Preparational work in my youth



The first watercolour was created during training as a scientific illustrator, a house mouse from the Zoological Institute of the University of Zurich watercolour, Zurich 1961



Inversion of the chromosome of a fruit fly (Drosophila subobscura)

pen-and-ink drawing, Zurich 1961





Created during my training at the Ecole Supérieure des Beaux Arts in Paris

Lithograph on the basis of a silhouette

Paris 1964



Scorpionfish (scorpaenidae), Zoo Zurich, watercolour 1964



Biocenosis, animals and plants cohabiting in 20 m depth in the Mediterranean. Corals, gymnosperms, worms and algae

watercolour

Banyuls sur mer 1964



Aquarium Noumea, New Caledonia, Nov. 18th/19th 1969



Heads of fruit fly (Drosophila subobscura), mutant 'quasimodo', mutated with the poison EMS in the feed. Sketched according to the flies which i had to sketch on behalf of Prof. Hans Burla

Drawing, University of Zurich 1967

Correct a Henre . However



Heads of fruit fly (Drosophila subobscura), left side: mutant *quasimodo* from the Zoological Institute of the University of Zurich watercolour, Zurich 1967



Children, victims of the Vietnam War 1959 - 1975

from Tu Du Hospital in Ho Chi Minh City Vietnam

Foto Cornelia Hesse-Honegger 2004



Children, victims of the Vietnam War 1959 – 1975, form Tu Du Hospital in Ho Chi Minh City Vietnam Foto: Cornelia Hesse-Honegger 2004





Vietnamese child and two bugs, Victims of the spray operations of the USA during the Vietnam War 1962 - 1971



Monographs of the various drosophilidae and leucophenga families. Important pictures which facilitated a taxonomic analysis.

Leucophenga fly, head and abdomen for the Zoological Institute of the University of Zurich

Source:

Dr. Gerhard Bächli, Leucophenga und Paraleucophenga (Diptera) Brachycera) Exploration du Parc National de l'Upemby, Fondation pour favoriser les recherches scinetifiques en Afrique, Mission G. F. De Witte , Bruxelles 1971

pen-and-ink drawing, Zurich 1970



My last work ist a sketched monograph about native kinds of drosophila flies for the Zoological Institute of the University of Zurich

Drosophila funebris, Drosophila melanogaster, Drosophila subobscura , Drosophila obscura

Souce: Gerhard Bächli and Hans Burla, Drosophilidae, Diptera, Insecta Helvetica, 1985

watercolour, Zurich 1984

## Beginning of the works with bugs

1969



Bug from Witikon watercolour, Zurich 1973

In 1968 I drawed my first bug (Heteroptera) and have stayed with these fascinating insects since then.

The symmetry of these animals fascinated me. To emphasize the symmetry, I omitted a part of the right wing.



Scutellum and wings of a Miridae (soft bug), Cremnocephalus

watercolour, Gockhausen 1978



Miridae Pilophorus from Canton of Ticino, Switzerland,

watercolour Gockhausen, 1980



Scutellum and wings of a Miridae (soft bug),unknown to me, from the surroundings of Zurich

watercolour, Gockhausen



Parts of the wings and scutellums of bugs from Gockhausen, watercolour 1977







Chernobyl Accident 1986 contaminating Sweden and Tichino



Map of the radioactive contamination in Europe, caused by the accident in Chernobyl on April 26th 1986

The first study area in Sweden



Heads of two damsel bugs from Gysinge, Sweden

The left one is normal. The head of the right one is too dark, the feelers are sausage-shaped and one of them grows out from the rim of the right eye.

watercolour Zurich, September 1987



Clover from Gysinge, Sweden

Reddish-brown clover instead of green, with yellow flowers instead of pink

watercolour, Gysinge, July 1987



Soft bug (Maridae) larva from Österfärnebo Sweden

Divided wings on the left side. They should be in a small pack like on the right side.

watercolour Gysinge, July 31st 1987





Homoptera (spittlebug), Cercopis vulnerata, found on May 3rd 1988 in Mendrisio, Ticino

A leg stump grows out of the joint of the left middle leg.

watercolour Zurich, May 1988 Forbskizze eines narkotisierten Drosophila melanogeister Männchens

Ausser dem linken Flügel ist alles normal

Scutellum Tergit hul Flügel Fühler mit Arista Schwing -Kölbchen Aug-e deformierter Flügel

Fruit fly, Drosophila melanogaster, 2nd generation, parents from Rancate Tichino, hatched out in my kitchen. The left wing is just a lump. watercolour, Zurich 1987



Head and abdomen of fruit fly, Drosophila melanogaster, 3rd generation of the parents from Rancate, Mendrisiotto, hatched out in October 1987

The segments of the abdomen are misaligned. The face is damaged, with eyes of different sizes, deformed antennae, carina and cheeks. Curved whiskers

watercolour, Zurich November 1987



Title page of the Tages – Anzeiger Magazin

January 1988

Upper: deformed head of a fruit fly, Drosophila melanogaster,

Lower: deformed abdomen of a Drosophila melanogaster

watercolour

Zurich 1987

## Nuclear Powr Plants in Switzerland

1988 - 1995



The beginning of the collecting of insects in the surroundings of the NPP Gösgen, Switzerland




Dragon fly, Panorpa communis from Reuenthal, Canton of Aargau, near the NPP Leibstadt

The right wings are deformed and the abdomen looks blown up.

warercolour, Zurich 1988



Soft bug, Miridae from the vicinity of the NPP Gösgen, Canton of Aargau, Switzerland

The right wing is shorter than the left one.

watercolour Zurich, August 1988



Pentatomidae, Graphosoma lineatum (tree bug) from the vicinity of the NPP Gösgen, Canton of Aargau Switzerland, found on August 16th 1994 in Rohr

The left side of the thorax is shorter.

watercolour Zurich, 1995



Squashu bug from Windisch, near he NPP Gösgen, Canton of Aargau Switzerland

The right wing and abdomen are damaged.

watercolour Zurich, August 1997



Distribution of the damage rates of the 40 positions in the Canton of Aargau Switzerland, where there are 4 NPPs and the Paul Scherrer Institute for reactor research, in correlation with the wind frequencies.

10% of the wind frequencies have benn fixed on 10 km.



All of the morphological damages of group 2, found on the rubble hill at the Paul Scherrer Institute 1995, Tempera on a graph paper 47 x 67,5 cm, Zurich 1995

Various body parts drawn with various colours show the damages:

Light red for wing damages, yellow for scutellum damages, green for feeler damages, a joint missing for both tree bugs. Dark red for abdomen damages

Lower: Number of the bugs found. 1 squaret = 1 bug. The white fields show white or grey layers on the wings.

#### Sellafield





The right wing of the ladybug (ladybird beetle) from the area near the reprocessing plant Sellafield is dented with dark stains.

watercolour 1989



Two soft bugs, Miridae, from Seascale and Drigg, near the reprocessing plant Sellafield, Cumbria England

The bug on the left side has a brown stain on the thorax which has slightly pulled in the thorax. The bug on the right side has an ulcer at the base of the right feeler.

watercolour 1989

# Chernobyl



The map shows the 30 km safety zone around the damaged reactor Chernobyl in November 1986 and my study areas in August 1990.

### Chernobyl

111 19



Pripjat 1999



Soft bug, Maridae, from Pripjat, found on August 13th 1990

The middle leg on the right side is damaged and the claw grows out from the leg stump directly.

watercolour Kiev, Zurich, 1990



Fire bug, Pyrrhocoridae, from the south portal of the 30 km zone around Chernobyl, Seljony Mys (Green Cape), Ukraine

The thorax and the patterns on the thorax are deformed.

watercolour

Zurich 1990



#### Lime leafs from Polesskoje, Ukraine

1990

Tempera on graph paper

#### **Three Mile Island**





Head of a cicada from the area across the NPP Three Mile Island, USA

The right eye is damaged with a cyst and the red pigment of the eye is on the head.

watercolour, New Cumberland, Zurich 1991



Ladybug from Governor's Stable, near the NPP Three Mile Island, USA

There is a dent on the left wing and a black ulcer on the upper rim.

watercolour, New Cumberland, Zurich 1991



Harlequin bug (Pentatomidae) from Governor's Stable, near the NPP Three Mile Island, USA

The scutellum form and the yellow stain form on the black background are deformed.

watercolour, New Cumberland, Zurich 1991

#### Hanford





minor or no deformations

Summary: Radiation Dose Estimates from Hanford Radioactive Material Releases to the Air and the Columbia River



Left: ladybug from Richland watercolour 1998 The left wing is shorter.



Right : Ambush bug, Phymatidae, from Othello watercolour 1998 The left foreleg is shorter and deformed and there is an ulcer on the right side of the abdomen.



Tree bug (Pentatomidae) from Parvin Road, Hanford Study 1998

One joint is missing in the right feeler.

watercolour, Zurich 1999

# La Hague



Reprocessing plant La Hague in France, 1999



Biotope in the area near the reporcessing plant La Hague in France, 1999



Abdomen of a tree bug larva, found in La Hogue, near the reprocessing plant La Hague, Normandy, France

The abdomen is asymmetric.

watercolour, St. Martin 1999



Wing part of a tree bug, found in Anse St. Martin, near the reprocessing plant La Hague, Normandy France

The right wings are damaged.

watercolour, Zurich 1999/2000



 $\mathbf{X}$ 

Map of Cape of La Hague, Normandy France with the reprocessing plant La Hague, COGEMA and 13 study points (all damages)



Map of Cape of La Hague, Normandy France with the reprocessing plant La Hague, COGEMA and 13 study points (all morphological damages of thorax, pronotum)

 $\bigstar$ 

## Gundremmingen

#### NPP Gundremminger


Clouds over the nuclear power plant Gundremmingen. They are always there and change the microclimate of the earth.



Squash bug from Limbach, near the NPP Gundremmingen, Bavaria Germany, found on August 27th August 2004

Deformed head with pigments of the eye on the head

colour sketch, Holzheim 2004



Deformed head of a squash bug from Limbach, near the NPP Gundremmingen, the Free State of Bavaria, found on August 27th 2004

watercolour, Zurich 2005



Legs of a tree bug, Pentatomidae, from Donaumoos, near the NPP Gundremmingen, Bavaria, Germany colour sketch, Zurich. May 10th – 12th 2005



Wind frequencies from the NPP Gundremmingen, the Free Stae of Bavaria, Germany: grey and damage rate of the 28 study positions: red



Winter lime leaf from Gorleben, intermediate waste storage facility for radioactive waste in Germany

Tempera, Flühli 2008

# **Control Areas**

Reference biotope Münstertal (Val Müstair) Canton of Graubünden



Abb. 9: Trajektorien als Funktion der Transporthöhe (Die Kurven entstehen durch die Verfolgung eines Luftpaketes) (Ref. 7)



Radioaktivitätsmessungen in der Schweiz nach Tschernobyl Band 1 Tagungsbericht Bern 20. - 22. Oktober 1986

eine Warnmeldung in der NAZ. Dieses Netz wird im Endausbau über ca. 60 Stationen verfügen. NADAM Stationen Frühwarnposten (FWP) Laboratorien E Ionisationskammer \* Der Unfall von Chernobyl Ein Überblick über Ursachen und Auswirkungen Hauptabteilung für die Sicherheit der Kernanlagen

November 1986

### (la conversion µR/h en nSv/h a été effectuée d'après 1 µR/h = 10 nSv/h)





Tree bun, Pentatomidae, from Sta. Maria, Val Mustair Switzerland

The right wings are deformed.

watercolour Zurich,1992 - 1993



#### Head of a soft baug, Miridae, from Sta. Maria, Val Mustair, Switzerland

The eye on the right side is misshaped.

watercolour

Zurich,1990

Reference biotope Biosphere Entlebuch Canton of Lucerne

Entlebuch from the south to the north Foto Cornelia Hesse-Honegger 2008



Abdomen of a soft bug, Miridae, from Flühli, Canton of Lucerne

Two leg parts grow out from the abdomen.

watercolour, Flühli 2007

Flickli LU 15.7.07 bei Kneippaulaje

P. Hesse. Howe for Flickli 20.



Abdomen of a soft bug, Miridae, from Schüpfheim, Canton of Lucerne

watercolour, Flühli, 2011



Tree bug, Pentatomidae, from Planalp, Canton of Lucerne Sep. 09th 2007

The right wing of the bug larva on the left side is shorter and deformed. The abdomen of the bug on the right side is curved.

watercolour Zurich 2007





Nuclear facilities

F s

Positions of the field study of Aargau

Field study of Entlebuch

Bise

Map of the damages detected on found bugs, Heteroptera Study of the Cantons of Aargau, Solothurn, Zurich and Zug 1993 – 1999 and Entlebuch 2006 - 2013

# Fukushima - Daiichi

2016





## The survivors

Seed bug Nysius and leafhopperDie

Left: Lygaeidae, Nysius sp. Collected near the nuclear factories Hanford, Washington, USA Right: Leafhopper, Cicadella viridis Image from wikipedia

What do they feed on to make them so resilient?



The Losers – True Bugs (Heteroptera) and Ladybird Beetles (Coleoptera, Coccinellidae) Especially endangered families in true bugs are: Pentatomidae, Coreidae, Reduviidae und Acanthosomatidae

Left: Ladybird beetle from Richland near atom factories Hanford, Washington USAthe left wing is shorter Right: Tree bug from near the nuclear power plant Gösgen, Canton Aargau Schweiz. The left side of the thorax is deformed.

From which plants do they feed, what makes them so vulnerable towards radioactive emissions from nuclear installations?



Head of a cicada from Yamakiya Saka, Japan, border to the 20 km exclusion zone from the nuclear power plant Fukushima - Daiichi

The right side of the head is disturbed. This disturbed cicada shows that the place where it lived is highly contaminated

watercolour Fukushima 2016





The biological impacts of the Fukushima nuclear accident on the pale grass blue butterfly

Atsuki Hiyama1\*, Chiyo Nohara1\*, Seira Kinjo1, Wataru Taira1, Shinichi Gima2, Akira Tanahara2 *Tetraneura sorini*, collected 32 km from the NPP Fukushima Daiichi in the spring of 2012. Damage rate: 13.2%





The biological impacts of the Fukushima nuclear accident on the pale grass blue butterfly

Atsuki Hiyama1\*, Chiyo Nohara1\*, Seira Kinjo1, Wataru Taira1, Shinichi Gima2, Akira Tanahara2



![](_page_100_Picture_0.jpeg)

![](_page_101_Picture_0.jpeg)

![](_page_102_Picture_0.jpeg)

![](_page_103_Picture_0.jpeg)

#### List of reference research areas

Entry	Location	Country	Year	Bugs collected	Disturbance [%]a)	
					TD	MD
1	Tema	Ghana	1971	50	8.0	0
2	Isérables	Switzerland	1992	265	3.4	1.9
3	Weggis	Switzerland	1997	68	1.5	1.5
4	Golfo dulce	Costa Rica	2005	63	1.6	0
5	Carlow	Ireland	2005	50	4.0	2.0
6	Entlebuch	Switzerland	2007	910	12.7	6.9
a) The terms TD and MD refer to total disturbance and morphological disturbance, resp. (see						

Experimental).

List of	Entry	Year	Location	Country	Target	Bugsa)
Research	1	1971	Tema	Ghana	reference biotope	50
areas	2	1987	Gysinge Österfärnebo Gävle	Sweden	Chernobyl fallout	80
	3	1987	Melano Rancate	Switzerland	Chernobyl fallout	60
	4	1988	Gösgen Leibstadt	Switzerland	nuclear-power plant	221
	5	1989 – 1998	Sellafield	UK	nuclear-reprocessing plant	445
	6	1989 – 1992	Gockhausen Isérables	Switzerland	reference biotope	313
	7	1990	Chernobyl: Polesskoje Pripjat Seljony Mys	Ukraine (former U.S.S.R.)	Chernobyl fallout	55b)
	8	1991	Three Mile Island	USA	nuclear-power plant	409
	9	1992 – 1994	Mouans Sartoux	France	reference biotope	111

List of Research	10	1992 – 1995	Sta. Maria	Switzerland	reference biotope	270
areas	11	1992 – 2003	Villigen (near <i>PSI</i> )	Switzerland	nuclear-research laboratory	1863
	12	1993 – 1994	Tubre Bormio	Italy	Chernobyl fallout	299
	13	1994 – 1996	Canton Aargau	Switzerland	nuclear-power plants	2600
	14	1993	Correns	France	-	118
	15	1994	Bagnols en Forêt St. Maxime	Franc	_	206
	16	1995	Stade Krümmel	Germany	Nuclear-power plants	754
	17	1997	Nevada	USA	Nuclear-weapon test area	1292
	18	1997	Weggis	Switzerland	Reference biotope	68
	19	1998	Hanford	USA	Nuclea factory	2139
	20	1999	Cape de la Haugue (Normandy)	France	Nuclear reprocessing	650

List of Research area	21 IS	2002 – 2004	Gunrremmingen (Bavaria)	Germnany	nuclear-power plant	2900
	22	2004	Cu Chic)	Vietmnam	Agent orange	360
	23	2005	Carlow Dundalk	Ireland	Reference biotope	131
	24	2005	Golfo dulce	Costa Rica	Reference biotope	63
	25	2006 – 2007	Entebuch	Switzerland	Reference biotope	910
	Total					16367

a) Total number of bugs collected and analyzed over the time period indicated.

b) Only a small number of bugs could be collected due to the local radiation. The recommended duration of stay was *ca*. 10 min (Pripjat) and 3 h (Polesskoje, Seljony Mys), depending on the distance to the molten reactor core.

c) Including other, less-known areas in Vietnam heavily sprayed with Agent Orange (2) between 1961 to 1971.