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# Some Memories of Pierre van Baal

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# Pierre at the KIAS Workshop on Quantum Field Theory



# Pierre at his Best

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Pierre was the ultimate expert on the mathematics and physics of Yang-Mills theories. He knew everything about classical solutions of the field equations which I would like to know. He understood all learned papers that ever have been written on this subject. He did not accept any nonsense by anyone, and it would have been great if he had been here today in the shape before his first stroke. It is hard to find anyone who has the breadth and depth of understanding of Yang-Mills theory that Pierre had. Pierre was also a good listener. He remembered every talk he attended, probably because it was only a small addition to what he already knew.

Above all, Pierre was a friend.

# Education

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- 1955 Pierre was born in Utrecht and also grew up there in a family with two more brothers.
- 1975 Start of study in Physics and Mathematics
- 1977 Bachelor degree in physics (cum laude)
- 1978 Bachelor degree in mathematics (cum laude)
- 1980 Master degree in physics (cum laude)
- 1984 PhD degree in physics (cum laude)

Pierre was interested in physics, astronomy and math from an early age on. For example built a telescope while in high school. He was a serious student who did not party as you can see from the “cum laude” which is the highest honor in the Netherlands which is only rarely given. One thing you may notice is that he started university late (18 is the normal age). The reason is that had to repeat a class in elementary school. This is a traumatic event and also had a strong impact on Pierre as well (and never should be done).

# Studying Physics at Utrecht

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- ▶ Pierre did the same courses as I did with mostly the same instructors (I also had an undergraduate degree in physics and math).
- ▶ From a US perspective the physics courses were not good, usually rather minimal. For example instead of Jackson we had lectures of about 60 pages. However, this allowed us to focus on the foundations rather than on technicalities. Math courses were more thorough.
- ▶ Favorite courses were real analysis taught by Professor Happy (translated into English) as well as group theory and quantum field theory taught by Tiny Veltman. At the start of each lecture, Tiny rehearsed everything what he had done in all previous classes, and in fact we never did a one-loop diagram. Pierre's book on Quantum Field theory still has the imprint of Tiny's course.

# Studying Physics at Utrecht

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- ▶ Already when we were Master students, we all new that the most important thing is to be independent, and see your advisor no more than once every couple of months. As a Master student or PhD student you did not expect any scientific input from the advisor. This tradition was continued by Pierre in his role as advisor, and all his students have authored several papers without Pierre as co-author.
- ▶ Pierre did his experimental work in low energy nuclear physics. During the seminar on this work, he was mangled by one of the (frustrated) experimentalists, but Pierre handled it very well. In Utrecht, you were not considered a real theorist if you work *for* experimentalists and even as a student you did not do that, but rather one should work on problems you formulated yourself completely independent of the need of experimentalists. Pierre wrote a poem on this episode which he recited in his inaugural speech as Professor in Leiden.

# Poem on Theory versus Experiment

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Theory without confrontation with Experiment has no right to exist,  
Experiment without feedback to theory must not be,  
Hand in hand do they reveal the secrets of nature,  
All you Physicists keep this in mind,  
Then only Beauty you will find.

Pierre van Baal, 1979

# PhD Thesis

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“Twisted Boundary Conditions: A Non-Perturbative Proof for Pure Non-Abelian Gauge Theories.”

- ▶ Pierre was the second student of Gerard 't Hooft. His first student did not get his PhD because he missed the inner drive to understand something at a deep level.
- ▶ In addition to topics covered by the title, the thesis has chapters on Eguchi Kawai reduction and instantons in Large  $N_c$  QCD.
- ▶ The main thesis topic was to study QCD in a small volume where the gauge fields can be taken constant as a first approximation. The work of Lüscher that came out in 1983 has had a great deal of impact on these chapters.

Pierre's goal was to obtain analytical insights into QCD. In his inaugural address he concludes, "A well-reasoned approximate calculation provides (or rather requires) more insight than running a computer



# Pierre as a Postdoc

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1984-1987: Postdoc at Stony Brook

1987-1989: Postdoc at CERN

Pierre accepted the offer from Stony Brook because of CN Yang and Peter van Nieuwenhuizen, who after 't Hooft, Veltman and Lüscher were two more influential role models. His time at Stony Brook was very productive, and with his collaborators he has been extending the finite volume approximation to larger volumes. At CERN he continued this line of research but also wrote an important paper on topological gauge theories and one on the Nahm transformation.

He always considered his time at Stony Brook and at CERN as formational for his research career. I overlapped with him for one day at Stony Brook, where he rented a cottage in Port Jefferson on top of the hill. He used to bicycle to Stony Brook (about 12 km), but he also had an old car with a speedometer that did not work which he used to go to the City and to shop for groceries.

# Pierre at Stony Brook

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Pierre was a man of standards, and as postdoc he also had to teach an undergraduate class for which he failed 80 percent of the students. Even after intervention of the Chair of the department, Pierre did not yield, but he never had to teach the class again.

One thing Pierre really enjoyed as well as were the Long Island beaches and he always wanted to return every time he visited.

# Pierre in the Long Island Dunes



# Walk on the Beach



# Pierre making a Fool of Myself





# Time at CERN

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When Pierre was at CERN he mainly socialized with the Dutch community. Apart from myself (we overlapped for one year), there were Bert Schellekens, Jochen van der Bij and Eric Bergshoef, which was an usually large number to have as Dutch theory postdocs. We usually had lunch together as well as many social dinners. What Pierre really enjoyed there was skiing with the CERN theory group which we did every Sunday during the Winter, and which always concluded with a joint dinner in Saint Genis-Pouilly. Good restaurants around Geneva is another thing Pierre really appreciated.

One event he often recounted was the theory Christmas party where the postdocs ridicule the senior physicists in the theory group. One sour point, in particular for Dutch, was that all manuscripts had to be reviewed by senior staff before submission to a journal. This practice was exposed during the party and was abolished shortly thereafter.

Pierre after drove back and fourth to the Netherlands and crashed his twice, and he always was proud that both times he was not injured

# Time at Utrecht

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After CERN, Pierre got a 5 year position at Utrecht University in 1989 with a vague promise that it would become permanent, but he left in 1992 when he accepted a Full Professor position at Leiden. His time at Utrecht was the worst on both worlds. On the one hand, he had a full teaching load, but the other hand he was not appreciated by his senior colleagues who treated him as a postdoc. I think that this time was the low point of Pierre's career.

# Pierre Having Breakfast with us (early 1990)





# Leiden 1992-2005

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In Leiden Pierre built up a group with students and postdocs. He enjoyed being a professor including administrative responsibilities and teaching. Pierre has had 6 students and 5 postdocs and at Leiden he started testing his ideas means of by real lattice simulations. He also continued his analytical work on topology in QCD. One thing he really liked was to be the organizer of the Ehrenfest colloquium, perhaps more because of the social aspects than because of scientific reasons. For Pierre social contacts and physics were coupled as Theory and Experiment. He enjoyed interacting with top physicists from all fields both scientifically and socially, but sometimes Leiden was too narrow-minded for and people forced him into his own corner.

Pierre was often invited to Conferences and workshops and the enjoyed every aspect of it. Interacting with like-minded physicists really excited him and as bonus he met his friends. For him each conference was like a vacation.

# Pierre after Breakfast in early 2000



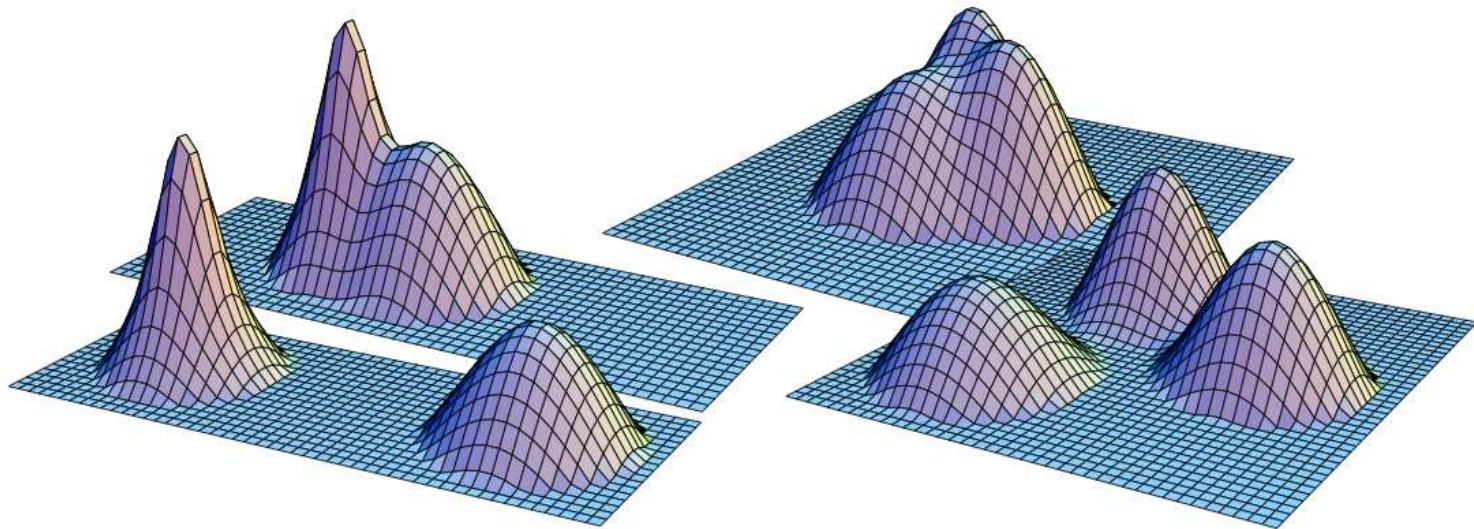
# Discovery of the Kraan van Baal Instanton Solution

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Probably his most important work during his time at Leiden was the discovery of the monopole constituents, which he originally found by just drawing pictures of instanton solutions with a nontrivial holonomy with Mathematica. He told me his excitement about this project during his visit at the INT in Seattle during the finite density workshop we were organizing. At that time (in 2000) it was not clear that this work would have a great deal of impact. However, Pierre was already dreaming of creating a monopole liquid in analogy to the instanton liquid, and Edward has been pursuing this idea recently.

# Kraan van Baal Instanton Solution

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# Students and Postdocs

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- ▶ Students: Bas van de Heuvel, Jeroen Snippe, Thomas Kraan, Arjan Keurentjes, Daniel Nógrádi and Mark de Kok (co-advised by Falk Bruckmann and Jan Willem van Holten).
- ▶ Postdocs: Margerita García Pérez Tamas Kovacs, Falck Bruckmann, David Adams, Chris Ford.

Pierre always encouraged his students to write papers independently without him as co-author, and on his webpage he has a list of these papers, typically 4 papers per student.

# Pierre and the Sign Problem

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Pierre has been interested in the sign problem since 1998 when he hosted Frank Wilczek and Kramers Professor for his sabbatical. In that year, Pierre took Frank Wilczek and myself along in his car from Leiden to Bielefeld to attend the first important conference on QCD at nonzero chemical potential. Pierre also spend a two weeks at the finite density program at the INT which we were organizing in 2000, and the journal club in Leiden, he gave a talk on the tri-critical point.



# Pierre as a Person

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Pierre loved to travel. Apart from his family, all his social contacts went through physics, and at conferences he met his friends. When he went to the US he usually visited both Maarten Golterman in St. Louis and later on the West Coast and us on Long Island. He always had stories about physics and physicists and enjoyed the company of Yola (Maarten's wife) and my wife. Pierre was a good guest and enjoyed being taken care of. He was equally hospitable himself and once lend his apartment to us when he was away for a conference. He had a beautiful penthouse apartment, with a view on the polders in between Leiden and the Hague. The only problem with Pierre's apartment was that it was absolutely impeccable, and we felt obliged to clean the shower after taking one. During the program on Nonperturbative Aspects of QCD which he organized, he had us as guests for two weeks in the house he was renting. This was a fun time together with Pierre. Pierre was very much down to earth and one of his favorite saying was, "Even if you act normally you look like a fool".

# Pierre's Penthouse





# Stroke in 2005

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As most of you know, Pierre got a stroke after the lattice conference in 2005. He was found unconscious in his apartment after he missed an appointment on Monday. He recovered from most physical symptoms, but he lost part of himself, and was no longer able to process new information, let alone do research.

He accepted this, but he hoped that somehow he would recover. It must have been a difficult time for him very much wanting to reach a goal that is not within reach. However, he never showed that he was suffering.

# Visits to Stony Brook

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Pierre made frequent visits to Stony Brook both before and after his stroke. During his good years he always gave a seminar, and the last one, in 2005, was on composite instantons. He usually stayed with us, but Peter and Marie van Nieuwenhuizen and Jack Smith were good friends as well.

Most of this visits to Stony Brook were related too conferences elsewhere in the United States, but Pierre specially came to Stony Brook for two events related to Frank Yang. The first one to celebrate Yang's 80'th birthday, where he gave a talk, and the second event was a fund raising Gala of Stony Brook University to celebrate Yang where he participated in a \$ 600 per plate dinner.

# Pierre going to Yang's Gala



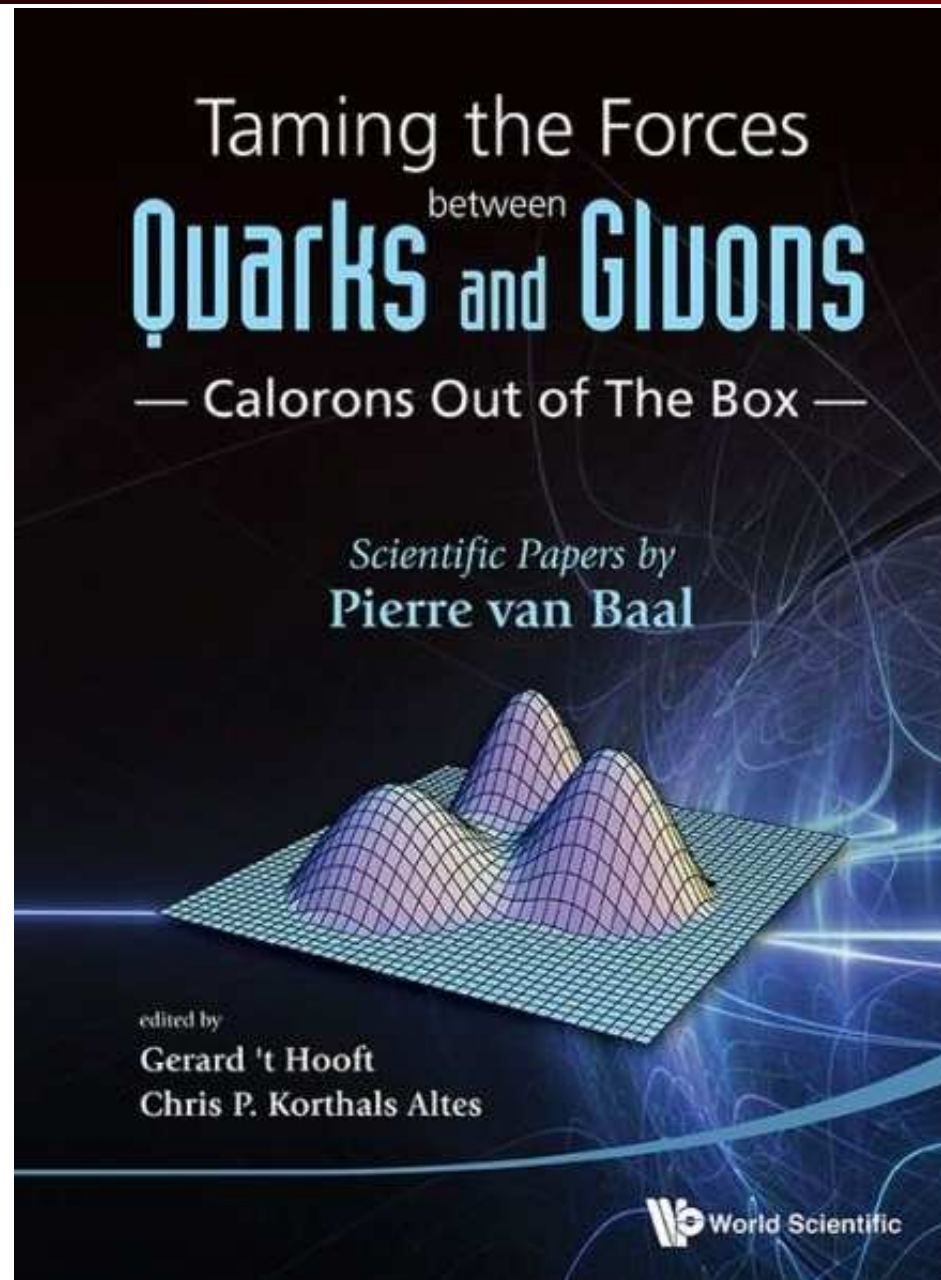
# The Pierre Fest

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At the suggestion of Mitja Diakonov, Gerard 't Hooft and Chris Korthals Altes took the initiative to collect the work of Pierre in a book which he agreed to.

The book was dedicated at the Pierre fest in June of last year, but unfortunately it was only announced two weeks before it took place so that many of his friends could not attend. There were talks by some of his collaborators, including Falck. According to Gerard 't Hooft, Pierre really appreciated this gesture.

# The Collected Works of Pierre





# The Collected Works of Pierre



# Lunch





# Offering the Book





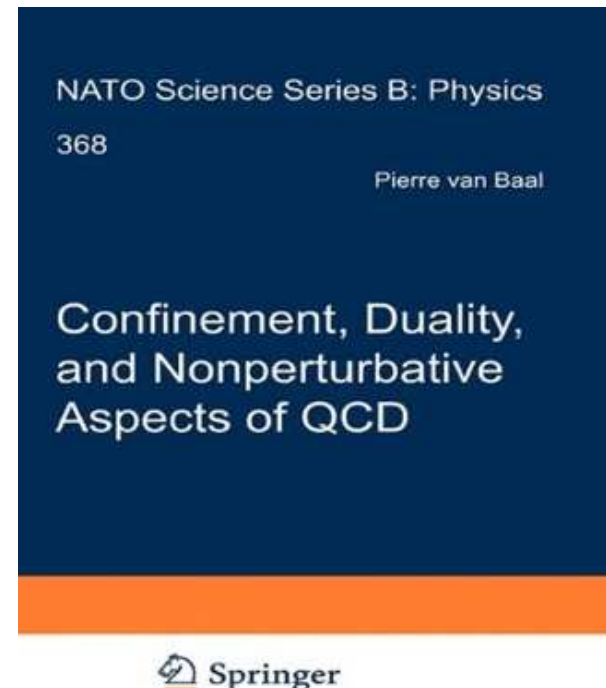
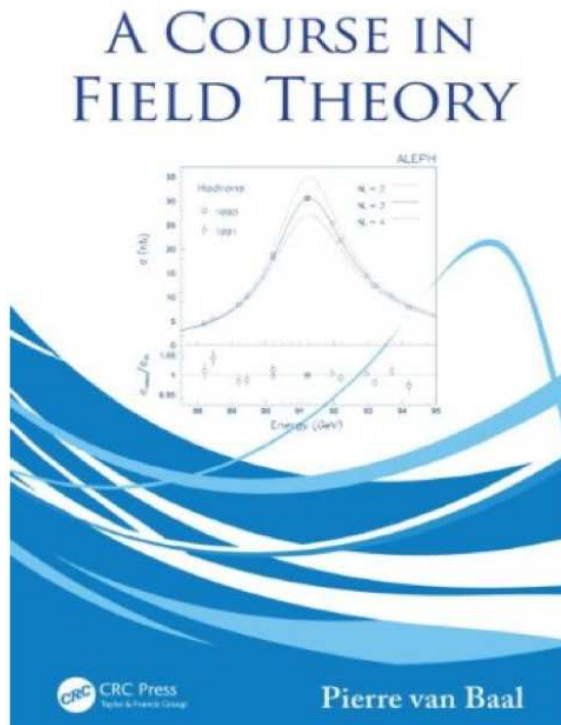
# Pierre's Collaborators

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# Other Books

Apart from his Collected Works, last year also his lecture notes on Quantum Field Theory were published as a book. He was also editor of a Summer School Lectures at Cambridge which were attended among others by Gert.



# Outreach

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Throughout his career, Pierre has been very active in outreach. He has given many lectures for high school students, but his main effort was the coordination of the HISPARC (High-School Project for Astroparticle Research with Cosmics) project, where high school students detect cosmic ray with Cerenkov counters on the roof of their high school.

His interest in astronomy is witness by the solar eclipse photo he took in 1999 in Landau.

# Solar Eclipse in 1999 at Landau

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# The Pierre van Baal Postdoctoral Achievement Award

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Initiated by Pierre in 2011, we at Stony Brook established a Postdoctoral Achievement Award. Starting this year it will be named the “Pierre van Baal Postdoctoral Achievement Award” where we recognize a postdoc whose research made a genuine break through during the time at Stony Brook. Mario Kieburg was co-recipient of this award in 2013. The citation was formulated by Pierre:

“This prize is to be awarded to a postdoc in theoretical physics for ground breaking work initiated at Stony Brook. The award shall be given while the postdoc is still at Stony Brook and will rotate on average between postdocs from the YITP, the Simons Center and Nuclear Theory. The amount of the prize is one thousand US Dollars and will be awarded annually. If there is no qualified candidate the prize will not awarded.”

Donations are welcome.

# Pierre's Last Days

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Pierre had Christmas dinner with his family on December 25 and called them when he arrived home. He did not take up the phone or responded to email when Edwin Laermann tried to contact him on December 27 to invite him for a walk on the beach together with his wife. His relatives tried to contact him after Christmas, but did not consider it too unusual that he respond until Sunday December 29. On December 30 he found in his bed, but the cause of death has not been investigated (which is typical in the Netherlands).

Pierre was cremated after a ceremony on January 7, which was attended by many friends and relatives. There were talks, by his two brothers, his mother, Gerard 't Hooft, Hans van Leeuwen (director of the Institute) and Karel Gaemers read a letter from Tiny Veltman who was at Stony Brook for a conference the celebrate Peter van Nieuwenhuizen for 40 years of supergravity.



# Pierre at Edward's 60th Birthday Party



# Dinner in the Old Field Club





# Pierre at Party in Edward's House



# Pierre in Front of our House



# Dinner with Andrei Smilga and Jean-Paul Blaizot



# Dinner in a French Restaurant with Edward





# Lunch at Lake Tahoe





# Pierre's Last Official Duty



# Pierre at the Beach in 2008

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# Pierre on the Look Out





# Leaving the Beeach in 2003

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# Leaving the Beach for the Last Time

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# That was It

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