Biography:

Born in the USSR, Albert Schwarz was interested in mathematics and physics from a young age. While a high school student in Ivanovo, he met Professor V. A. Efremovich, who organized mathematical circles and Olympiads for young students. This professor had a profound effect on Schwarz, and continued to mentor him at the Ivanovo Pedagogical Institute. His research career started when he was eighteen years old; he entered graduate school at Moscow University with 7 published papers. He authored 15 papers by the time of his PHD dissertation, many of which were well known.

Upon graduation, Schwarz accepted an offer from the Mathematics department at Voronezh University. Soon after, he met and married his wife, L. Kissina, a Moscow native. Together, after one year of marriage, they moved to Moscow, where Schwarz accepted a position as Professor of Theoretical Physics at M E Ph I. At that time, he was perhaps the youngest Doctor of Sciences in the USSR.

In 1989 he and his family left the Soviet Union -- forever.

After spending time at both Princeton and Cambridge, Schwarz has worked in the Department of Mathematics at UCDavis since 1990. He has enjoyed many new opportunities for "long distance collaboration" and written several joint papers which continue to explore new research topics. Serving as a bridge between mathematics and theoretical physics, this year marks his 50th year of research contributions.

His Research:

1. Geometry of uniform continuity. Volume invariant growth of a group. (1952-1955)
2. Topological questions of calculus of variations. Space of closed curves. Genus of fiber space. (1956-1962)
3. Duality of functors in autonomous categories. (1962-1968, 1971)
4. Scattering matrix in quantum field theory (adiabatic definition, axiomatic theory). (1971-1974)
5. Particle-like solutions to classical equations of motion and quantum particles. Topological charges. Magnetic monopoles. Symmetric gauge fields. (1975-1978, 1980)
6. Instantons. Quantum fluctuations of instantons. (1975-1979)
7. Topological quantum field theories. (1978-1979, 1987, 1996, 2000)
8. Topologically non-trivial string-like fields. Alice strings. (1981-1982)
9. Geometry of supergravity. Field-space democracy. (1981-1986)
10. Superconformal manifolds. Supermoduli spaces. Multiloop contribution to superstring theory. (1985-1991)
11. Mathematical problems of 2D gravity. String equation. (1990-1991)
12. Geometry of Batalin-Vilkovisky formalism. (1992-1994)
13. Noncommutative algebraic equations. (1995, 1997, 2000)
14. Noncommutative geometry and its application to string/M-theory (1997-)
15. Maximally supersymmetric gauge theories (2003-)

Quotes from Others:

The proposal is excellent. The PI is a leader in the field with a strong record with students. The work will have a huge impact on the community. At least one panelist said "can't wait to see the results" of the proposed research.

Schwarz is one of the active leaders in mathematical quantum field theory, and his work in the past has largely determined the development of the field. Schwarz has a record of never deviating from what is important for physics, and quite often, what he proposes to do becomes the cutting edge of mathematical physics, starting with a paper of his.

Dr. Schwarz was a very respected scientist in the former Soviet Union. I am glad to see that he is still very active and successful and UC Davis is benefiting from his extraordinary expertise.

Dr. Schwarz pays a lot of attention to the formation of young researchers. He has successfully involved several graduates in his research projects, most of whom, after graduation, have secured positions in excellent places. He integrates his research in the graduate courses he teaches at the university.

Excerpts from an Interview between Andrew Waldron and Albert Schwarz:

A. Body of Knowledge:

Albert: Let me explain to you about my view of the body of knowledge. (see picture)

There is a body of knowledge which people consider trivial at this moment. In theory, you can go ahead from this center.

You also have these "tentacles" where you can go very far. This is difficult stuff; you have very advanced people on these tentacles.

After that, this body grows in all directions.

Andrew: The tentacles grow very far, but some of them come back to the center. Is that intentional?

Albert: Yes. Sometimes the space between the branches fills in and the stuff considered very advanced comes close to the center.

Andrew: Do you ever worry that a hole will appear in the center? That we will look back, and discover that what we know we really didn't know.

Albert: No, I am only talking about real knowledge. What I'm saying is that some things are non-trivial at some moment, but later become completely simple. This happened for example with special relativity, which was considered very, very difficult and later professors complained that the course of special relativity was too easy compared to other courses.

You can expand the knowledge in different ways. Some people like to go to the end of the branch. Some people try to enhance our knowledge around the surface.

Andrew: So where would you like to be in this diagram?

Albert: I am connecting these two branches.

B. Research Passions & Methodologies

Andrew: Is there any one of the many problems you have solved that you look back upon with especial fondness?

Albert: I have enjoyed the discovery that you can use ideas from physics in mathematics, in particular, in topology.

Andrew: Do solutions to problems come to you in discrete inspirational packets, or is the process more gradual?

Albert: I'm not a problem solver. I'm a problem finder. I'm trying to understand what happens. In fact, I'm trying to find new problems. Ask new questions. A really good idea is to try to make all the stuff that you know trivial. And when you are able to make trivial the stuff that you know, then you are able to move ahead.

Andrew: If you could wake up one morning with an idea for solving one of the famous open problems in mathematics or physics, which would it be and why?

Albert: I have some ideas how to construct a rigorous theory of functional integrals, but it is not very likely that I'll work in this direction. I would need collaboration with a strong analyst. I would be very happy if I could find a mathematical formulation of M-theory, but I don't have any good idea for what the way to go is.

I don't like to work in overcrowded fields. A couple of times I was happy to find a new direction of study, but I left it when it became overcrowded. Therefore I will work on a popular problem only if I am able to find an absolutely new approach to it. Using the terminology of economists, I can say that you should have comparative advantage to succeed.

C. His Shaping Influences

Andrew: Who were some of your early mentors? Can you describe the influence they had at the beginning of your career?

Albert: My advisor, Efremovich, was truly a remarkable man, in many relations. For one, he was a very original mathematician, who liked to invent new problems, new directions of study. He was a Geometer. He also was a person who made friends with many people, particularly his students. All of his students became his friends. He died 15 years ago, but still I am in constant contact with his daughter.

From Boltyansky, I learned how to write papers. He edited one of my papers in my presence, explaining to me what was wrong with what I had written, and what was right. After that I was able to avoid the mistakes he had shown me.

Andrew: Can you remember what you were doing wrong at the time?

Albert: There are some typical mistakes. The most typical is that the writer thinks that the reader knows everything the author knows. But I don't know if I made that mistake. By the way, the typical mistake of beginning lecturers is of the same kind: they think that students know everything that was discussed in the lectures earlier.

D. Words of Wisdom

Andrew: What is, in your opinion, the single most important piece of advice for aspiring young mathematicians and physicists?

Albert: To mathematicians and physicists, I have several pieces of advice. The first advice is to please have in mind that you will always make some mistakes. You will think you've solved the problem, and the next day you discover that the solution is far away. In my experience, one in five attempts is a success. Not more. Nevertheless, the advice is that errors should not disturb you. Everyone makes mistakes. You should enjoy the excitement that you have when you think you discover something extraordinary. Even if it is possible that you have the wrong excitement and the next day you can discover that your idea is wrong.

Andrew: Oh, so you say you should enjoy what you find while you find it, even though tomorrow, it may be swept away. I always feel very guilty about that.

Albert: Because if you do not enjoy this, you will never enjoy real discovery. When everything is checked, then there's no excitement.

Andrew: By the time you've checked it, there's no excitement in the discovery. So you may as well risk enjoying it before it gets cut down the next day. Very interesting.

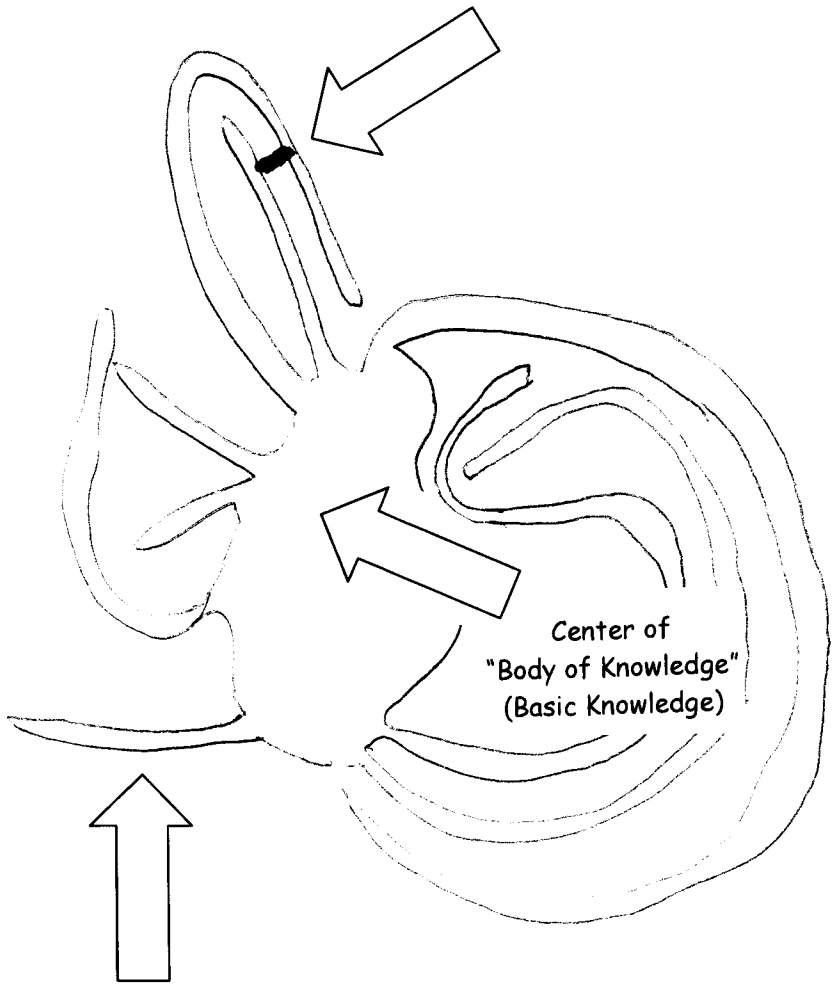
Albert: First advice is to enjoy your work.

The second advice is to remember that you will have boring moments. You will make boring calculations, and so on. You should keep in mind that this is unavoidable.

Andrew: Mathematics and physics have grown both together and apart. As a mediator between the two, do you have any advice for young students trying to decide on a career in either of these fields?

Albert: Some advice from me is as follows: If you would like to work in something between math and physics, you are really in danger: mathematicians will not consider you a mathematician and physicists will not consider you a physicist. But there is another possibility: that both of them will consider you as one of their own. That's what I'd like to aim for. There's a Russian expression that I always apply to myself. It's translated that as "a nice calf uses milk from two cows." I've always considered myself such a calf.

Schwarz's place in the Body
(Connecting Branches)



"Tentacles" of
Body of Knowledge
(Advanced Knowledge)