



## Rafael Vicuña



**Date of Birth** 12 September 1949

**Place** Santiago (Chile)

**Nomination** 11 October 2000

**Field** Biochemistry

**Title** Professor

### Most important awards, prizes and academies

**Honours:** Fulbright Foundation, travel fellowship (1974, 1978); Albert Einstein College of Medicine, NY, fellowship for Ph.D. studies (1974-78); International Union of Biochemistry, travel fellowship (1979); John Simon Guggenheim Memorial Foundation fellowship (1986); officially invited by the Chinese Government (mainland) to visit academic institutions (1989) and by the DFG to visit academic institutions in Germany (1998). **Academies:** Chilean Society of Biology (1973); Chilean Society of Biochemistry and Molecular Biology (1973, President 1997-99); American Society for Microbiology (1974); Association for Politics and the Life Sciences, USA (1987); Technical Association of the Pulp and Paper Industry, TAPPI, USA (1988-2000); Third World Academy of Sciences (1993); Chilean Society of Microbiology (1996); International Academy of Wood Science (1996); Latin American Academy of Sciences (1999); Chilean Academy of Sciences (1999, Vice-President 2001-03); Pontifical Academy of Sciences (2000).

### Summary of scientific research

Major accomplishments in the field of biochemistry of nucleic acids: the identification and characterization of two protein factors that selectively inhibit viral DNA from fX174 phage from using the replication machinery of other single stranded DNA phages; the isolation and thorough characterization of plasmids and the restriction-modification system of the extremely thermophilic bacterium *Thermus thermophilus*; the purification and characterization of DNA polymerase from *T. thermophilus*, an enzyme that is widely used today in PCR experiments. On the other hand, some achievements in the field of microbial degradation of lignin are: the isolation, identification and characterization of natural bacterial strains able to metabolize lignin model compounds; the elucidation of metabolic pathways involving novel catabolic intermediates; the discovery of the new enzyme benzaldehyde lyase, a proposition for its reaction mechanism and cloning and sequencing of the corresponding gene; finding that the ligninolytic system of the basidiomycete *Ceriporiopsis subvermispota* is composed of a manganese-dependent peroxidase and the copper containing phenol oxidase called laccase. Discovery of a new family of multicopper oxidases in the fungus *Phanerochaete chrysosporium*. Discovery of a transcription factor responding to copper in the same fungus. Proposition of a novel mechanism for the production of the extracellular hydrogen peroxide required as a substrate by MnP in cultures of *C. subvermispota*. Co-director of the genome project of the same fungus. Current work deals with microbial life in extremely arid environments.

### Main publications

R. Vicuña, J. Hurwitz, S. Wallace, M. Girard. Selective inhibition of in vitro DNA synthesis dependent on fX174 compared with fd DNA. I. Protein requirements for selective inhibition. *J. Biol. Chem.* 252, 2524-33, 1977; A. Venegas, M. Motles, C. Vásquez, R. Vicuña. Conditions affecting DNA cleavage by TthI at a TthI endonuclease-dam methylase overlapping sequence. *FEBS Lett.* 130, 272-4, 1981; C. Rüttimann, M. Cotorás, J. Zaldívar, R. Vicuña. DNA polymerases from the extremely thermophilic bacterium *Thermus thermophilus* HB-8. *Eur. J. Biochem.* 149, 41-6, 1985; B. González, R. Vicuña. Benzaldehyde lyase from *Pseudomonas fluorescens* biovar I: a novel thiamine pyrophosphate-requiring enzyme. *J. Bacteriol.* 171, 2401-5, 1989; U. Urzúa, P. Kersten, R. Vicuña. Kinetics of Mn<sup>3+</sup>-oxalate in reactions catalyzed by manganese peroxidase of

*Ceriporiopsis subvermispota*. *Arch. Biochem. Biophys.* 360, 215-22, 1998; L. Larrondo, S. Lobos, P. Stewart, D. Cullen, R. Vicuña. Isoenzyme multiplicity and characterization of recombinant manganese peroxidases (rMnPs) from *Ceriporiopsis subvermispota* and *Phanerochaete chrysosporium*. *Appl. Environ. Microbiol.* 67, 2070-5, 2001; A. Manubens, M. Avila, P. Canessa, R. Vicuña. Differential regulation of genes encoding manganese peroxidase (MnP) in the basidiomycete *Ceriporiopsis subvermispota*. *Current Genetics* 43, 433-8, 2003; L. Larrondo, B. González, D. Cullen R. Vicuña. Characterization of a multicopper oxidase gene cluster in *Phanerochaete chrysosporium* and evidence of altered splicing of the *mco* transcripts. *Microbiology* 150, 2775-83, 2004; P. Canessa, J.M. Álvarez, R. Polanco, P. Bull, R. Vicuña. The copper-dependent ACE1 transcription factor activates the transcription of the *mco1* gene from the basidiomycete *Phanerochaete chrysosporium*. *Microbiology* 154, 491-9, 2008; A. Azúa-Bustos, C. González-Silva, R. Mancilla, L. Salas, B. Gómez-Silva, C.P. McKay, R. Vicuña. Hypolithic cyanobacteria supported only by fog in the Coastal Range of the Atacama Desert. *Microbial Ecol.* 61, 568-81, 2011.