Curriculum Vitae

Name and title:	Krug, Harald F. Prof. Dr.
Date and place of birth:	30.09.1952, Edermünde-Besse, Germany
Affiliation:	Empa – Federal Institute for Materials Testung and Research
Current Position:	**Head of Department "Materials meet Life" and Member of the Directorate of Empa**
Address	Empa Lerchenfeldstr. 5 St. Gallen ZIP CH-9014 Switzerland Phone: +41 (0) 71-274-7248 Fax: +41 (0) 71-274-7161 e-mail: harald.krug@empa.ch www.empa.ch
Scientific Vita:	*1978: first state examination in Biology/Chemistry at the University of Kassel (passed with distinction)* *1982: doctoral degree at the University of Göttingen, Institute of Zoology (highest degree)* *1983: Postdoctoral Stipend at the GSF Forschungszentrum Munich* *1986: Group leader position at the KfK, Institute for Genetics and Toxicology of Nuclides* *1996: Head of Dep. of Molecular and Environmental Toxicology* *1996: Habilitation "Umwelttoxikologie" at the University of Karlsruhe* *2001-2006: Speaker of the Study Group "Biochemical Pharmacology and Toxicology" of the GBM (German Society for Biochemistry and Molecular Biology; http://www.gbm-online.de)* *since 2002: Academic member of the DECHEMA Working Group "Responsible Production and Use of Nanomaterials" (http://www.processnet.org/Chemische_Reaktionstechnik-p-11/Nanotechnologie-path-1%2C11-p-112.html) and since 2005 member of the steering committee of this working group* *since 2004: Member of the Council of the European Academy for the Research on the Consequences of Scientific and Technological Advance (http://www.europaeische-akademie-aw.de)* *Project Group: Nanomaterials, Nanodevices, Nanocomputing* *since 2005: appointed as a member of the "Nanobotschafter (Nano ambassador)", an initiative of the "Deutsches Museum" in Munich* (http://www.nanobotschafter.de/) *March 2006-July 2009: appointed as the manager of the consortium "NanoCare", a research project of the German Ministry for Education and Research* (http://www.nanopartikel.info) *September 2006: appointment to the EMPA in St. Gallen (Switzerland)* *since January 2007: Head of Materials-Biology Interactions at the Empa, St. Gallen* (http://www.empa.ch/abt274) *March 2007: appointed as member of the Action Group "NanoDialog" of the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU)* (http://www.bmu.de/pressemitteilungen/pressemitteilungen_ab_22112005/pm/39021.php)

	July 2007: appointed as member of the "Commission for Environmental Toxicology" of the Federal Office for the Environment (BAfU) of Switzerland (http://www.bafu.admin.ch/) August 2008: appointed as "Titularprofessor" at the Medical Faculty, University of Berne September 2008: founder member of the IANH, the „International Alliance for NanoEHS Harmonization" (http://www.nanoehsalliance.org/sections/Home) October 2008: elected as a member of the foundation board of the "GEN SUISSE" foundation (http://www.gensuisse.ch/) January 2009: appointed as member of the scientific board of the CNT-Initiative, a BMBF-funded activity of the German Industry (http://www.cnt-initiative.de/index.php) January 2009: appointed as member of the ad-hoc working group of the DFG on "Food and Nanotechnology" (http://www.dfg-sklm.de/index.html) November 2009: appointed as Head of Department "Materials meet Life" at Empa, St. Gallen December 2009: appointed as Member of the Directorate of Empa by the ETH-Board, Switzerland Since January 2010: appointed as member of the EASAC-JRC Expert Group to study nanoparticles toxicity in order to assess the possible impact of nanomaterials on human health. Since May 2010: appointed as member of the working group of the Federal Office for Internal Affairs on "Kommunikation and Dialog" regarding the Swiss Action Plan for Nanomaterials. Since June 2010: appointed as advisory board member of the NanoTec-Institute in Bangkok, Thailand
Scholarships / Awards:	*1979 – 1980: Graduate scholarship, DFG* *1983 – 1985: Ph.D. fellowship, GSF National Research Center for Environment and Health* *1994: Price of the "Stiftung für Verhalten und Umwelt (VERUM)" at the 1st Int. Congress on Environmental Hygiene* *1998/2000: best scientific presentations at the conferences of the Int. Acad. Tumor Marker Oncol. (IATMO) and the International Conference on the Bioscience of Lipids* *2003: third price within the "Cinema of the Cell" Bioclip contest of the ELSO (Eur. Life Scientist Org.; http://www.elso.org)* *2004: one of five best presentations at the STS Conference in Weimar* *2006: one of the best presentations at the MRIEM Conference in Paris* *2006: DGK-Symp. cfi-Award (1.000€)* *2007: Scientific Award of Baden-Württemberg for Substitutive Methods for Animal Testing (25.000€)*
Memberships :	*BIOLAGO e.V.* *DECHEMA (incl. Fachsektion Nanotechnologie)* *Environmental Mutagen Society (GUM)* *German Society for Biochemistry and Molecular Biology (GBM)* *German Society for Cell Biology (DGZ)* *International Society for Aerosols in Medicine (ISAM)* *Signal Transduction Society (STS)* *Society of Hygiene, Environmental and Public Health Sciences – GHUP (formerly: Society for Hygiene and Environmental Medicine-GHU)*

Research Fields:	Biological mechanisms of action of **alkylated metal compounds** Cellular mechanisms of **polybrominated diphenylethers** main topics: cellular signalling cascades, hormone disrupting activity, stress and cell cycle Mechanisms of action of **synthetic lipids** main topic: induction of apoptosis in tumor cells **Nanotoxicology**: effects of nanomaterials on cells and tissues
Teaching:	*Lectures at the TU München, 1984 - 1985:* *Part of the lecture on "Environmental Biochemistry" of Prof. Dr. Jürgen Berndt* *Teaching at the Fridericiana Karlsruhe since WS 1989/90:* *Lecture "General Toxicology of Metals"* *Lecture "General Environmental Toxicology"* *Lecture "Molecular Toxicology of Xenobiotics"* *Practical Course "Molecular Toxicology of Metals"* *Practical Course "Cell Cycle and Apoptosis"* *Lecture „Toxicology of Mykotoxins“* *Teaching at the ETH Zürich since SS 2007:* *Lecture “FRONTIERS IN NANOTECHNOLOGY” Part Nanotoxicology* *Examination in "Umwelttoxikologie" – Diploma and Ph.D. students; Koreferent for numerous Diploma and doctoral theses.* *Training of lab assistants in biology of the FZK.* *Invited lecturer at the Fortbildungszentrum für Technik und Umwelt (FTU), the Sozial- und Arbeitsmedizinische Akademie Baden-Württemberg e.V., Stuttgart, and the "Haus der Technik", Essen.* *Invited lecturer of the CCMX-SPERU Course activities for students* *http://www.ccmx.ch/events/detail/article/speru-continuing-education-2007-annual-course-particles-and-thin-films/index.html* *Since Fall Semester 2008: Professorship at the University of Berne, lectures in “Climate, environment and human health” at the Oeschger Center, in “Nanotoxicology” at the Bretscher-Center*
Reviewing:	*Referee for the following scientific journals* *Analytical and Bio-analytical Chemistry* *Angewandte Chemie Int. Ed.* *Archives of Toxicology* *ChemBioChem* *Chemosphere* *Environment International* *Environmental Health Perspectives* *Environmental Pollution* *Environmental Science and Pollution Research* *Environmental Science and Technology* *European Journal of Pharmaceutics and Biopharmaceutics* *International Journal of Hygiene and Environmental Health* *Journal of the Amercian Chemical Society* *Journal of Nanoparticle Research* *Nanotoxicology* *Nature Nanotechnology* *Particle & Fibre Toxicology* *Signal Transduction* *Toxicology and Environmental Health* *Toxicology Letters* *Toxicological Science*

	Umweltwissenschaften und Schadstoff-Forschung (UWSF) – Zeitschrift für Umweltchemie und Ökotoxikologie *and for the funding organisations* *- Deutsche Krebshilfe e.V.* *- Schweizerischer Nationalfonds SNF* *- "Particle and Surface Engineering" Education and Research Unit (ERU) of the Competence Centre for Material Science and Technology (CCMX) in Switzerland* *- Deutsche Bundesstiftung Umwelt (DBU)*
Peer-reviewed Publications (since 2000):	Diabaté, S., Mülhopt, S., Paur, H.-R., Wottrich, R. & Krug, H.F. (2002) In vitro effects of incinerator fly ash on pulmonary macrophages and epithelial cells**. Int. J. Hygiene Environm. Health,** 204, 1-4. Diabaté, S., Mülhopt, S., Paur, H.-R. and Krug, H.F. (2002) Pro-inflammatory effects in lung cells after exposure to fly ash aerosol via the atmosphere or via the liquid phase. **Ann. occup. Hyg**., 46, 382-385. Sures, B., Dezfuli, B.S. and Krug, H.F. (2003) The intestinal parasite Pomphorhynchus laevis (Acanthocephala) interferes with the uptake and accumulation of lead (^{210}Pb) in its fish final host chub (Leuciscus cephalus). **Int. J. Parasitol.**, 33, 1617-1622. Voelkel, K., Krug, H.F. and Diabaté, S. (2003) Formation of reactive oxygen species in rat epithelial cells upon stimulation with fly ash. **J. Biosci.**, 28, 51-55. Wottrich, R., Diabaté, S. and Krug, H.F. (2004) Effects of ultrafine particulate matter in human cell co-culture systems. **Int. J. Hyg. Environ. Health**, 207, 353-361. Oberle, C., Massing, U. and Krug, H.F. (2005) On the mechanism of Alkylphosphocholine (APC) induced apoptosis in tumour cells. **Biol. Chem.**, 386, 237-245. Fritsch, S., Diabaté, S.and Krug, H.F. (2006) Incinerator fly ash provokes alteration of redox equilibrium and liberation of arachidonic acid in vitro. **Biol. Chem.**, 387, 1421-1428. Gursinsky, T., Ruhs, S., Friess, U., Diabaté, S., Krug, H.F., Silber, R.E. and Simm, A. (2006): Air pollution associated fly ash particles contribute to cardiac fibrosis. **Biol. Chem.**, 387, 1411-1420. Wörle-Knirsch, J.M., Pulskamp, K. and Krug, H.F. (2006): Oops they did it again! Carbon nanotubes hoax scientists in viability assays. **Nano Lett.**, 6, 1261-1268 Fadeel, B., Kagan, V., Krug, H.F., Shvedova, A., Svartengren, M., Tran, L. and Wiklund, L. (2007): There's plenty of room at the forum: Potential risks and safety assessment of engineered nanomaterials. **Nanotoxicology**, 1, 73-84. Krug, H.F., Diabaté, S., Wörle-Knirsch, J.M., Mülhopt, S. and Paur, H.-R. (2007) Synthetische Nanopartikel am Arbeitsplatz und in der Umwelt. Occupational and Environmental Aspects of Synthetic Nanoparticles. **Arbeitsmed. Sozialmed. Umweltmed.** 42, 4-14 Pulskamp, K., Diabaté, S. and Krug, H.F. (2007): Carbon nanotubes show no sign of acute toxicity but induce intracellular reactive oxygen species in dependence on contaminants. **Toxicol. Lett.**, 168, 58-74 Pulskamp, K., Wörle-Knirsch, J.M., Hennrich, F., Kern, K. and Krug, H.F. (2007): Human lung epithelial cells show biphasic oxidative burst after single walled carbon nanotube contact. **Carbon**, 45, 2241–2249. Schmid, M., Zimmermann, S., Krug, H.F. and Sures, B. (2007): Influence of platinum, palladium and rhodium as compared with cadmium, nickel and chromium on cell viability and oxidative

	stress in human bronchial epithelial cells. **Environ. Int.**, 33, 385-390. Schröder, T., Schmitz, K., Niemeier, N., Balaban, T.S., Krug, H.F., Schepers, U. and Bräse, S. (2007): Solid-phase synthesis, bioconjugation, and toxicology of novel cationic oligopeptides for cellular drug delivery. **Bioconjugate Chem.**, 18, 342-354. Strack, S., Detzel, T., Wahl, M., Kuch, B. and Krug, H.F. (2007): Cytotoxicity of TBBPA and effects on proliferation, cell cycle and MAPK pathways in mammalian cells. **Chemosphere**, 67, S405-S411 Wörle-Knirsch, J.M., Kern, K., Schleh, C., Adelhelm, C., Feldmann, C. and Krug, H.F. (2007) Nano particulate vanadium oxide potentiated vanadium toxicity in human lung cells. **Environ. Sci & Technol.**, 41, 331-336 Behra, R. and Krug, H.F. (2008) Nanoecotoxicology: Nanoparticles at large. **Nature Nanotechnol.**, 3, 253-254 Diabaté, S., Mülhopt, S., Paur, H.R. and Krug, H.F. (2008): Responses of human lung cells after exposure to ultrafine particles of incinerator fly ash at the air-liquid interface. **ATLA**, 36, 285-298. Schröder, T., Niemeier, N., Afonin, S., Ulrich, A.S., Krug, H.F., Bräse, S. (2008): Peptoidic amino- and guanidinium-carrier systems: targeted drug delivery into the cell cytosol or the nucleus. **J. Med. Chem.** 51, 376-379. Krug, H.F. (2008) Nanotechnologie – Zwerge erobern den Alltag. **Chemie Ingenieur Technik**, 80 (11), 1653-1660. Belyanskaya, L., Weigel, S., Hirsch, C., Tobler, U., Krug, H.F., Wick, P. (2009): Effects of carbon nanotubes on primary neurons and glial cells. **Neurotoxicology**, 30, 702-711. Spohn, P., Hirsch, C., Hasler, F., Bruinink, A., Krug, H.F. and Wick P. (2009) C60 fullerene: a powerful antioxidant or a damaging nanonoxe? The importance of an in-depth material characterization prior to toxicity assays. **Environm. Pollut.**, 4, 1134-1139. Kaiser, J.P., Krug, H.F., Wick, P. (2009) Nanomaterial cell interactions: how do carbon nanotubes affect cell physiology? **Nanomed**. 4, 57-63. Thurnherr, T., Su, D., Diener, L., Weinberg, G., Manser, P., Pfänder, N., Arrigo, R., Schuster, M.E., Wick, P., and Krug, H.F. (2009): Comprehensive evaluation of in vitro toxicity of three large-scale produced carbon nanotubes on human Jurkat T cells and a comparison to crocidolite asbestos. **Nanotoxicology**, 3/4, 319-338 Kunzmann, A., Andersson, B., Thurnherr, T., Krug, H.F., Scheynius, A., and Fadeel, B. (2010): Toxicology of engineered nanomaterials: Focus on biocompatibility, biodistribution and biodegradation. **Biochim. Biophys. Acta**, doi:10.1016/j.bbagen.2010.04.007: Wick P, Malek A, Manser P, Meili D, Maeder-Althaus X, Diener L, Diener PA, Zisch A, Krug HF, von Mandach U (2010) Barrier capacity of human placenta for nanosized materials. **Environ. Health Perspect.** 118, 432-436
Reports / Books / Book Chapters	Krug, H.F., Kern, K. and Diabaté, S. (2004) Toxikologische Aspekte der Nanotechnologie. Versuch einer Abwägung. Technikfolgenabschätzung. **Theorie und Praxis**, 13 (2), 58-64. Krug, H.F. (2005) Neues aus der Nanotechnologie: unser Korrespondent berichtet. **UWSF – Z. Umweltchem. Ökotox.** 17

	(4), 252. Krug, H.F., Kern, K., Wörle-Knirsch, J.M. and Diabaté, S. (2005) Ultrafeine Partikel - Gesundheitsrisiko und Anwendungsmöglichkeiten. **internistische praxis**, 45 (4), 443-455. Krug, H.F., Kern, K. Wörle-Knirsch, J.M. and Diabaté, S. (2006) Toxicity of Nanomaterials – new carbon conformations and metal oxides. In: Impact of Nanomaterials on the Environment, Series title: **Nanotechnology for Life Sciences** (Kumar, C., ed.) Wiley-VCh, Weinheim Brune H, Ernst H, Grunwald A, Grünwald W, Hofmann H, Janich P, Krug HF, Mayor M, Schmid G, Simon U, Vogel V, Gethmann CF (eds.) **Nanotechnology. Assessment and Perspectives**. Springer, Berlin, 2006 Krug, H.F. (2006) Gibt es Gefährdungen oder Risiken durch Nanopartikel? In: Nanotechnologien nachhaltig gestalten – Konzepte und Praxis für eine verantwortliche Entwicklung und Anwendung (Markus, P. Kühling, W., Henn, S., eds.) Ev. Akademie Iserlohn, pp. 67-77 Krug, H.F. (2006) Gesundheitliche Aspekte von Nanomaterialien. In: Nanopartikel – Anwendungen und mögliche Risiken (Ministerium für Arbeit und Soziales des Landes Baden-Württemberg, Hrsg.), iku, Dortmund, pp. 38-49. Krug, H.F. (2006) Kleine und giftig? Interview von Klaus-Dieter Linsmeier. **Spektrum der Wissenschaften**, 10/2006, 64-66. Krug, H.F. (2006). How dangerous are nanoparticles? **Nanos**, 2/06, 36-37. Krug, H.F., Diabaté, S. and Wörle-Knirsch, J.M. (2006) Nanonoxen: Aufnahme und Wirkung von synthetischen Nanopartikeln. In: Partikuläre und molekulare Belastungen der Innenraum- und Außenluft. Series title: Schriftenreihe des Institutes für Medizinische Mikrobiologie und Hygiene der Universität zu Lübeck, Band 10, (X. Lübecker Fachtagung für Umwelthygiene) (Keller, R., Senkpiel, K., Samson, R.A. and Hoekstra, E.S. eds.) Schmidt-Römhild Verlag, Lübeck, pp. 233-245. Krug, H.F. and Wörle-Knirsch, J.M. (2006) 'Cause I'm CNT, not dynamite. **nanotoday**, 1 (4), 48. Krug, H.F. and Wörle-Knirsch, J.M. (2007) Risikoforschung und toxikologische Bewertung von Nanomaterialien. In: nano – Chancen und Risiken aktueller Technologien (Gazsó, A., Greßler, S. and Schiemer, F., eds.). Springer Wien New York, pp. 101-114 Krug, H.F. (2008) Environmental Aspects of Nanotechnology, Series title: **Nanotechnology**, Vol. 2. Krug, H.F., Klug, P. (2008) Impact of Nanotechnological Developments on the Environment. In: Nanotechnology: Environmental Aspects. Krug, H.F. (ed.), Vol. 2. Wiley-VCh, Weinheim, pp 291-306 Krug, H.F. (2009) Sicherheit von Nanomaterialien – Umwelt und Gesundheit. In: Nanotechnologie – Grundlagen, Anwendungen, Risiken, Regulierung. Scherzberg, A., Wendorff, J.H. (eds.), De Gruyter Recht, Berlin.
Third Party Funding (bold: particles and nanomaterials):	**BWPLUS BWB 20013 Health effects due to inhalable fine particles from technical combustion devices: in vitro studies on the effects of fine and ultrafine particles in cultivated lung**

cells. (Diabaté und Krug, 11/2001 – 03/2004; 240.000,-€)

BWPLUS BWR 24013: Toxikologie (poly)bromierter cyclischer Kohlenwasserstoffe (Flammschutzmittel) – Wirkmechanismen in vitro (Strack und Krug, 09/2004 – 08/2007; 200.000,-€)

DFG KR 2207/1-1: Identifizierung des molekularen Targets bei der Apoptoseinduktion durch Alkylphosphocholine (Krug, 01/2003 – 02/2006; 105.000,-€)

DFG CFN E1.3: Transport of nanoparticles into cells: mechanism and toxicological aspects (Krug, 2004 – 2009; 260.000,-€)

BfR WK-1-1328-182: In vitro exposure of lung cells to aerosol at the air-liquid layer as an alternative for inhalation experiments with animals. (Diabaté, 2004 – 2007; 140.000,-€)

EU 6th FP - IMPART: Improving the understanding of the impact of nanoparticles on human health and the environment (Krug, 02/2005 – 10/2008; 70.000,-€)

BMBF - NanoCare: (Krug, Konsortialleitung und eigener Projektanteil 340.000,-€, 3/2006 – 2/2009)

HGF – Nanotechnology and health - Technological options, risk evaluation and precautionary strategies (lead-managed: ITAS; Krug: 49.000,-€, 4/2006 – 3/2009)

EU 7th FP – NanoImpactNet: Europe-wide Cooperation and coordination in the study of the Health and Environmental Impact of Nanomaterials

EU 7th FP – NANOMMUNE: Comprehensive assessment of hazardous effects of engineered nanomaterials on the immune system; started 1st of September 2008; 485.000,-€

BMBF - DaNa: Acquisition, evaluation and public orientated presentation of societal relevant data and findings for nanomaterials) (Krug, Partner within the German Project Konsortium 250.000,-CHF, 8/2009 – 7/2013)

CCMX – VIGO: A new evaluation tool for determination, description and comparison of the biological effects of nanoparticles/nanomaterials (Krug, 675.000,- CHF, 2/2010 – 1/2013)

(Under)-Graduate education:	Diploma students	Ph.D. students:
	Andrea Käfer (1991) Frank Zauke (1993) Heike Dieterich (1994) Tatjana Treiber (1995) Isabelle Heinisch (1996) Arnt Luchmann (1996) Ariane Tomsche (2001) Claudia Ball (2002) Carolin Oberle (2002) Marco Sander (2002) Christian Nollert (2002) Young-Moo Choi (2003) Dirk Blindow (2003) Gerald Haring (2004) René Benz (2004) Karin Pulskamp (2004) Dariush Ettehadieh (2005) Carsten Schleh (2005) Anna-Maria Kovacs (2005) Nicole Jänsch (2006/07) Sylvia Özdemir (2006/07) *Christoph Wettstein (2008)*	Uta Brückner-Nieder (1992) Andrea Käfer (1994) Thomas Ade (1996) Frank Zaucke (1997) Verena Höckele (1998) Marion Mögel (1998) Astrid Matzke (1999) Anne Regelin (2001) Jörg Trapp (2002) Ralf Wottrich (2003) Carolin Oberle (2006) Susanne Fritsch (2008) Karin Pulskamp (2008) *Nicole Niemeier (2009)* *Katrin Fischer (2009)* *Anne-Kathrin Born(2009)* *Markus Rottmar (2010)* *Michal Gasser (2011)*