Niilo Eelis Virkki, Cytogeneticist: In Memoriam (1924-2005)[1]

Which weeps the comrade of my choice,
An awful thought, a life removed,
The human-hearted man I loved,
A Spirit, not a breathing voice.

by Alfred, Lord Tennyson (1809-1892)

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Dedication, persistence and devotion to science, and to all things alive, marked Niilo Virkki's work until illness overtook him 10 September 2005, in his adoptive Puerto Rico. His wife Sylvi, his daughters

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Jaana and Anna, and son Jyri survive him. Virkki spent 45 years in Puerto Rico, where he worked as a Cytogeneticist at the University of Puerto Rico, Agricultural Experiment Station between 1961 and 1995. His highly productive career and his legacy of scientific work in cytogenetics are recognized worldwide. Of note, his pioneering work with the Oedionychina (Coleoptera: Chrysomelidae), especially with the beautiful metallic-colored *Alagoasa* beetles, made him the world authority in coleopteran cytogenetics. During his life, Dr. Niilo Virkki authored or coauthored over a hundred peer-reviewed articles as well as several book chapters.

Niilo Virkki was born 7 May 1924 in Vouksela, in the magnificent Karelia region of eastern Finland (annexed by Russia during WWII). As a child, he loved cross-country skiing in the crisp air of Finnish winters. He often spoke of early awakenings of his love for nature through this childhood fondness for his country's forests and for his people. As a young man, he also endured the horrors of World War II as the conflict enveloped and shattered his beloved land. Perhaps war, and the cruel and terrifying Nazi and Soviet occupations that followed, helped in forging a man possessing his relentless and purposeful character. Adversity did not stop Niilo Virkki from being a man with endless love, wonderment and compassion for other people, and for having passion for the natural world around him.

After the war, Virkki studied at the University of Helsinki's Department of Mathematics and Natural History. Here he obtained these degrees: Candidate of Philosophy (1949, Major: Genetics); Licentiate of Philosophy (1951, Majors; Genetics and Zoology); and a Doctor of Philosophy in Cytogenetics (1952). While at school he worked as veterinary inspector for the City of Helsinki's Health Board. In 1951, he obtained a full time award for basic studies in insect cytology from the Finnish government, which enabled him to complete his doctoral research. After his graduation, he worked at the University of Helsinki until 1959, becoming Associate Professor of Genetics. In 1956, the Canadian Department of Agriculture awarded him a postgraduate fellowship at the Ottawa Forest Insect Laboratory, where he worked under the direction of Dr. S.G. Smith. In 1959, he obtained a joint appointment by the Universities of Helsinki and El Salvador, under the prestigious Rosenberg Award, to survey insect chromosomes in Central America.

In 1961, Arturo Roque then Director of the UPR Agricultural Experiment Station hired him as an Assistant Cytogeneticist at the Department of Genetics in Río Piedras. In 1981, Dr. Virkki took sabbatical leave to work at the Centro do Genética at Universidade Estadual Paulista in Campinas, Brazil. Collections he made in the Amazon basin formed the basis of several publications, even though he lost many cy-

togenetic preparations and samples to careless custom agents and would-be jewel thieves.

Niilo Virkki devoted much of his work to karyotypic descriptions and gametogenesis studies of both insects and plants. In most of his work he concentrated on cytogenetic and cytotaxonomic studies of fleabeetles (Chrysomelidae: Galerucinae: Alticini) from Neotropical regions, especially from Puerto Rico and from Brazil. For his outstanding and original work he was invited to collaborate with several internationally renowned organizations, such as the Max Planck- Institut für Zellbiologie Abteilung in Tübingen, Germany; the North American Treaty Organization's (NATO's) Advanced Studies Institute in Stressa, Italy; the Universidad Nacional de Cuzco in Perú; Oregon State University, Corvallis, Oregon; Duke University, North Carolina; the University of Pennsylvania's J. Leidy Institute in Philadelphia; and the Waksman Institute of Microbiology at Rutgers University in New Jersey.

Dr. Virkki's important discoveries in chrysomelid cytogenetics made him a world-renowned scientist worthy of profound admiration and recognition. His most noted discoveries and accomplishments include: (1) the discovery of the smallest karyotype and meiotype in the Coleoptera; (2) the discovery and interpretation of unorthodox and interesting modes of chromosome orientation and segregation in Neotropical Alticini; (3) the presentation of novel hypotheses of quantitative aspects of centromere function; (4) the discovery of correct timing of gametogenesis in controlling irradiation results or the "irradiation clock" for the sugarcane borer, *Diatraea saccharalis* (Lepidoptera: Pyralidae); (5) the discovery and assessment of environmental controls for evaluating plant gametogenesis in sugarcane; (6) the cytological description of seven color morphs of the Puerto Rican sugarcane weevil, *Diaprepes abbreviatus* (L.) (Coleoptera: Curculionidae); and (7) the preparation of the first comprehensive synopsis of cytogenetic variables and descriptions for the abundant and important Chrysomelid beetle fauna of Puerto Rico (Table 1). A list of science publications by Dr. Niilo Virkki is shown in Table 2. 'Don Niilo', as many affectionately called him, was also an ardent woodworker in his spare time; he specialized in making high quality furniture and sports-fishing rods.

Finally, Dr. Niilo Virkki was a profound observer of nature and people. At the University of Puerto Rico he trained and befriended all those who came around him, including students, co-workers, and colleagues. His broad smile and his sweet sense of humor overcame every obstacle and sadness that befell those who knew him. The scientific world has lost one of its best, a real credit to the creative genius of his native Finland, a true friend, and an indefatigable discoverer of natural wonders in Puerto Rico and in the world.

TABLE 1.—*List of Puerto Rican Coleoptera: Chrysomelidae that Dr. Niilo Virkki described karyotypically (1964-1998). Species are listed by chrysomeline subfamily and tribe. (For complete records see Virkki & Santiago-Blay, 1998)*

Criocerinae
Lema dorsalis (Olivier)
Lema nigripes (Weise)

Cryptocephalinae
Pachybrachis mendica Weise
Cryptocephalus multiguttatus Suffrian
Cryptocephalus tristiculus Weise
Diachus nothus (Weise)
Exema carinaticollis (Lacordaire)
Chlamisus straminea Suffrian

Lamprosomatinae
Oomorphus longifrons (Lacordaire)

Eumolpinae
Alethaxius near *meliae* Blake
Metachroma ampilicollis Blake
Metachroma fenestratum Blake
Metachroma leiotrachelus Blake
Chalcosicya crotonis (Fabricius)
Myochrous portoricensis Blake

Chrysomelinae
Leucocera laevicollis Weise

Galerucinae
Yingaresca varicornis (Weise)
Erynephala near *maritima* LeConte
Neolachmaea obliterata (Olivier)
Diabrotica graminea Baly
Acalymma annulata (Suffrian)
Acalymma innuba (Fabricius)
Acalymma bivittata (Fabricius)
Ceratoma ruficornis Olivier

Galerucinae: Alticini
Disonycha spilotrachela Blake
Disonycha comma White
Disonycha leptolineata Blatchley
Disonycha eximia Harold
Pseudodisonycha portoricensis Blake
Omophoita albicollis Fabricius
Omophoita cyanipennis Fabricius
Alagoasa bicolor Linnaeus
Phyllotreta guatemalensis Jacoby
Aphthona lamprocyanea Blake
Glyptina sp.
Homoschema obesum Blake
Homoschema nigriventre Blake
Homoschema fraternum Blake
Homoschema latitarsum Blake
Apraea portoricensis Blake
Longitarsus oakleyi Blake
Longitarsus near *varicornis* Blake
Longitarsus sp.
Phyllotrupes near *acutangula* Chevrolat
Cyrsylus volkameriae (Fabricius)
Systena basalis Jacquelin DuVal
Syphraea cubana (Bryant)
Syphraea cylindrica (Weise)
Syphraea near *maldonadoi* (Blake)
Macrohaltica jamaicensis (Fabricius)
Lysathia ludoviciana (Fall)
Lysathia occidentalis Suffrian
Nesaecrepida rufomarginata Blake
Strabala puertoricensis Blake
Epitrix cucumeris (Harris)
Epitrix fasciata Blatchley
Chaetocnema brunnescens Horn
Heikertingerella krugi (Weise)
Aedmon eugeniae (Blake)
Aedmon morrisoni (Blake)
Aedmon oakleyi (Blake)

Hispinae
Sceloenopla mantecada Sanderson
Chalepus sanguinicollis (Linnaeus)
Hilarocassis exclamationis (Linnaeus)
Chelymorpha multipunctata Olivier
Physonota jamaicensis (Linnaeus)
Agroiconota propinqua (Boheman)
Deloyala guttata (Olivier)
Charidotella quadrisignata (Boheman)
Charidotella sexpunctata (Fabricius)

TABLE 2.—*List of science publications by Dr. Niilo Virkki. 1951-1998.*

Virkki, N., 1951. Zur zytologie einiger Scarabaeiden (Coleoptera). Studien and der Spermatogenese. *Ann. Zool. Soc. "Vanamo"* 14:1-104.

Virkki, N., 1953. Über die Verknöcherung einiger Schädelsuturen beim Eichhörnchen, *Sciurus vulgaris* L. *Arch. Soc. "Vanamo"* 7:83-93.

Virkki, N., 1953. Suomalaisen oravan Pääkallon mitoista. *Arch. Soc. "Vanamo"* 7:94-99.

Virkki, N., 1953. Versuch einer Kernanalyse bei den somatischen Hodenzellen der Aphodius-Arten (Coleoptera, Scarabaeidae). *Chromosoma* 6:1-32.

Virkki, N., 1954. Weitere Spermatogenesestudien an Skarabäiden (Coleoptera). *Ann. Acad. Sci. Fenn. A. IV* 25:1-58.

Virkki, N., 1954. Akzessorische Chromosomen bei zwei Käfern, *Epicometis hirta* Poda und *Oryctes nasicornis* L. *Ann. Acad. Sci. Fenn. A. IV* 26:1-19.

Virkki, N., 1954. Über den Schaltknochen der Bregmagegend beim Eichhörnchen, *Sciurus vulgaris* L. *Arch. Soc. "Vanamo"* 9:100-108.

Virkki, N., 1955. Mitose und meiose. *Naturwiss. Rundschau* 8:352-355.

Virkki, N., 1956. Zur Kenntnis der postmeiotischen Ereignisse der Samenentwicklung bie der Skarabäiden (Coleoptera). *Canad. J. Zool.* 35:265-277.

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Virkki, N., 1957. Structure of the testis follicle in relation to evolution in the Scarabaeidae (Coleoptera). *Canad. J. Zool.* 35:265-277.

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Virkki, N., 1958. High chiasma frequency in allocyclic segments of chromosomes. *Nature* 181:1146-1147.

Virkki, N., 1959. Neo-XY mechanism in two scarabaeoid beetles, *Phanaeus vindex* MacL. (Scarabaeidae), and *Dorcus parallelopipedus* L. (Lucanidae). *Hereditas* 45:481-494.

Virkki, N., 1959. Citología de algunos escarabajos neárticos (Coleoptera, Scarabaeidae). *Comm. I.T.I.C.* 8:40-49.

Virkki, N., 1960. Cytology of some Nearctic scarabs. (Coleoptera, Scarabaeidae) Ann. *Acad. Sci. Fenn. A. IV* 48:1-12.

Virkki, N., 1960. Cytology of male meiosis in certain European forest beetles of the families Scolytidae, Cleridae, Anobiidae. *Ann. Acad. Sci. Fenn. A. IV* 49:1-16.

Virkki, N., 1961. Salvadorin Instituto Tropical. Vousikymmen Luonnontutkimusta Keski-Amerikan pienimmässä tasavallassa. *Luonnon Tutkija* 65:5-9.

Virkki, N., 1961. Non-conjugation and late conjugation of the sex chromosomes in the beetles of the genus *Alagoasa*. (Chrysomelidae, Alticinae). *Ann. Acad. Sci. Fenn. A. IV* 54:1-22.

Virkki, N., 1961. Talamancan pilvimetsissä ja paramoilla. *Luonnon Tutkija* 65:129-139.

Virkki, N., 1962. The passalid testis and its structural kinship with the testes of other scarabeoid beetles. *Ann. Soc. "Vanamo"* 16:19-22.

Virkki, N., 1962. Chromosomes of certain meloid beetles from El Salvador. *Ann. Acad. Sci. Fenn. A. IV.* 57:1-11.

Virkki, N., 1962. Meiosis and development of embryo sac in *Gunnera insignis* (Oersted) D.C. (Halorhagacease). *J. Agric. Univ. P. R.* 46:254-268.

Virkki, N., 1962. On the cytology of some Neotropical elaterids (Coleoptera), with special reference to the Neo-XY of Pyrophorini. *Ann. Acad. Sci. Fenn. A. IV.* 61:1-21.

Virkki, N., 1962. Comentarios sobre el baño de vapor entre los indígenas de Guatemala. *Revista Guatemala Indígena* 2(2) :abril-junio.

Virkki, N., 1963. On the cytology of certain Neotropical Cantharoids. *Ann. Acad. Sci. Fenn. A. IV.* 65:1-16.

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Virkki, N., 1963. Eighteen chromosome pairs in an American bamboo. *Chusquea subtessellata* Hitch. *J. Agric. Univ. P. R.* 47:98-101.

Virkki, N., 1963. Gametogenesis in the sugarcane borer moth, *Diatraea saccharalis* (Fabr.) (Crambidae). *J. Agric. Univ. P. R.* 47:102-137.

Virkki, N., 1963. High chromosome number and giant, postreductional sex chromosomes in *Walterianella venusta* Schaufuss (Chrysomelidae, Alticinae). *J. Agric. Univ. P. R.* 47:154-163.

Virkki, N., 1964. The chromosomes of Chironja. *J. Agric. Univ. P. R.* 48:13-16.

Virkki, N., 1964. On the cytology of some Neotropical Chrysomelidae (Coleoptera). *Ann. Acad. Sci. Fenn. A IV.* 75:1-25.

Virkki, N., 1964. Chromosomes of certain anthribid and brentid beetles from El Salvador. *Ann. Acad. Sci. Fenn. A IV.* 83:1-11.

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Virkki, N., 1966. Observations on the spermatogenesis of some scarabaeoid beetles. *J. Agric. Univ. P. R.* 50:338-341.

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Virkki, N., 1967. Chromosome relationships in some North American scarabaeoid beetles, with some special reference to *Pleocoma* and *Trox*. *Canad. J. Genet. Cytol.* 9:107-125.

Virkki, N., 1967. Initiation and course of male meiosis in scarabaeoid beetles, with special reference to *Pleocoma* and *Lichnanthe*. *Pan-Pacific Entomol.* 43:99-112.

Virkki, N., 1967. Orientation and segregation of asynaptic multiple sex chromosomes in the male of *Omophoita clerica* Erichson (Coleoptera, Alticidae). *Hereditas* 57:275-288.

Virkki, N. and C. M. Purcell, 1967. Observations on the behavior, genetics, and cytology of two South African *Digitaria valida* Stent accessions in Puerto Rico. *J. Agric. Univ. Puerto Rico* 51:258-269.

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Virkki, N., 1968. Regular segregation of seven asynaptic sex chromosomes in *Asphaera daniela* Bech. (Coleoptera, Alticidae). *Caryologia* 21:47-51.

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