SCRI was formed in 1981 by the amalgamation of the long-established Scottish Plant Breeding Station (SPBS) at Pentlandfield, Edinburgh, with the Scottish Horticultural Research Institute (SHRI) which already existed at Invergowrie, Dundee, on the north shore of the Tay estuary in Eastern Scotland.

**The Scottish Plant Breeding Station (SPBS)**
The SPBS was established in 1921 at Craigs House near Edinburgh, close to a new Government Registration and Seed Testing Station, to “establish a thoroughly equipped station for the improvement of agricultural plants, the improvement to be attained partly by selection and partly by the creation of new varieties possessing those qualities which will make them most profitable under Scottish conditions”.

The first crops to be grown at Craigs House were oats, barley and potatoes; collections of varieties were obtained and their performance monitored to determine which were best suited to local conditions. Not long after, improvement of swedes and turnips, ryegrass, cocksfoot and timothy grass were included in the remit.

Staff numbers grew slowly and steadily over the next 25 years, but by 1945 further impetus to the development of agriculture and the attainment of self-sufficiency in basic foodstuffs was given by the emergence from the war years. As a consequence, additional staff were appointed, and in 1947 the SPBS acquired some land on the University of Edinburgh’s Bush Estate south of Edinburgh on which they built a new research station. The new facilities at Pentlandfield were officially opened by the Secretary of State of Scotland in 1955.

**Oats**
In the early years when oats was a major cereal crop in Scotland for animal fodder and human consumption, considerable work was carried out at SPBS in the development of new varieties with early ripening characteristics, resistance to lodging, low levels of husk and fibre, and resistance to stem eelworm (*Ditylenchus dipsaci*). As barley gradually supplanted oats as the major animal feed crop in Scotland, work on oats declined and effectively concluded by 1981.

**Barley**
In the 1960s, trials were carried out in collaboration with the Plant Breeding Institute, Cambridge, to trial barley selections for their suitability for Scottish conditions; a crossing programme was started in 1966, selections being made on the basis of high diastase and high amylase characters to improve acceptability to malsters. In the 1970s, as the seriousness of resistance became apparent, resistance to mildew, *Rhynchosporium*, yellow rust and brown rust were included in the programme.

**Grasses**
Work was carried out at SPBS on the development of new strains of cocksfoot, timothy and perennial ryegrass most suited to Scottish growing conditions with the aim of improving the quality of upland grassland.

**Forage brassicas**
SPBS carried out work directed towards selection and improvement of swedes, turnips, kale and forage rape. Interspecific crosses were made and difference in ploidy level overcome to create new forms and greater variability. Resistance to clubroot (*Plasmodiophora brassicae*) and mildew (*Erysiphe cruciferarum*) were also incorporated by this technique. The culmination of this work was the production of an inter-generic hybrid between *Raphanus sativus* and *B. oleracea* called Raphanobrassica which outyielded all other forms of leafy brassica available. The programme on breeding brassicas as forage crops declined throughout the 1980s.

**Potatoes**
Potatoes received a great deal of attention from the inception of SPBS, especially the breeding of resistance to wart disease (*Synchytrium endobioticum*) and late blight (*Phytophthora infestans*), the latter being a particularly intractable problem which is still being researched today. For example, although the dominant major genes, designated R genes, were identified and introduced, blight susceptibility soon returned. Dr William Black, the Director of SPBS, became an international authority on blight and the Station received many isolates for characterisation and distributed many seedlings containing R genes throughout the world. Black and coworkers observed that some genotypes containing the same R genes were less...
susceptible than others. Attention turned to this “field resistance” and, although polygenically controlled, field resistance was successfully incorporated into new clones. Present day varieties such as Brodick, Torridon and Stirling are direct descendents of this programme and show high degrees of field resistance.

In 1929 a special unit was established at Craigs House for work on viral diseases of potatoes which had become recognised as a serious problem. The early work concentrated on characterising the several virus diseases in potatoes, particularly viruses X, Y and S and potato leafroll virus (PLRV), and distinct strains within each virus were identified. This unit was amongst the first in the UK to introduce diagnostic serological tests in 1948. One successful outcome of this research was Pentland Crown which has a high degree of resistance to PLRV and to virus Y. The emphasis on virus diseases remains to the present with new useful sources of resistance being identified and new genetic technology implemented. Throughout the history of SPBS, other diseases have been added to the list under investigation, e.g. potato cyst nematode, common scab, gangrene and blackleg.

Material from the SPBS programme has always maintained a presence in the top varieties grown in the UK. At the heart of the continuing improvement and introduction of new genetic material is the Commonwealth Potato Collection.

Scottish Horticultural Research Institute (SHRI)
The SHRI was founded in 1951 at Invergowrie, largely as a result of the concerns of Scottish fruit growers over a decline in the vigour and yield of raspberry and strawberry crops. Initially the emphasis was on raspberries, and a system of introducing virus-free foundation stocks was developed to provide planting material for new plantations which helped to revive the failing industry. Several aphid-borne virus diseases were characterised in the crop and soil-borne nematodes were identified as transmitting raspberry ring spot; SHRI thus became a major centre in this area, developing the Glen series of varieties. Strawberry breeding at SHRI produced a series of varieties including Talisman and Red Gauntlet at Auchincruive, and blackcurrants and blackberries were also included in the breeding programme at Invergowrie. Alongside the breeding, pathology and agronomy of soft fruit, an active programme on vegetable crops developed, to support the increasingly important vegetable processing industry in the east of Scotland. Breeding efforts on cabbage, Brussel sprouts, beans and carrots were initiated, together with agronomic and pathological work.

The amalgamation into SCRI
Throughout the 1960s and 1970s, the SPBS and SHRI were administered by the Department of Agriculture for Scotland, acting on advice from the Agricultural Research Council.

A radical change to the administrative system was heralded by the Rothschild Report published in 1972 in which it was recommended that a substantial proportion of the funds administered by the ARC in England should be transferred to the Ministry of Agriculture, Fisheries and Food (MAFF). By 1975, the ARC initiated discussions on areas of overlap of research within the Agricultural Research service and concluded that research on potatoes, forage brassicas and barley should continue at SPBS, but that work on grasses and clover should be terminated. Raspberries and blackcurrants would remain at SHRI and culinary vegetables were to be transferred to the National Vegetable Research Station.

Further rationalisation was deemed desirable and, following the recommendations of a Working Party set up by the Secretary of State for Scotland in 1978, the SPBS and SHRI were amalgamated on the site at Invergowrie under the name Scottish Crop Research Institute (SCRI); the combined institute came into being officially on 1 February 1981. The transfer to Invergowrie was a phased operation and was not completed until 1991. The remit of the SCRI was “to do the research needed to sustain and increase crop production in Scotland and northern Europe...with emphasis on plant breeding, crop physiology, agronomy and crop protection. It will concentrate on potatoes, spring barley, forage brassicas, raspberries and blackberries”.

In 2000, SCRI celebrated 50 years at Invergowrie, and an 80-year history of outstanding contribution to UK agriculture.

SCRI today
The site
The Institute has 172 hectares of land, mostly free draining, rising from 15 to 140 m above sea level, adjacent to the laboratory complex and which is available for field experiments. Supplementary water for irrigation is provided from boreholes. There is a total of over 11,000 m² glasshouse accommodation on site, most of it with heating and supplementary lighting to provide year-round growing conditions. For more closely controlled conditions, there are over 90 growth cabinets and walk-in rooms of varying capacity totalling about 700 m² floor area. The John Home Robertson Research Glasshouse, opened in June 2000, is Scotland’s most sophisticated complex, with the most up-to-date facilities available for controlled, contained studies.

Varieties bred at SPBS, SHRI, and latterly SCRI, are widely released throughout the world. The ‘Glen’ series of
raspberries accounts for over 96% of the Scottish and 70% of the UK certified stocks, whilst a fifth of the UK maincrop potato area is planted to SCRI varieties including the ‘Pentland’ series, and more recent releases which are named after Scottish castles and other features. About 400 people work at SCRI, of whom around 280 are graduate scientists including some 150 short-term contract staff and research students.

Structure
SCRI is grant-aided by the Scottish Executive Environment and Rural Affairs Department (SEERAD) and has charitable status. It is one of five Scottish Agricultural and Biological Research Institutes (SABRIs) which, together with those of the Biotechnology and Biological Sciences Research Council, form the agricultural and food research service of the UK.

Training
A special emphasis is placed on providing training for PhD students (in collaboration with Scottish Universities) and visitors from overseas. In the last five years, collaborative research links have been maintained with over 300 institutions in 54 countries. Staff are housed in recent, purpose-built accommodation arranged compactly on the Invergowrie site. The research is divided into three broad themes:

- Mechanisms & Processes
- Genes to Products
- Management of Genes & Organisms in the Environment

Each theme is further divided into a number of programmes. The Institute also administers Biomathematics and Statistics Scotland (BioSS). The research is supported by a Finance and Administration Division, which includes Engineering and Maintenance; Estate, Glasshouse and Field Research; Scientific Liaison and Information Services; and Information Technology units.

Research
A broad, yet fully integrated programme of fundamental and strategic research of the highest quality is a special strength of the Institute. The range of skills available, from fundamental studies on genetics and physiology, through agronomy and pathology, to glasshouse and field trials is unique within the UK research service. In particular, SCRI seeks to create and protect wealth in relevant industries, to improve the quality of life, and to protect the environment.

SCRI collaborates with many research centres in Europe and throughout the rest of the world on a wide range of scientific disciplines and crops. It actively seeks research contracts from levy boards, international agencies and commercial companies.

For further information on the SCRI contact the Information Office: W.MacfarlaneSmith@scri.sari.ac.uk

GENE CHIPS

The first public release of plant gene chip information was launched at the Society for Experimental Biology conference in Swansea, UK, on Friday 12th April. Scientists from the Nottingham Arabidopsis Stock Centre (NASC), part of a multi-million pound resource network, announced a newly accessible plant gene chip database which is available through the internet.

Gene chips are produced in a similar manner to silicon chips, but instead of wires and transistors, the chips are covered with nucleotides and ‘virtual gene’. These chips allow scientists to take a small sample of an organism and then electronically show the simultaneous state of thousands of the RNA products from genes in that organism. This potentially gives you a ‘barcode’ for the plant or animal and can be used in applications stretching from basic research to the real-time effects of GM manipulation, providing an exhaustive ‘contents’ list for a transgenic organism. The ‘barcode’ allow you to take a snapshot of the state of an organism telling you, for example, which genes are switched on in response to different exposures of light in a flower. The data is generated using Affymetrix gene chip technology and has been one of the hottest applications in the biological community for the last few years.

The gene chip is currently the only available chip for plants and covers the model plant Arabidopsis, at present covering 8000+ genes, to be increased to the plant’s full complement of 25 000 genes later this year.

“It is now possible to take a GM plant, compare it to a standard plant using gene chips, and precisely see ALL of the changes that have occurred. This takes away a great deal of the unknowns in genetic manipulation and will make the analysis of transgenic crops a more exact science,” said Dr Sean May, director of NASC.