

PARIS  
**MATCH**

FRENCH ACADEMY OF  
SCIENCES' MEMBER

**CATHERINE BRÉCHIGNAC**

BRINGS TOGETHER  
A PANEL OF EXPERTS

**THE SECRETS OF SCIENCE**

File no. 1

# THE MYSTERIES OF BLOOD

Everything you need  
to know about this  
vital treasure

# WHAT WE KNOW WHAT IS UNKNOWN

■ Blood is life. And even more. Our life and that of others. It is a component of the human body's mechanics - a well-oiled machine - that operates within us without our being aware of it, and has the capacity to save, if necessary, all those whose fate is at stake in a matter of seconds. The aim of «The Secrets of Science», this Paris Match insert, is to give everyone the best, clearest and most useful access to scientific knowledge. From the origins of discoveries to the latest research results, and featuring portraits of researchers and visionaries who are among the most renowned in

their field. This focus on blood provides explanations for what we think we know, and answers for what we don't. Produced in close collaboration with Catherine Bréchignac, member of the French Academy of Sciences, former President of the CNRS, world-renowned nanoscience expert and author of several acclaimed books, in partnership with the Groupe interacadémique pour le développement (GID) and the French Academy of Sciences, this document is a voyage into the very heart of mankind. ■  
**Philippe Legrand**



**“EVERYONE  
TOGETHER”**  
**CATHERINE BRÉCHIGNAC**  
FROM THE FRENCH  
ACADEMY OF SCIENCE

■ It was at the end of the day of reflection on blood donations held at the beginning of the year in Marseille at the Institut Paoli-Calmettes, which brings together her treatment, teaching and research in the fight against cancer, that the actors collectively answered questions from Paris Match to share their insights into the enigma of blood with its readers. They include three haematology professors and doctors: **Dominique Maraninchi**, former director of the Agence nationale de sécurité du médicament et des produits de santé (ANSM); **Jacques Chiaroni**, director of the Établissement français du sang (EFS) Provence-Alpes-Côte d'Azur-Corse; **Norbert Vey**, director of the Paoli-Calmettes and anthropologist **Yannick Jaffré**, Emeritus Director of Research at the CNRS who spent twenty years in Africa working to improve the health of mothers and children. ■



## 1. WHAT IS BLOOD?

« AN ENIGMA... »

■ In ancient Greece, it was a drinkable elixir. It was only in 1628 that blood circulation was discovered. Today, we know that blood is made up of two intimately mixed components. One, called plasma, is liquid and contains molecules; the other is cellular and is made up of red blood cells, which carry oxygen, white blood cells, which defend the body against external attacks, and platelets, which play a fundamental role in coagulation. By circulating continuously throughout the body, this fluid not only brings oxygen and nutrients to the tissues, but enables them to interact with each other, to the extent that a hormone released by one passes through the bloodstream to have an effect on another. ■



## The blood scientists who contributed to this insert



**Dominique Maraninchi**

A professor of oncology at the University of Aix-Marseille, he was director of the Institut Paoli-Calmettes for fifteen years, where he began performing bone marrow transplants. He then chaired the Institut national du cancer de santé and was director of the ANSM.



**Jacques Chiaroni**

Hospital practitioner, professor of hematology, doctor in medicine and genetic anthropology, he is the Director of the EFS Provence-Alpes-Côte d'Azur-Corse. In addition to transfusion medicine, his field of expertise is the study of blood groups in human populations, with a transfusion, medical (blood groups and pathological susceptibility) and anthropological approach.



**Yannick Jaffré**

Anthropologist, emeritus director of research at the CNRS and programme director of GID-Santé. For thirty years, he has worked in West Africa to analyse and teach the socio-cultural dimensions of health and to build qualitative public health. He is the author of several books, including «Enfants et soins en pédiatrie en Afrique de l'Ouest» (published by Karthala, 2019).



**Norbert Vey**  
Professor of hema-

tology at the University of Aix-Marseille, director of clinical research at the Institut Paoli-Calmettes, he specialises in the treatment of leukaemia. He was appointed Managing Director of the Institut Paoli-Calmettes in 2022.



## 2. WHAT DOES IT SAY ABOUT US?

### “IT DECIPHERS OUR HISTORY...”

■ Beliefs about this vital liquid reveal a great deal. «They speak of our imagined parentage – evoking the «right of blood» – the place of women’s bodies, our relationship with our deities...

Blood means blood groups. Genetically coded, they are passed down from generation to generation. Everyone is familiar with groups A, B, O and the Rh factor, but they are further divided into sub-groups. Today, 390 subgroups have been identified, some of which are very rare and characteristic of populations that have lived in isolation. We are therefore witnessing a real geography of blood groups. Blood also tells us about our health. As the biological element that irrigates our body, it collects a great deal of information. And we are always anxiously awaiting the results of its analysis. ■

## 4. THE BLOOD THAT SAVES

### DONATING BLOOD

#### “FREE, ANONYMOUS, LIFE-SAVING...”

■ Transplants, cancers and blood diseases are treated with blood donated by healthy, compassionate people. This requires an enormous amount of energy and skill, from laboratory technicians to scientists.

The contaminated blood episode led to a complete transformation of the French blood transfusion system, making it one of the safest in the world. There are two constant concerns: the safety of the donor and the safety of the recipient. The safety of both is ensured by rigorous technical procedures and a range of extremely demanding microbiological checks, from the time of donation right until it reaches the patient’s bed. The aim of all these precautions is to detect blood-borne pathogens and give the «right blood» to the «right patient». From an ethical point of view, donation in France is voluntary, free and anonymous, highlighting the fact that the human being cannot be a commodity. ■

## 3. SEPARATING FACT FROM FICTION

### PRECONCEIVED IDEAS AND SCIENTIFIC TRUTHS

#### “FROM THE FEAR OF BLOOD TO THE SEPARATION PROCESS...”

■ Blood is not created in our bodies only once but is continually regenerated. The production of the various blood cells, known scientifically as haematopoiesis, takes place in the bone marrow.

Giving blood doesn’t hurt, but we don’t transfuse a donors’ blood directly into the recipient. A separation process puts the red blood cells in one bag, the plasma in another and the platelets in a third. These three products can be given to three different patients according to their needs, saving three lives in the process! You can also donate only plasma, which will be used to make blood-derived medicines. The blood cells are then returned to the donor. ■

## 5. WHAT ABOUT TOMORROW?

#### “BACK TO THE FUTURE...”

■ Thanks to scientific research into genome analysis, therapeutic strategies now include gene-targeting treatments that need to be accompanied by supporting treatments such as blood transfusions. This requires different branches of biology to work together with the engineering professions that are essential for mathematically analysing complex data. Recent work on bone marrow transplants, which are carried out in a similar way to blood transfusions, has shown that patients’ recovery depends largely on the reaction of the donor’s immune cells, which track down and kill the recipient’s residual leukaemia cells. The next step is to stimulate the patient’s own immune system. Progress is being made in research to produce blood in vitro. However, it cannot be entirely artificial. Red blood cells, platelets, etc. are obtained from stem cells cultivated in vitro. Donated human blood will remain essential. We must bear in mind that we do not yet have a factory to replace human generosity! ■

## DONORS VIEWED BY PHOTOGRAPHER CLÉMENT CHAPILLON



## COMMITMENT IS IN THEIR BLOOD

Every day, people give blood. Every day, people receive blood to save their lives. It's vital that we keep giving blood, and it's worth paying tribute to the men and women who make this commitment anonymously and a part of their civic duty. This series of portraits of donors of all ages is part of that commitment. Photographer Clément Chapillon has put a face to these everyday heroes. The extract, on the left, from his photo gallery reveals the happiness that can be seen in their eyes. **== P.L.**



**Giving in the name of life**  
She writes to her saviour  
Scan to listen  
Set to music by Erwan Jaffré

## BOOKS

### EXAMINING THE EARTH'S BLOOD

In her new book, Catherine Bréchnignac tells the story of a fourteen-generation ancestral line in the heart of Finistère, in a lively, scientific and literary style, with a touch of history. What are our origins? Where do we come from? What part do our ancestors play in what we become and what we do with our lives? The blood of history flows through our land, into our behaviour and into our future. A book that takes you on a journey through time. **== P.L.**

« La force de nos racines.  
Une épopée de gens ordinaires »,  
by Catherine Bréchnignac, ed. du Cerf, 2024.



### THE ART OF HEALTH IN IMAGES

How do you talk about blood and the need to donate without making people anxious? Renowned scientist Yannick Jaffré and talented photographer Clément Chapillon have found the answer by sharing their vision in a collaborative work poetically entitled «Trois gouttes de sang comme une fleur» («Three drops of blood like a flower»). The words and photos form a comprehensive whole that pays tribute to both the nursing staff and the donors. Over the pages, a community - closer to a family - is revealed. **== P.L.**

« Trois gouttes de sang comme une fleur »,  
by Yannick Jaffré, photos by Clément Chapillon,  
ed. Le bec en l'air, coming this September.



## GID ITS MISSIONS

The Groupe interacadémique pour le développement (GID) is a catalyst for knowledge at the service of development. Created in 2007 by ten academies from southern Europe and Africa, this group of members has the capacity to rapidly call on the most relevant skills and to encourage the exchange of studies, reflections, analyses and knowledge necessary for the progress of humanity. Involved on all fronts of knowledge, from the protection of natural and cultural heritage, food and health to debates on the future, GID is a precious institution that builds relationships by enabling everyone to work together. Find out more at **g-i-d.org/fr**.



Scan for  
more information



Under the direction of Jérôme Béglé, Caroline Mangez, Stéphane Albouy, chief editor Philippe Legrand with scientific advice from Catherine Bréchnignac, artistic direction Thierry Carpentier with Elena Liot. Contributors: Emmanuel Caron, Clotilde Chaffin, Cécile Espérou-Kenig, Anne-Charlotte Hourigat, Tania Lucio, Hala El Solh. Photo credits. Cover: Getty Images. P.2 à 4: Clément Chapillon, DR. Printed in France by Rotocolor.