideas. He was always enthusiastic.

But in January 1996 came the disaster. A long cancer with small cells, the worst variety. He was treated for eighteen months. There was no operation. After a remission the inexorable evolution started again.

François faced his ordeal with great courage. He often read the Bible. He never despaired. Mathematics was of great help to him. He worked until his last days... One year ago...

François has been happy with his work. He loved research and he loved Mathematics. To know this gives us some comfort and help us to live. I speak also for the two sons François has left us. Nicolas, 25, is a biologist; Raphael, 23, has studied political science, but he wants to be a high mountain guide.

If François has been happy in his profession it is also thanks to you. You have always received him as well. You have given him your esteem when he lived and you show today how faifthful you are to his memory.

I thank you very much.

Charles Jaeger

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Address by Claude Benzaken

François came to Grenoble in 1970 to prepare a thesis after his *Ecole Polytechnique* diploma: he was only twenty-three years old. A small new research team started out at that time (about 6 or more members). I was actually in charge of it. The team was called Algebra, Logic and Combinatorics and was devoted to the study of theoretical and mathematical aspects of Computer Science. François was an essential researcher in promoting this team to a high international level. I am still impressed by the quality of his thesis, which I had the honorific duty to present to the doctoral committee.

François had a wide range of research activities. Starting with the 4-colour problem and the connected 5-flow conjecture, he gave many new orientations by including geometrical, algebraic and topological methods, until his last works on knot theory and related topics. He collaborated with the most eminent researchers in these fields.

As probably the oldest of François' colleagues, it has been an honour for me, with a great emotion, to give the opening message for the Symposium.

Claude Benzaken

Address by Charles Payan

It is quite difficult, in a few minutes, to talk about twenty-five years spent with François. We shared the same office. I would simply like to mention two or three images crossing my mind.

The first one goes back to 1971: we had both succeeded in joining the CNRS. At this time we were working together on a conjecture of Erdös. To prove this conjecture each of us did a part of the path. He certainly did most of it, I did some smaller parts. One night, by chance, I finally covered the last steps. On the day after, when I showed him the result, he jumped with joy. I remember that we had a stupid gesture: we shook hands.

The second image deals with a few walks that we took together in the mountains. There also, like in mathematics, I really had trouble following him. But he was the kind of man who is able to wait, always being cautious so that none notices anything. Bill Jackson certainly remembers a certain hike: we had to give up because of the weather, after having spent one night camping in the snow. That evening, François left us his tent and slept in the open...

A last image. It was last summer in the rest house in the Chartreuse mountain. I went to see him late one evening. We talked about nothing, about everything, politics, books, and maths also. We felt good. Guess what he said... I realise that I don't know anything about maths... he said.

This was the very last time I saw him.

Charles Payan

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Address by Myriam Preissmann

As a former student and colleague of François Jaeger I will evoke some aspects of his personality which were remarkable to me.

I met François for the first time exactly twenty years ago when he proposed to me to prepare a thesis under his supervision. The subject was related to cubic graphs and edge-colorability, and with his advised indications, discrete, patient and essential help, I obtained after two years

enough results to claim to defend my thesis. But, surprisingly for me, one more year appeared to be necessary to complete the writing of the manuscript. Indeed François was rigorous and liked perfection; he wanted not only the proofs to be as elegant as possible, or nice synthetic analyses of problems, but also a perfect style. And I remember, now with pleasure, the hours we spent discussing every sentence, every comma. I always felt privileged for being able to benefit from his teaching.

One could think that somebody who was as demanding as François was to himself was also very severe with others. This was absolutely not the case. On the contrary, his kindness made him always see the good side of people and things. François appreciated humor, good food and company. Beside mathematics he had a passion for nature, mountain and sport.

Another characteristic of François was his insatiable scientific curiosity, associated to a great memory. Whatever talk he listened to, while most of us were lost or thinking of something else, he always had pertinent questions and remarks.

François loved to spend time in the library, browsing through all kinds of journals, discovering and taking notes or making copies of papers which could be of interest not only to him but also to his colleagues. If you had any doubt about the status of a problem it was always useful to ask François. François had also a remarkable capability to understand papers written in a language different from the one used in Discrete Mathematics, and this was of great help when we prepared together a course on the applications of Graph Theory. In particular I remember his pleasure when he discovered an interesting application of the max-cut problem in planar graphs in a journal devoted to VLSI design.

This attraction towards universal knowledge was not compatible with his longing for deeper thinking. He devoted all these last years to Knot Theory, often regretting that he did not have enough time to do all he would have liked to do.

Fate in fact left him very little time... One year ago faced with our powerlessness before Death, we all felt the necessity to pay an hommage to François: what could be best than to gather all his friends, colleagues, students and, who knows, make some progress in knowledge?

This was possible only with your help. Your presence here is the best Testimony of the esteem that everyone had for François. Thank you.

Myriam Preissmann

Address by Claude Berge

I do not propose to point out here the major contributions that we owe to François Jaeger; we graph theorists know his work in Combinatorial Mathematics, and we all remember his long discussions with the youngest French mathematicians when, descending from his Grenoble mountains, he would come to Paris to participate in our Monday seminars at the Maison des Sciences de l'Homme. If I were asked to characterize his personality in a few words, I would be tempted to answer that he was a deep mathematician, at the same time bright and modest.

In fact, with me François rarely spoke about himself, his private concerns or his own views about the academic world; he never uttered a negative opinion about a colleague. It is only on the occasion of international conferences that I got to known more about him. I will never forget our efforts to reach an old castle near Aberdeen after the 5th British Combinatorial Conference, or the visit we did together in Honolulu to the Bishop Museum of Oceanic Art and his fascination for a polynesian tiki.

His own taste for some new mathematical ideas and his approaches to their analyses were also significant of his originality. His first notes (in 1971, 1972), mostly published jointly with Charles Payan, and his PhD thesis, presented three years later, were all devoted to a particular aspect of Graph Theory: combinatorial properties of planar graphs, coloring problems, orientations of edges, all problems whose apparent simplicity stands in marked contrast with the sophistication of the techniques devised to solve them. His last papers, about chromatic invariants, spin models for link invariants, association schemes, are of the same distinctive flavor: with a concrete visual interpretation, but requiring the kind of abstract developments that we could expect to see in Higher Algebra or in Topology. His most famous result, the 8-flow theorem, stems also from highly recondite coloring problems.

The work of François Jaeger, honored by this volume, is the most impressive illustration of a sentence of Gauss who, according to Pierce, declared: Algebra is a science of the eye.

Claude Berge

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List of talks

Brian ALSPACH - *Isomorphisms of circulant graphs and digraphs of prime power order*

Eiichi BANNAI - *Modular invariance property of associated schemes, Type II codes over finite rings and finite abelian groups, and reminiscence of François Jaeger*

Claude BERGE - *Combinatorial properties for the odd cycles in a graph of small chromatic number*

Jean-Claude BERMOND - *Applications of flows and codes to broadcasting in hypercubes*

Adrian BONDY - *Colourings and orientations of graphs*

André BOUCHET - *Circle graphs*

Paul CAMION - *Metric coset schemes*

Yves COLIN DE VERDIÈRE - *Determinants and Fresnel integrals*

Bruno COURCELLE - *Logical representation of graph drawings with and without edge crossing*

Jack EDMONDS - *Some graphic uses of an even number of odd nodes*

Herbert FLEISCHNER - *Helping to pave the way: François Jaeger's 8-flow theorem, and a connection between compatibility and cycle double covers*

Chris GODSIL - *Spin models and triangle-free strongly regular graphs*

Pierre de la HARPE - *Sur la croissance des groupes de type fini*

Marie-Claude HEYDEMANN - *On a problem of walks*

Bill JACKSON - *On Jaeger's dual-Hamiltonian conjecture*

Vaughan JONES - *Planar algebras, Hadamard matrices*

Louis KAUFFMAN - *François Jaeger's work of state models for knot invariants*

Abdelkader KHELLADI - *Colorations généralisées, graphes biorientés, et deux ou trois choses sur François*

Michel LAS VERGNAS - *On Tutte polynomials of vectorial matroids*

Makoto MATSUMOTO - *A generalization of Jaeger and Nomura's Bose-Mesner Algebra associated to type II matrices*

Kazumasa NOMURA - *Non-symmetric spin models*

André RASPAUD - *Anti-flows and strong oriented colorings of oriented graphs*

Horst SACHS - $(3,6)$-*cages, toroidal hexagonal systems and their spectra*

Attila SALI - *Orientations of self-complementary graphs and relations to Sperner and Shannon capacities*

Alexander SCHRIJVER - *Spectrally characterizing linklessly embeddable graphs*

Paul SEYMOUR - *Tutte's* 3*-edge-colouring conjecture*

V.S. SUNDER - *Algebras of G-relations*

Michael TARSI - *Counting proper colorings of a graph by Fourier analysis of its graph polynomial*

William TUTTE - *Bicubic maps*

Dominic WELSH - *The complexity of some combinatorial polynomials*

Fred WU - *Duality and sum-rule relations for the n-point correlation function of the Potts model*

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