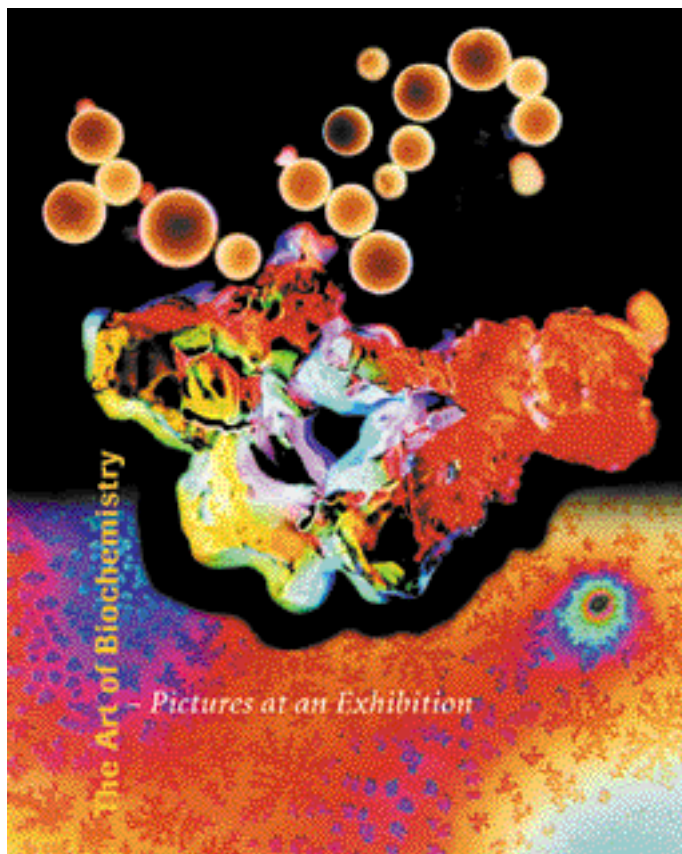


# The Art of Biochemistry

*Where science meets art*

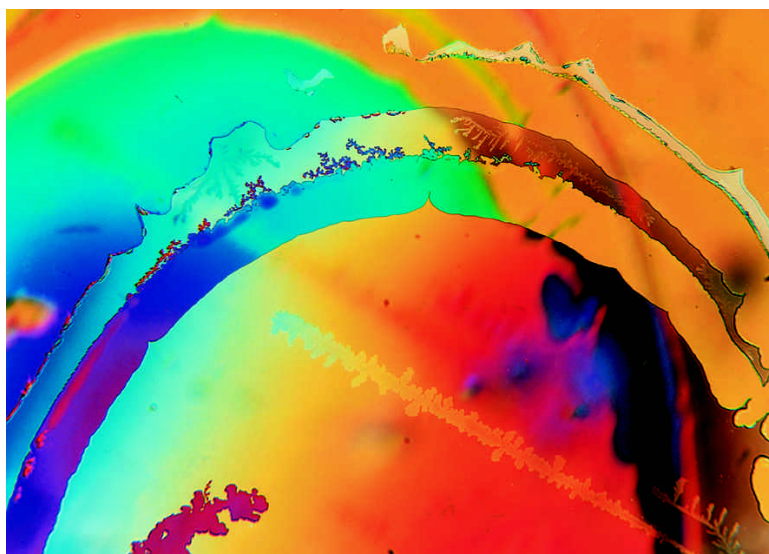


At first glance, science and art seem to be very different disciplines. Science is founded on reason and uses reason as its tool to explain the world. Art is an emotional matter. Art offers no answers, but merely leads to more questions, and is based only on the subjective feelings of an individual.

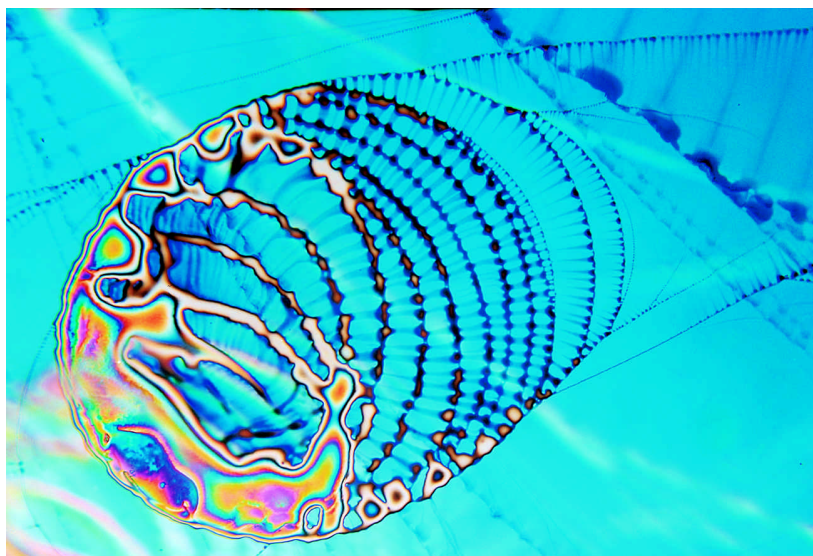
A more detailed analysis reveals many similarities. The most important one certainly is infinity, which is the driving force behind both disciplines. Man will never be satisfied by his scientific knowledge, he will never stop asking questions, and will continue to do research. On the other hand – and in very similar vein – he will never tire of seeking out new ways to express what he feels, and to illustrate his view of the world in the form of paintings and music. In either case, a final target cannot be reached because there is no final target. Every personal success story will only represent a small step forward for the whole human species.

Sometimes science and art are not only similar, but the same. The German photographer and scientist, Manfred Kage, is working on an approach that merges art and science, demonstrating the aesthetic aspects of scientific studies. Science Art – this is what he calls his approach – shows us things in a way that had never been seen before. Kage illustrates the – under normal conditions – invisible, and his pictures lead us into worlds that are quite near, yet, in a certain manner, are also far away. One of these worlds is the microcosmos.

Some months ago, Roche Molecular Biochemicals asked Kage to photograph a series of their products used in industrial applications. The pictures, originally intended for use in advertising material, looked so fascinating that the decision was made to present them to a broader public. The idea of “*The Art of Biochemistry*” was born, an exhibition featuring products of Roche Molecular Biochemicals in a way that had never been seen before.



**Figure 1: UDP- $\alpha$ -D-Galactose**



**Figure 2: Catalase**

The pictures on this page represent only a small part of Kage's output, but maybe they can convey an impression of what "Science Art" could mean.

**Figure 1** shows an activated galactose, UDP-Gal. Sugar nucleotides, also known as activated sugars, are the key substrates for the glycosyl transferases in building up oligo- and polysaccharides. UDP-Gal is utilized by several galactosyl transferases to form either  $\alpha$ 1,2-,  $\alpha$ 1,3-, or  $\beta$ 1,4-linkages. Until this time, the industrial-scale synthesis of oligosaccharides has been hampered by the unavailability of large amounts of sugar nucleotides such as UDP-Gal at reasonable cost. This hurdle has been overcome by Roche Molecular Biochemicals' yeast-based process for producing several kilograms in one batch. With a purity of more than 97% by HPLC, the activated galactose is used, in combination with the appropriate enzymes, to build up either Sialyl Lewis x or human milk-structured oligosaccharides containing galactose as one component.

Catalase (**Figure 2**) is an enzyme used in industrial applications whenever hydrogen peroxide ( $H_2O_2$ ) needs to be removed. The enzyme is capable of converting peroxide into water and oxygen, two harmless substances. This specific property has been used for many years in contact lens cleaning systems, which include peroxide to eliminate contaminating microorganisms. The eye-irritant peroxide is "neutralized" to water and oxygen by the action of catalase. The enzyme is also used in the food industry, where peroxide serves as a preservative in the processing of (e.g., gelatine). Other

applications of catalase include the removal of peroxide after bleaching of textiles in the so-called "bleach cleanup."

**(Figure 3)** dCTP is a component of nucleic acid amplification reactions used in diagnostics and forensics. The >99% pure PCR-Grade dNTPs of Roche Molecular Biochemicals, only consists of dNTP,  $Na^+$ , and highly purified water, pH 8.3. Compared to formerly used lithium preparations, dNTPs- $Na$  are extremely stable and exhibit high PCR and RT-PCR confidence; no reaction interference from stabilizers, and no pH stress of the dNTPs, since most PCR standard procedures are performed between pH 8.0 and 9.0.



**Figure 3: dCTP-Na**