A new *Anthurium* (Araceae) species found in cultivation at the Royal Botanic Garden Edinburgh

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ABSTRACT

A new species of *Anthurium* (Araceae) in section *Calomystrium* originating from Colombia is described and illustrated from a plant cultivated in RBG Edinburgh, Scotland.

KEY WORDS

Anthurium alexandri, Araceae, Colombia, Cultivation, Sect. *Calomystrium*, New Species.

INTRODUCTION

While surveying European Herbaria for a National Science Foundation OPUS grant in April and May, 2016, the senior author encountered a misdetermined collection in the herbarium of the Royal Botanic Garden Edinburgh (E). The specimen was made from the glass house collection at RBG Edinburgh. It was immediately obvious that the specimen, labeled *Anthurum formosum* Schott, was not that species, so he received permission to borrow the specimen for further study. After using the Lucid Key to *Anthurium* and other studies in the herbarium, the species proved to be undescribed. This is a common occurrence

with cultivated material and usually nothing more can be done except to label the plant as a new species and return it, but this case proved to be different because the collection was of known origin and thus worthy of being described. After contacting Peter Brownless, co-author of this paper, he got the details of the original locality as well as freshly prepared specimens and all manner of photographs which enabled an accurate description and detailing of the differences with its seemingly closest cogener, *Anthurium formosum* Schott.

The example related here is not an uncommon occurrence because the world's living collections, both public and private, are teeming with unpublished new species. The senior author has visited hundreds of living collections both large and small, public and private and it is rare indeed that all of the species in such collections are described species. Even so, the frequency that new species are described from most living collections is low, often owing to lack of herbarium specimens, lack of information about the original location or lack of flowering material. The situation in Edinburgh was exceptional in that the plant was of known origin and there was ample material to prepare specimens. This is a testament to the value of living collections in the process of discovery. Many of the living collections in greenhouses are representatives of areas that no longer even exist. The senior author has collected in more than 5000 collecting localities and very few of the original collecting sites still exist owing to the rapid destruction of habitat. Typically collecting is done in newly opened areas suddenly made available by a new road but within a year's time most of the vegetation that is accessible is cut off and burned to make way for crop plants. In the lowlands, there are many crop plants, including corn, cacao, oil palms, manihot, plantano and bananas to name only a few but at higher elevations most of the newly cleared mountain slopes are devoted to the cultivation of mountain coffee, naranjillo (*Solanum* spp.) or cardamom (*Elettaria cardamomum*) depending on the country. Botanical gardens could serve as a place where rare plant species could be cultivated to save them from extinction. Unfortunately, most countries now have laws which preclude the possibility of collecting living plants for any purpose so extinction is imminent. The scale of such extinction is staggering. If one considers, for example, the number of probable new species of Araceae in Colombia alone, the number surely exceeds 8000. Panama, which has a much more well-documented flora, has a total of 587 known species of Araceae (80 percent of which are believed to be endemic). At the same time Colombia's recently published checklist has 820 species but Colombia is 15 times larger and many times more diverse in terms of topology, riverine systems and coastal associations with borders on the Caribbean, the Pacific Ocean, the llanos of north-central South America and the Amazon basin. In addition, Colombia has three separate mountain chains (Cordillera Oriental, Cordillera Central and Cordillera Occidental) each with its mostly unique sets of species on

both separate slopes of each chain. So the 8000 additional species estimated to be present in Colombia are perhaps a great underestimate. Despite this probability of a greatly underestimated aroid flora (and no doubt just as short for many other plant groups) there is little urgency to collect and catalogue plants. Inertia, the presence of bureaucratic hurdles and the lack of an appropriate number of skilled collectors anxious to undergo the trials and dangers involved, lead the way for reasons that this is not happening. What is certain is that forests are being felled and burned at a nearly constant rate and owing to the high rate of endemism for Araceae, even small amounts of habitat destruction will lead to extinction. During more than a half century of collecting throughout the Neotropics, I have seen massive destruction and this has not abated at all, even with the additional conservation measures. Indeed, the conservation procedures at one level have almost completely stopped the collection of living material, greatly decreased the collection of herbarium material and immeasurably stopped research on taxonomy in most cases. The same measures have done very little to stop the destruction of forests at every level and in nearly every place. Forest that remains is largely present because no one has yet had time to cut it down. Owing to the very high rates of endemism in Araceae, any forest that is removed and burned anywhere raises the probability that many species of aroids (and clearly other families as well) will go extinct before they are even collected and described. One only needs to view the vast reaches of the Magdalena River Valley, the Cauca River Valley or view the Pacific Ocean from the summit of the Cordillera Occidental to see that virtually no forest exists along most of the streams and this is in an area where there are virtually no roads. If you can drive to an area you see even less. Just open Google Earth and view the forest in areas believed to be "remote" such as San José Palmar in Chocó Department where I recently visited. This region has such a rich flora that virtually every specimen collected in the 1980's was a new species but few if any other collections were ever made and there is little forest left. Cerro Colán near La Peca (East of Bagua) in Amazonas State which was studied 30 years ago by a few biologists from Louisiana State University and where many new species of plants and animals were discovered is now largely deforested. Hundreds of such stories could be told.

Botanical gardens, while perhaps being in no position to change the rules or to modify the path of destruction, can play an important role in preserving and propagating rare and endangered plants that are already present, thus assuring that some of these endangered species are preserved indefinitely in the living collections of the world. The habitat where J. Crinan Alexander collected this new species likely no longer exists after all these years but it is good that the Edinburgh Botanic Garden has managed to successfully cultivate and protect this new species for all those years.

Cultivation of Aroids — Proper Method of Growing Aroids

Aroids as a group are remarkably easily acquired and successfully transported, largely owing to the nature of the stem (or caudex) which usually easily produces roots at each node under the proper conditions. Many species in the Neotropics are epiphytic and are thus preadapted for easy transport without perishing. The caudex is often thick with short internodes and with dormant shoots and root buds at the ready at every node when the stem is severed. Plants in nature seldom are injured from being severed but instead quickly produce one to several new growing points (one eventually gaining dominance) which replaces the severed portion. Bits of stem with only a few internodes, whether from apical or sub-basal portion of the stem, usually regrow especially if treated with a fungicide and/or with root-producing hormone such as "Rootone" which increases the possibility of rooting. Unless roots can develop, the piece of stem usually will die, especially if it is producing a large leaf that absorbs all the nutrients. Removing tip-cuttings in a natural area rarely causes harm as I have revisited many sites and found the same plants to be thriving after less than a year. Although collecting in the wild is no longer possible these same procedures apply to cultivated collections so we should encourage the propagation and distribution of existing collections as broadly as possible because it is only by this method that survival of rare species is assured. Every living collection loses some material regardless of how well plants are grown, so the more places there are at which any given species is being propagated and grown, the more likely it will survive indefinitely. Unfortunately, even the practice of exchanging living material is now greatly curtailed by restrictions on exchange.

Growing Conditions

Most aroids and especially those which were originally epiphytic such as most *Anthurium* species, must be grown in a light soil mix with ingredients such as perlite, oak bark, fragments of lava rock, gravel or even chips of wood to keep the soil mix well-drained but at the same time humid. Since the soil mixes must be light, frequent watering is usually necessary. Since some pests in living collections, especially *Xanthomonas* bacteria are more prevalent in humid conditions, good air movement is preferred and the spacing of plants is thus important, allowing fewer plants to be in close contact with each other, something that allows the spread of this contamination. Overhead watering with the spray and dripping also allow for the spread of disease. Watering directly into the pots is preferable. Cultivated collections of monocultures such as in Holland, usually use an ebb and flow system of watering with sterilization of the recycled water to prevent nematodes and other bacterial or fungal pests.

Having plants a little pot-bound often improves growth perhaps owing to the fact that most *Anthurium* grow in places where

Figure 1. *Anthurium alexandri* Croat, Brownless & Belt. Habit in greenhouse. [Photo credits needed throughout??]

Figure 2. *Anthurium alexandri* Croat, Brownless & Belt. Stems with cataphylls and roots.

Figure 3. *Anthurium alexandri* Croat, Brownless & Belt. Leaf blade, adaxial surface.

Figure 4. *Anthurium alexandri* Croat, Brownless & Belt. Leaf blade, adaxial surface with petiole.

Figure 5. *Anthurium alexandri* Croat, Brownless & Belt. Leaf blade, abaxial surface showing base of leaf.

Figure 6. *Anthurium alexandri* Croat, Brownless & Belt. Base of leaf blade showing posterior rib.

Figure 7. *Anthurium alexandri* Croat, Brownless & Belt. Petiole with geniculum.

Figure 8. *Anthurium alexandri* Croat, Brownless & Belt. Petiole, adaxial surface.

Figure 9. *Anthurium alexandri* Croat, Brownless & Belt. A pair of inflorescences, on left pre-anthesis, on right at anthesis.

Figure 10. *Anthurium alexandri* Croat, Brownless & Belt. Inflorescences, on left showing female stage, on right showing male stage.

Figure 11. *Anthurium alexandri* Croat, Brownless & Belt. Spathe, abaxial surface.

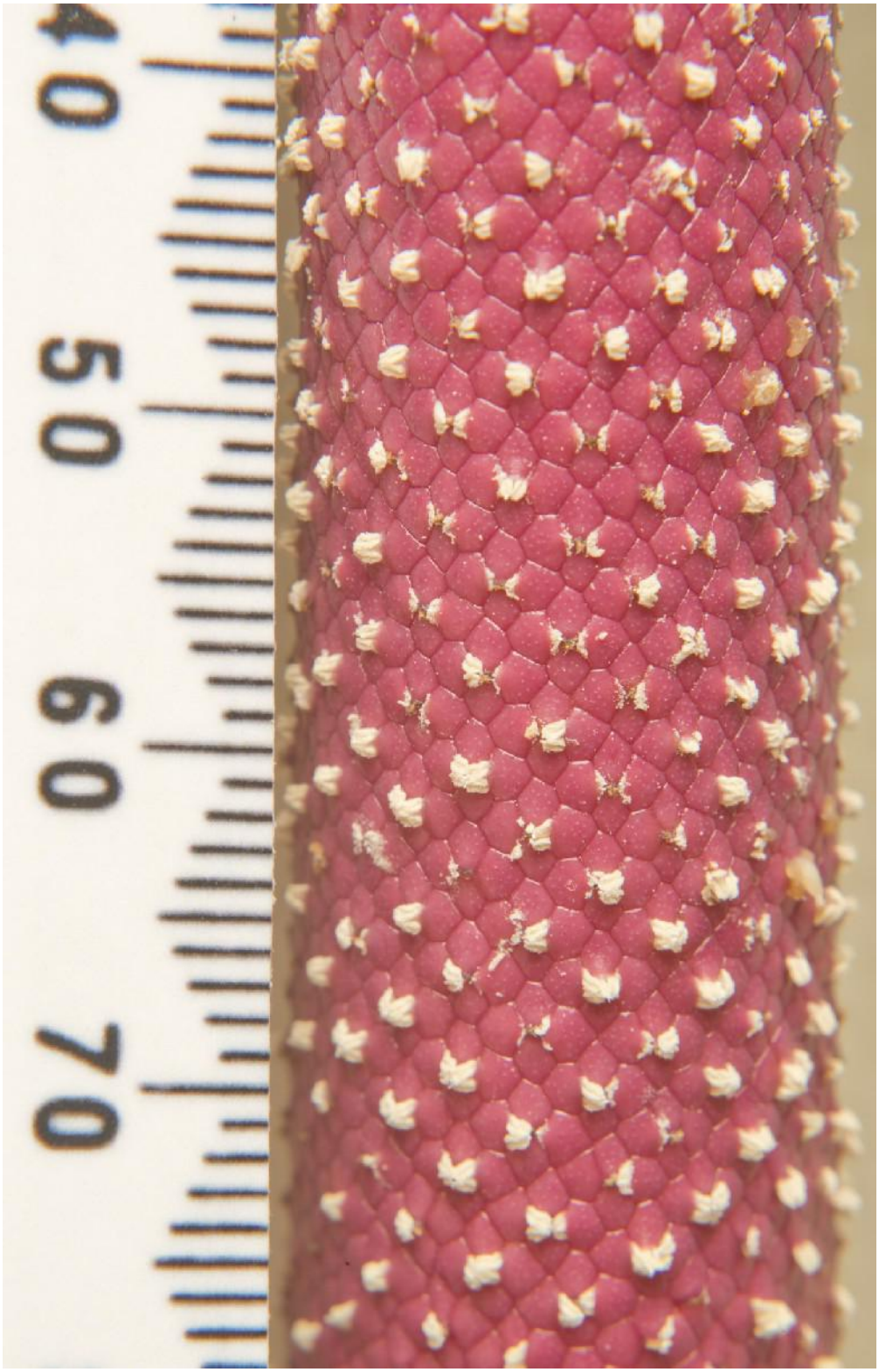

Figure 12. *Anthurium alexandri* Croat, Brownless & Belt. Close up of spadix showing flowers with stamens emerging.

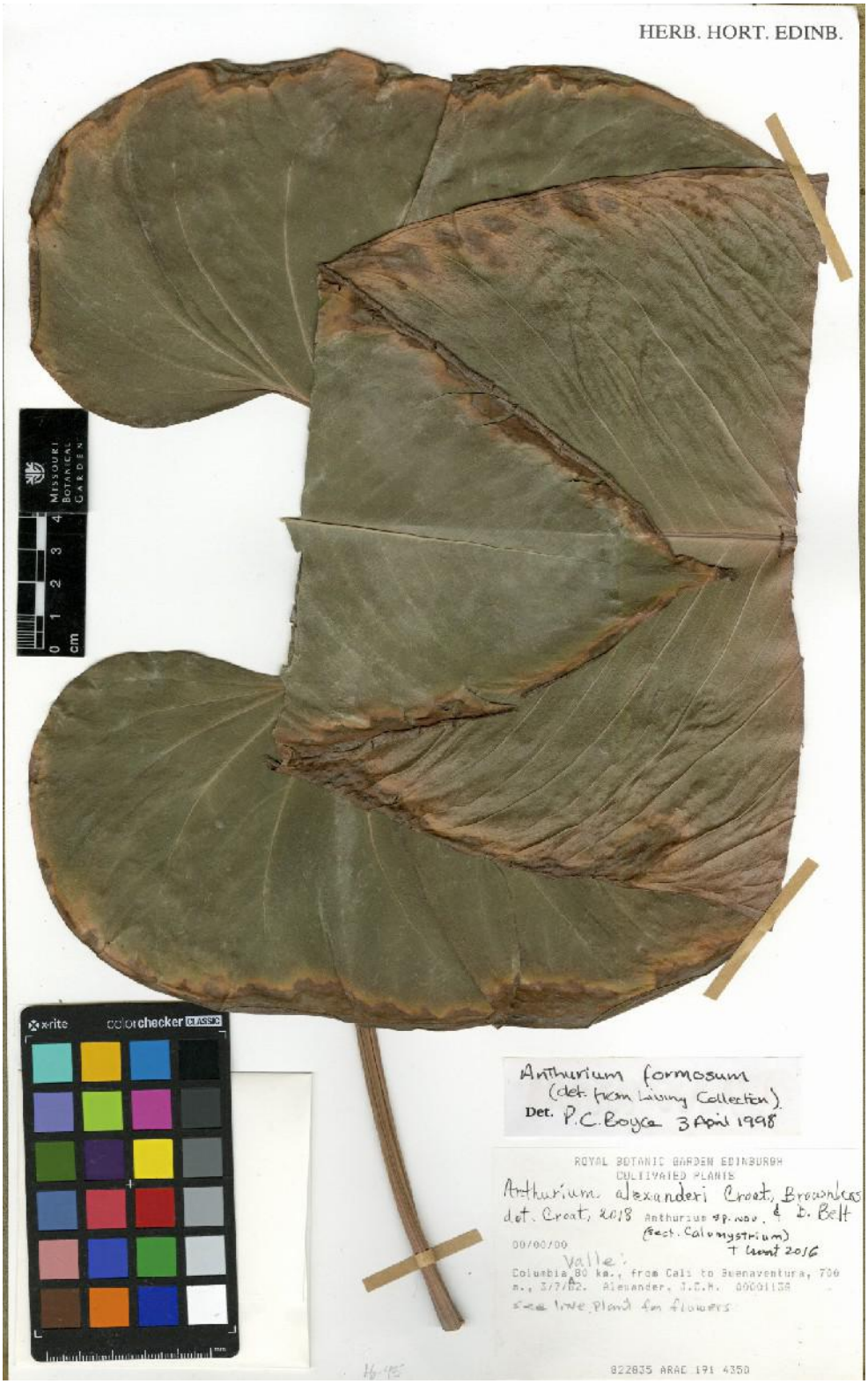

Figure 13. *Anthurium alexandri* Croat, Brownless & Belt. Herbarium specimen (*P. Brownless 1235*, E).

there is no soil at all. That said, the complete repotting of plants each year, allowing for a new soil mix (such as usually carried out at the Nancy Botanical Garden, Nancy, France) is also very favourable and usually encourages good growth. Since most aroids easily accommodate the removal of occasional leaves, old or unattractive leaves can readily be removed without adversely affecting the plant and this too helps to prevent the spread of disease. The research collection at the Missouri Botanical Garden regularly is collected for preparing herbarium specimens and this also allow for records to be updated. The original field descriptions are often greatly modified by the growing plants. Some plants first introduced as seedlings or as seed or as sterile plants thus only become available for study years later when they are first discovered in flower. Many new species were first discovered in the greenhouse, several after many years masquerading as some other species. This indeed was the situation at the Royal Botanic Garden Edinburgh with the plant being described here.

Anthurium alexandri Croat, P.Brownless & Belt, **sp. nov.** Type: Cult. RBG Edinburgh, Acc. no. 19822835 ex Colombia, Valle del Cauca: Along road from Cali to Buenaventura, km 80, 700 m (orig. coll. 3 July 1982, J. Crinan Alexander 1138), voucher April 2017, P. Brownless 1235 (holotype, E; isotypes, COL, MO). **Figures 1–13.**

The species is closely related to *Anthurium formosum* Schott which differs in having more broadly ovate dark brown-drying blades that are less than 1.7 times longer than wide and glossy on both surfaces with the sinus hippocrepiform to spathulate. Other differences are that *Anthurium formosum* has the posterior ribs prominently turned upward (not inwards), and petioles that are not reddish punctate-lineate.

Terrestrial; **internodes** short, thick; **cataphylls** marcescent, reddish brown, 31 cm long, 6 cm wide near base. LEAVES with **petioles** 77 cm long, 0.8 cm diam. midway, subterete, deeply and narrowly sulcate, medium green, weakly glossy, drying strongly ridged,—and pale greenish brown fading to pale brown, inconspicuously reddish punctate-lineate, weakly glossy; **geniculum** 2.5 cm long, slightly enlarged, drying slightly darker than petiole; **blade** ovate-cordate, sagittate, 67 cm long, 39 cm wide at the petiolar plexus, 1.7 times as long as wide, 0.89 times as long as petiole, abruptly short acuminate at apex, prominently lobed as base; subcoriaceous, darker green, matte above, lighter green, semiglossy below, drying gray-green and matte above, greenish and semiglossy below; **anterior lobe** 46.5 cm long, broadly convex and undulate on margins, weakly concave near petiolar plexus; **posterior lobes** 18 cm long, 20 cm wide, pointing inward; **basal veins**, 9 pairs, 1st & 2nd pairs free to base, 3rd & 4th pairs fused for 1.5 cm, 4th & 5th pairs fused for 3.3 cm, 5th & 6th pairs fused for 5.1 cm, pale reddish brown; **posterior ribs** 6 cm long, weakly curved,

naked entire length; **sinus** closed, obovate, 9 cm long, 5.4 cm wide; **midrib** narrowly rounded and moderately paler above, sunken toward apex above, narrowly rounded and paler below, drying flattened and weakly ribbed toward apex, sparsely and minutely reddish punctate-lineate above, pale brown, much paler, flattened and weakly ribbed toward apex below; **primary lateral veins** 9 pairs, departing from midrib at a 55–60° angle, narrowly raised and paler, moderately quilted above, narrowly rounded and paler below, drying rounded to acute on both surfaces; **interprimary veins** present; **tertiary and reticulate veins** present, concolorous; **collective veins** arising from 8th pair of basal veins, 4 mm from margin; **upper surface** densely and minutely granular, densely pale-lineate (both short and longer lineations); **lower surface** sparsely obtuse-granular. INFLORESCENCE erect-spreading; **peduncle** 27 cm long, 6 mm diam. midway, 0.35 times as long as petiole, drying grayish brown, ribbed; **spathe** 18.5 cm long, 5.5 cm wide midway, creamy white inside, greenish yellow medially on outside, the margins broadly tinged with faint lavender, drying pale brown, darker near the base inside, brown at the base, becoming pale to yellowish brown with reddish violet especially along the margins approaching the apex outside; **spadix** 14–15.5 cm long, 1.2–1.5 cm diam. midway, sessile, smooth, weakly semi-glossy, pale lavender-purple (B & K 7.5/8) during pistillate anthesis, reddish purple (B & K 5/6) during staminate anthesis, drying yellowish brown to deep reddish violet; **flowers** 4-lobed in plan view, 3.2 mm long, 3.2 mm wide, the edges jaggedly sigmoid; tepals smooth, glossy, faintly and sparsely pale-spotted; lateral tepals 1.6 mm wide, broadly rounded on inner margin, obtusely 3-sided on outer margins; stamens held at level of tepals, beginning to emerge in the lower 1/3rd of spadix and developing upward and downward along its length; anthers white, 0.7 mm long, 0.8 mm wide, thecae ovoid, moderately divaricate. Berries not seen.

Anthurium alexandri is a member of sect. *Calomystrium* characterized by its short thick internodes with dense intact reddish brown cataphylls, subterete narrowly and deeply sulcate petioles, narrowly ovate-sagittate narrowly acuminate blades with a hippocrepiform sinus, 9 pairs of basal veins, the first pair of which are free to the base, the posterior rib naked throughout most of its length, 9 pairs of primary lateral veins, green drying matte upper blade surface, moderately paler and greenish gray lower surfaces.

The species is named in honor of Scottish botanist, J. Crinan Alexander who worked at the Royal Botanic Garden Edinburgh and collected the plant from which the type specimen was later made on a trip to Ecuador and Peru. He spent much of his career at the Royal Botanic Garden Edinburgh and worked on the European Garden Flora production team. Dr Alexander is now retired and living in Scotland.

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