

# Science Communication:

## A guide to working with Black and Minority Ethnic Communities



**The African Network for Science and Technology & the British Association for the Advancement of Science**

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## **Foreword**

Many people might ask why the contributions of Africa should be included in an American science curriculum. Carl Sandburg (1979) related a dialogue between a white American and an American Indian which illustrates the need for multicultural education:

The white man drew a small circle in the sand and told the red man, "This is what the Indian knows," and drawing a big circle around the small one, "this is what the white man knows." The Indian then took the stick and swept an immense ring around both circles and said "this is where the white man and the red man know nothing.

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### **Glossary of terms**

- ethnic minority – a group culturally and/or racially distinct from another, represented in small numbers in a country or territory
- Refugee – seekers of refuge, usually in another country, from political, war, natural disasters and other kinds of oppressive strife
- Asylum seeker – an individual seeking refuge from various types oppression
- Newly-arrived – recently arrived in a foreign country
- Patois or patwa (from French) – usually unwritten dialect, deemed incorrectly by some to be inferior to standard written form of language. (See 'Creole'.)
- Creole (from the French) – person born of mixed European and African, Spanish or French ancestry as a result of the slave trade and colonisation. Has also been used to refer to the language spoken by Creoles.
- Dialect – a language spoken by groups from a particular geographic area or of a particular background. The language has its own grammar, vocabulary and pronunciation.
- Heritage – in this context, heritage is the cultural or racial background of a person
- Dual or Mixed heritage - a person biologically sharing two or more cultural or racial backgrounds

### **Abbreviations**

- ACNST – African Caribbean Network for Science and Technology
- BME – black and ethnic minority
- DH – dual heritage
- DISC – Developing Inclusion in Science Communication
- EAL – English as an additional language
- EMA - ethnic minority achievement
- LEA - local education authority
- MORI – Market and Opinion Research International
- NESTA - National Endowment for Science, Language and the Arts
- OECD - Organisation for Economic Cooperation and Development
- PCT – primary care trust (health services)
- REC – race equality council
- RS – The Royal Society
- SET - science, engineering and technology
- STEM - Science, technology, engineering and manufacturing
- TTA - The Teacher Training Agency
- UCE - University of Central England

## Part 1

### Background to the Guide

*The size of the ethnic minority population in the UK has increased significantly over recent years, from only 1 million three decades ago to 4.6 million today, representing 7.9% of the total population of the UK. This population is diverse: half of the ethnic minority population is Asian, chiefly Indian, Pakistani or Bangladeshi and a quarter describe themselves as Black, either African or Caribbean.*

*(2001 figures: Source: Office for National Statistics)*

### Involvement of BME Groups in science-related activities

It has long been the work of the African Caribbean Network Science and Technology (ACNST) to address the under-representation and under-participation of African Caribbean heritage and other communities in UK scientific enterprise. The work, carried out under the Delivery Inclusion in Science Communication (DISC) umbrella, is located in three regions: Northwest England, the Midlands and London. It aims to create an effective national framework to facilitate empowering networks and sustainable partnerships between ethnic minorities and the science communication community by engaging both groups in consultation and dialogue.

Nationally, science communication activities suffer from a paucity or an invisibility of such groups. Participation in science-related study and careers is all but negligible and attendance at science events such as festivals or museum-based activity likewise. Part of the issue is the lack of sustained monitoring practice of the various groups attending events which hinders the accurate picture of what the reality is. Science's non-registration on the 'interest' radar for youngsters and adults is also a major contributory factor.

This work was commissioned in order to work with BME groups to build an understanding of the various issues for those groups that can impact science communication. It has flowed from DISC's year 1 work highlighting impact issues that would hinder involvement in science communication activities. A key finding from DISC delegates was that more intelligence on the various BME groups/organisations must be gathered in order to include them successfully. Equally, the Science communicators by their attendance at DISC conferences community have begun to recognise the need to be more inclusive; they too are bemoaning the woeful access to BME groups in the past.

Ventures such as DISC will hopefully mean an honest engagement with this neglected section of the population not just as window dressing but with a real spirit of integrity and sustained action.

The British Association for the Advancement of Science (BA) in partnership with DISC are some way along in this process assisting with year 1 and 2 conferences that have linked BME groups and science organisations for partnership activities.

## What's taken so long?

Other sectors, particularly education and the arts, are familiar with the idea of considering the need for inclusion and, hence, are advanced when dealing with BME communities. Anguish or disquiet arising from issues such as suitable language use around race or wondering how to reach various communities is not as pronounced as it once was in these sectors, through the development of good practice. This is attributable to various factors, including:

- The need to understand the issues given the numbers of BME communities assisted by or working with these agencies or sectors.
- A developing understanding of legislation as regards equality of opportunity and the acknowledgement of diversity, institutional racism and discrimination with regard to education and employment.
- Location of community arts centres, schools and similar venues: if these are in the heart of the community then the community is easier to reach and to know; familiarity and partnership with groups results, BME group members are a source of advice and knowledge and importantly, a source for employment.
- The growth of Black History Month has given organisations and sectors a chance to test out activity in a safe, non-threatening way, particularly with a view to enhancing the study and career choices of the community.
- BME groups and schooling has been a contentious area for over forty years. Schools with high BME populations have had no choice but to confront race, school improvement and curriculum representation issues.
- The use of ethnic monitoring statistics is providing a basis for understanding how the various communities are faring. An emerging picture of for instance, employment, school performance at 16 or demographic patterns has stimulated debate and inform strategy on inclusion.
- Pressure via The Race Relations Amendment Act 2000 has provided an imperative for the business and public sector to closely examine even more closely their policy and practices relating to inclusion.

This management of this change has taken considerable time and there is still much more groundwork to do. However, the measurable gains for certain sector organisations determined to challenge the status quo and to change policy and practice are transferable to the SET sector.

Also, BME communities are already used to the widening of participation in other sectors and will expect it of SET communicators. Once the SET sector accepts that change needs to occur within its institutions and it has dealt with the issues outlined above, trust from and interaction with the BME communities will be a welcome and swift consequence.

## **Agencies that can provide assistance to Science Communicators: *the Commission for Racial Equality (CRE) and Race Equality Councils (RECs)***

The Commission for Racial Equality (CRE), which is currently under threat, is able assist organisations, individuals and groups in regard to their legal rights and obligations regarding discrimination. Their useful website offers advice for everything from monitoring ethnicity to research and analysis. Race Equality Councils (RECs) do likewise at local level and assist individuals in pursuing cases of race discrimination.

The legal framework establishes clearly that the Race Relations Amendment of 2001 makes it a statutory duty to promote race equality. Public authorities should, five years on, be ready to provide fair and accessible services and deliver improvements in equal opportunities and employment. This was the outcome of the murder of Stephen Lawrence and the subsequent McPherson enquiry into his death which led to recommendations that bolster this legal framework.

Thus, organisations are to work to:

- **eliminate unlawful racial discrimination,**
- **to promote equality of opportunity\* between persons of different racial groups and**
- **to promote good relations between persons of different racial groups**

\*(section 71(1), Race Relations Act 1976 as amended (the Act) and the various specific duties, including employment duty that were introduced by way of statutory instruments).

The Race Relations Amendment Act 2000 mandates businesses, schools, authorities and government to undertake ethnic monitoring. Science communicators and providers, therefore, are not exempt from examining their own organisational practices.

### **Ethnic Monitoring**

As stated previously, data provides evidence of the real picture of the extent to which BME communities are included in society, be it in employment or on a SET communication programme. Again, advice is on offer on the CRE website (<http://www.cre.gov.uk/about/localwork.htm>) or from RECs with exemplar forms and mechanisms for gathering and monitoring statistics. Monitoring categories vary according to whether organisations are based in Wales, Scotland or other parts of the UK.

The agencies are clear in stating that the guidance may be useful but that communities and their self-definitions vary according to how long they have been settled, background and heritage etc. The CRE has also expanded the 2001 categories used for the census, shown in brackets below.

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Suggested are:

- A: White:
  - British
  - Irish
  - Other

(Expanded category: White English, White Welsh, White Scottish, Other)

- B: Mixed:
  - White and black Caribbean
  - White and black African
  - White and Asian
  - Any other mixed background

- C: Asian or Asian British
  - Indian
  - Pakistani
  - Bangladeshi
  - Any other

(Expanded category: Asian English, Asian Welsh, Asian Scottish etc)

- D: Black or Black British
  - Caribbean
  - African
  - Black Other

(Expanded category: Black English, Black Scottish, Black Welsh etc)

- E: Chinese

(Expanded category: Chinese English, Welsh or Scottish) or any other

## Why the Midlands?

This groundbreaking portfolio of information has been drawn from members of the various minority communities in the Midlands. The area was selected as a representative region for perspectives and the wide variety of groups that are easily accessible. The following groups are well represented across the region:

- African Caribbean
- African
- Pakistani
- Indian
- Bangladeshi
- Vietnamese
- Somali
- Chinese
- Dual Heritage

High concentrations of single communities remain in particular areas, especially in Birmingham, Nottingham and Leicester. Pockets of poverty and disengagement from services e.g. housing, health and schooling exists for certain groups. Other BME communities have prospered and have a strong showing in industry and commerce.

Information for the guide was sought via focus groups discussions, through one-to-one sessions and telephone interviews across communities that were both newly arrived and established. Various age groups and religions were targeted and care was taken to ensure both genders' view was represented.

Their comments mirrored those expressed at the initial DISC consultation events. Analysis of the responses by attendees nationally showed that:

- 73% of BME groups had never undertaken science communication activities
- 4% of science communication organisations had worked with all ethnic groups
- 95% of BME groups had no links at all with science communication organisations
- 9% of BME groups had ever received any information on activities such as National Science Week.
- 93% of BME groups are interested in undertaking science activities
- a powerful tool for BME groups is word of mouth, indicated by 84% of respondents
- 72% of BME groups and 86% of science communication organisations have no links with BME scientists
- 85% of BME groups have no access to funding for science communication activities

Many of the BME individual and groups' conversations reflect the above. They had never read or received information regarding various science events or weeks and science was not a feature in their everyday lives and reflections.

The figures above reflect a lack of inclusion that is profound. It also demonstrates the few numbers of BME communities feeling confident enough that they could study and take up SET careers and/or aspire to become role models. Whilst communities appreciate the need to be literate and numerate, science remains a remote and distant consideration.

The latter is a pity as extensive examples of the achievements of particularly, African-heritage and Asian scientists, historical and contemporary, is available, if not widely. Africans, in America, historically, were inventive, many gaining patents for inventions of one kind and another, often forerunners of machines and technology today, in his seminal book, *Blacks in Science: Ancient and Modern (1990)* makes mention of many of these activities and discusses how slavery and seeking freedom dominated black minds and this meant an underperformance in the various fields of SET and education as it was not allowed by slave holders in general. Dr Sandra Harding in her 1993 work, *The Racial Economy of Science*,

*Toward A Democratic Future* talks about SET and culture; to her issues around 'bad' and non-multicultural science has been and remains problematic for communities.

Middle Eastern and South Asian ancient science scholars (please see Representations of Science repository on this portal) have provided the foundation for mathematical and scientific knowledge in the West although this fact is frequently omitted or lightly addressed in academics papers or books, whether for pupils, adults or SET professionals

This points to poor school experiences and non-stimulating, often inappropriate Eurocentric curricula. This is possibly more the case for sciences than other subjects. SET subjects are still considered to be race-free areas or neutral abstract subjects and issues of race do not apply. Yet, science has been used to underestimate and cast doubt on the abilities of visible minorities. Science thinking and development will always be part of the prevailing social ideas and community and here, this has been to the detriment of excluded BME communities. BME groups and their environments are researched using Eurocentric models and subject to Eurocentric notions. How often are these groups the SET researchers who understand cultural, social and religious values of the BME community in relation to science? The achievements of minority scientists are barely acknowledged or included on school syllabuses. However, these curricular inclusions enthuse and provide powerful inspiration all youngsters to succeed and provide a human face and background to potentially difficult and abstract subjects. Also, some schools are in areas of deprivation and challenge; social class and the effect on life chances, attitudes and ambitions of young people are among the complex factors in education.

Poor schooling, poor and stereotypical careers advice and racist practices ensure that BME pupils of certain backgrounds imbibe a notion of education that never recovers from such acute negativity. The loss of confidence has a deleterious effect and in some cases may mean a retreat to undesirable, stereotypical outcomes for BME youngsters. It may also be that other family members over several generations have had similar experiences and this compounds the disassociation from schooling and sciences that can lead to under-attainment and poor employment opportunities later. For many adults of African Caribbean heritage, the underachievement began early in schools in the UK and never recovered or learning was resumed later in life.

This unsettling picture of schooling is been the subject of much research and intervention strategies such as the DfES's *Aiming High* programme for schools with African Caribbean heritage and other underachieving communities.

Populations in mixed conurbations such as Birmingham and Manchester are changing. The 'white flight' from urban area and an aging white population means young populations of colour will succeed them. It mandates all those concerned to ensure that minority communities feel included and can participate confidently in a society that accepts them in their schools, education facilities and workplaces; otherwise the consequences may be serious. Considering the future demographics of areas such as Birmingham, it is vital to recognise that to exclude minority communities means exclusion of groups who are the future potential workforce. Inclusion must equal investment in communities who may be able to attend closing university science SET departments. The population landscape is changing particularly in the Midlands and elsewhere across Europe and it is the BME communities in those areas who may well be the source of future scientists as city demographics alter. The above is also vital if the science agenda for economic leadership in Europe is to be maintained.

Science educators and communicators must be fully cognisant of the barriers outlined above. Once these barriers are accepted as factors that hinder any interest and outcomes in science, then communication and trust can be built with the BME community, ensuring appropriate engagement and inclusion through high-quality SET activities.

It highlights the outstanding need for the science communication organisations to make inclusion of BME groups strategic, deliverable and monitored objectives within their internal policies and practice. This may require organisational change but would be a welcome shift in attitudes within the organisation. Science communicators need to ease their way towards BME communities so that inclusion become part of whole-institution organisational policy as opposed an individual's concern. The latter approach has been a common systems failure in organisations and is realised particularly when the individual leaves the organisation taking knowledge and contacts with them. It leads to reinvention and can connote a lack of interest in inclusion.

The DISC conferences brought science communication organisations together with BME groups and both are in enthusiastic agreement that they must move forward. Community members interviewed enjoyed contributing to this resource but are adamant that it was not an empty exercise. Science and its related fields provoked much interest and discussion, even when groups initially expressed disinterest. Once groups were able to fully appreciate the notion and impact of SET activities, they readily discussed aspects of GM foods, nanotechnologies or late-onset Diabetes and they were particularly interested in what affected their lives directly. Groups admitted that they had gaps in their knowledge regarding specific SET areas; there was no lack of interest. This erases the notion that certain BME groups do not consider science. This went across gender, age and abilities. BME groups did, however, comment vehemently on teaching and a level of arrogance shown by knowledgeable science specialists towards non-scientists or students not so au fait with the subject matter.

Some minority groups were given doubtful and stereotypical careers' advice; the suggestion of following a SET-related career was often met with derision and alternative suggestions regardless of the pupils' learning outcomes.

BME groups also commented on having to deal with SET professionals such as health personnel whose science communication skills are not always apparent when explaining medical conditions. The communities said when they first arrived they were made to feel ignorant and sometimes sidelined or 'talked over' especially if they were unable to speak English.

This DISC initiative is seen as vital to ensuring minority ethnic inclusion in science communication. For both SET communicators and BME organisations and individuals, the lack of inclusion can be dealt with by providing guidance –based resources and intelligence that informs both science communicators and BME groups.

It takes forward the priorities from the DISC consultations, namely:

- providing training events and materials/content to support the science community's work with BME groups: workshop events have been organised by DISC with invited science communication organisations and BME groups. Joint partnership working is an outcome, together with the identification of specialist science funding opportunities to assist science communication programme development
- collation of ideas, information and guidance on the various groups in order that appropriate activity is structured
- ideas on include how to use informal networks and the BME media, from broadcast media, journals and newspapers to the web.
- Supporting science communication organisations. This would provide extensive opportunities not only to recruit BME communities but to also involve them in debate and discussion of issues and not only those that relate directly to the communities but issues on e.g. nanotechnologies or 'bio-piracy' (the practice of privatising and unauthorised use of biological resources by agencies etc outside of a country).

- Building knowledge and understanding of the BME communities by religion and various cultural practices in order to better cater for communities.

Science communicators unused to BME groups will find enthusiasm and knowledge despite the very mixed, patchy picture of participation in SET among BME groups

### Why perceptions develop: attitudes to science

The subject is deemed unpopular with students whose perceptions about science and science teachers are formed well before the end of primary schooling.

The BBC's web homepage (<http://news.bbc.co.uk/hi/education>, 7.2.05) carried a report on children's views about scientists. They were seen as 'boring eccentrics'. This was the perception of scientists to children as young as eight:

"children as young as eight may be put off the idea of becoming scientists because they see them as "middle-aged white males who never have any fun"

This research, carried out by the University of Leicester from the SC1centre, the National Centre for Initial Teacher Training in Primary School Science, surveyed between 4000 and 5000 children in Leicester and Perth Australia. Images drawn by children showed males in white coats and glasses with eccentric hair, boys never drew girls, only very occasionally were women drawn and it was rare for a black or Asian student to draw a black scientist, reinforcing the invisibility factor.

As learning is not the coolest thing for some youngsters, the notion of the 'boffin' big-foreheaded scientist reinforces this notion.

Generally, as students move through school, SET curricula are eschewed in favour of 'softer' studies or it is not always encouraged as a future path for students by careers' service personnel. The experiences of some BME group members have been mentioned elsewhere. In many cases, they choose alternative studies or leave school on the basis of poor careers information or suggestions that science is not suitable for them, even when students show a propensity towards the subject. This is particularly the case of African Caribbean students. Bangladeshi and Pakistani communities also experience underachievement but the Indian and Chinese community are outperforming white communities in this area. This demonstrates the peculiar attitudes to individual communities and their learning. It is also of great concern that this state of affairs continues to exist.

Practical experiments in the classroom seem to be on the wane also particularly in the more challenging schools (see *New Scientist* 17.9.2005, p41). Whilst primary schools offer a more exciting view of science in a cross-curricular way, rigid secondary curricula does not appear to retain the excitement that science can generate. Relating abstract activity to everyday contexts, collecting and debating science news stories weekly, role models, external visits and ethical debates are all valid curricular activities which are under-utilised and enable all youngsters to become 'science-literate' (see later section on science literacy).

The TES (Times Educational Supplement) pullout section on Science (7/1/05) looks at the above issues with an interesting article on science experiment writing. Rupert Sheldrake, biologist and author, is adamant that the direct, active voice i.e. the first person or 'I' is used as opposed to the passive. He is keen that schools wean themselves off this style, seeing it as outmoded and not authentic; the direct descriptions are easier for pupils and schools abandoning this approach would find themselves in good company (journals, scientists etc are adopting the direct voice). Traditionalists may baulk at this development but the inclusive nature of direct writing is more direct.

Literacy and numeracy are contributory issues. Many youngsters' basic knowledge of these areas is insufficient. If children find it hard to acquit themselves well in their own or another language, then it is little wonder that science learning will be problematic. It gives them a low base from which to operate which can only make science learning arduous.

However, effective schooling, inclusive curricula, the use of role models and science communication targeted at including BME groups in partnership with BME communities will help to dismantle barriers to the subject.

## Other factors in science learning

1. Educators from BME groups are an issue. These teachers do not exist in great numbers and the Teacher Training Agency (TTA) and LEAs aim to recruit and retain further numbers. Some science departments in schools have a fair sprinkling of BME teachers, particularly from abroad, although there are issues regarding the recruitment of teachers from countries where they are already in demand. The BME Science teacher is simultaneously science professional and role model who is charged with getting scientific understanding and enjoyment right so that it equals achievement but in-school support is critical. Often the driver of BME activities in school will be a BME teacher but they may be expected to carry the role alone and without reward or support. Also, they may be regarded as the expert on BME issues and not recognised for other skills or roles which places limits on that teacher.

2. The Royal Society report (Science, Engineering and Technology and the UK's Ethnic Minority Population. A report for The Royal society) must create operational opportunities from its research. This research, by Warwick University went deep and wide in its analysis of the current situation regarding BME communities and science careers and study and science communication. The resulting statistics expose the institutionalisation of policy and practices that excludes certain communities or stereotypically, demonstrates achievement and success for certain communities but only in certain fields e.g. Health. The statistics call for action on inclusion and they also highlight the need for sustained, ongoing statistical data collection and research in order to capture more intelligence about the state of affairs. Once collected systematically and more fully, the need for action will be even more overwhelming than it is currently.

3. Role model work carried out by various agencies including The Royal Society (RS), The National Endowment for Science Technology and the Arts (NESTA) and OPM Partnership has been collated into a good practice guide, *Taking a Leading Role* (see references). On offer is advice for role model engagement, activities and evaluation.

Critical to the success of any role model scheme is the recognition for role models and their conditions, financial and physical. Any scheme needs to have excellence as a standard in order to attract and retain them as well as enough role models to share the plentiful work and make a difference. This is a key area given the findings in the Social Research Institute report *Science in Society* (March 2005). The report indicates that BME groups are less likely to have 'scientists or engineers among their friends and relatives yet

*"Conversely, on qualifications, BME individuals are more likely than White people to say they have studied science to 'A' level, or to have any science qualification (GCSE/ 'O' level, or/and 'A' level, or/and degree." (p66.)*

If the BME community have SET qualifications, then further data collection and statistical analysis needs to demonstrate this and research needs to identify what professions they occupy.

The MORI report also indicated the following:

White people were more likely than minorities to state that they have scientists or engineers as friends, that they meet scientists or engineers at least once a month, or that they work with scientists or engineers. Yet having friends and relatives in the science field is one of the key drivers for science study and careers.

This interesting section also goes on to analyse perspectives on a variety of science-related issues which highlights differences in perspective between minority groups and Whites.

A national database of BME role models would be a key shibboleth in addressing this paucity of visible BME scientists.

4. Science and Engineering Ambassadors (SEA) (via Set net) is another initiative but it appears underdeveloped as a scheme and little is known of it. Extensive groundwork needs to be carried so that this strategic activity ripples out further than it appears to be at the moment, in order to filter through to communities. Initiative such as SEA should be given the resources to recruit STEM ethnic minority professionals could be databased and called on and paid for conference-, schools-based and community programmes.

### **What more could be done?**

The BME community must confidently engage with SET, via study, careers and science communication activity. Community agencies with an empowerment agenda can help to lead on a national campaign in the same mould of literacy campaigns on television, radio or in the BME press at national, regional and local level.

Additionally, the impetus can come through schools, particularly those which have specialist science, maths, or computing status, otherwise the status is meaningless. Extra resources are given to specialist schools and role model engagement or an inclusive syllabus would democratise the curriculum and provide an opportunity to promote science and science-related subjects. Schools in areas of deprivation and social challenge are essential candidates for support as it is their pupils who are often in most need.

The science curriculum resources for teaching and learning and the practical elements of science need revision. Earlier scoping studies carried out for Ethnic Minority Achievement online (DfES project carried out by Leeds, Birmingham and Manchester LEA) with schools demonstrates this. Schools' questionnaires called for a diverse curriculum with high quality resources for their diverse BME communities and particularly:

- Audio and visual references reflecting pupils and their languages
- ICT-ready solutions which feature the diversity of the classroom
- Role models
- Games
- Black history information
- Posters
- Databases of information
- DVDs

and training in how to use these materials confidently.

Few BME pupils see themselves replicated on the pages of their textbooks or see role model biographies of BME scientists working in SET to make a difference; in some of more challenging schools, practical experiment experiences are also on the wane and inclusive SET teachers are hard to retain.

The careers service requires specialist personnel who are knowledgeable about science careers. Staff should be very clear about the academic predictions for pupils and advice given should be clearly based on those outcomes and pupils' options. Industry days and work experience could have a particular focus on SET activities. Pupils with a propensity towards SET should be selected for a Gifted and Talented school or similar programmes. Such programmes can be laid on by science communicators in conjunction with the school and careers' service.

Additionally, adults, particularly parents, should be encouraged to carry out science communication activities with their children/relatives in the home community environment as well as at specialist venues. These interventions can make an early difference, particularly when their children are making subject selections in year 9/11/13 later. Support for parents is available through the DfES and science communicators.

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A higher profile of the various SET weeks and events is an imperative as is marketing since very few BME community members know about them.

The BA, Royal Society, MORI, NESTA and ACNST are amongst the few ambassadors in this area with webspace dedicated to this aspect of science communication.

Further articles and practical advice is available on their websites and in their publications:

[www.the-ba.net](http://www.the-ba.net)

[www.royalsociety.co.uk](http://www.royalsociety.co.uk)

[www.planetscience.co.uk](http://www.planetscience.co.uk)

[www.ishangohouse.com](http://www.ishangohouse.com)

## **Part 2**

### **The Guide**

Comments on the value of this resource will be valuable as to materials, quality, usefulness, relevance and accuracy. The writer has ensured the latter wherever possible however, it must be noted that these notes are purely a guide and not definitive about BME groups and attitudes and practices.

Science Communication organisers are strongly advised to consult with and learn from their BME communities. Groups are not homogenous. Some are liberal, others more traditional. Groups are self-defining in terms of religious or cultural description. Their needs and wishes are dependent on all kinds of factors. This eclecticism is apparent in the shifts in group definition – e.g. African Caribbean to Black British, Asian to British Indian and so on.

Dual Heritage groups often do not register on any profile yet are one of the fastest-growing groups (particularly one black and one white parent). This group's experiences of underperformance at school and in employment is similar to the Black community. When undertaking ethnic monitoring at science communication events, feedback forms such those suggested by the CRE may be helpful to science communicators for the development of policy and practice.

### **Using the guide**

This guide has been laid out under generic headings relating to cultural, religious and political aspects of the various communities. This deliberate approach is about not encouraging the notion of a homogeneity amongst communities.

Tips for gaining insights into and the trust of various communities are offered as well as ideas for working with them in general and specific ways.

## The Statistical picture

The picture is patchy due to the lack of prior statistics for comparison, however, an attempt by the Royal Society through its report: **Science, Engineering and Technology and the UK's Ethnic Minority Population: a report for the Royal Society April 2005** makes a crucial start. All of the tables and statistics are taken from this important report.

For local areas figures from the 2001 Census are available from local government websites. Sites are data-rich with various measures and indices of e.g. poverty and deprivation to provide a complex picture of communities. The National Statistics Office is also a useful source.

### Figure 1: The number of minorities in the population

<b>Population of BME groups: 1971</b>	<b>1,000,000 population</b>
<b>Population of BME groups: 2001</b>	<b>4.6 million of population</b>

(2001 figures: Office for National Statistics)

In 2004 the UK was home to 59.8 million people. This represents a 19 per cent increase from its population of 50.3 million in 1951, and a 3.3 per cent increase over the last decade (1994 to 2004). 4.6 million of the population is represented by BME groups, the largest being Indian, followed by Pakistani, Black African, Black Caribbean, Bangladeshi, Chinese and other groups.

Also, National Statistics online mentions that until the mid-1990s, population growth in the UK was due to "natural increase – the number of births exceeding the number of deaths each year."

Since the late 1990s, there has been a growth in migration up to the current year, a main driver of population growth and much needed labour for the economy. Out-migration has also increased but to a lesser extent.

"Between 2001 and 2004, almost two thirds of the increase in population in England and the UK was due to net in-migration."

(National Statistics online)

In 2001, 4.9 million (8.3 per cent) of the total population of the UK were born overseas.

Immigrants have a variety of reasons for arriving but a consequence of short lengths of stay in the UK is that foreign populations are relatively young. This is particularly the case of arrivals from Africa and the Far East. Non-OECD (Organisation for Economic Cooperation and Development) migrants tend to remain longer than OECD migrants. Older, more settled immigrant communities such as the African Caribbean community have an older age profile.

The National Statistics site goes on to say,

**"Compared with the UK-born population, the foreign-born population has a greater mix of ethnic groups. While 92 per cent of people born in the UK identified themselves as White in 2001, 53 per cent (2.6 million) of the foreign-born population was White. The next largest ethnic groups for people born overseas were Indian (569,800) and Pakistani (336,400)."**

**Figure 2: Estimated numbers employed in SET by ethnic group and gender**

<b>Ethnicity</b>	<b>Male</b>	<b>Female</b>	<b>Total</b>
<b>White</b>	<b>1,059,900</b>	<b>189,000</b>	<b>1,248,900</b>
<b>Black- Caribbean</b>	<b>4,700</b>	<b>700</b>	<b>5,400</b>
<b>Black- African</b>	<b>5,400</b>	<b>1,900</b>	<b>7,300</b>
<b>Indian</b>	<b>22,400</b>	<b>7,700</b>	<b>30,100</b>
<b>Pakistani</b>	<b>5,700</b>	<b>1,600</b>	<b>7,300</b>
<b>Bangladeshi</b>	<b>700</b>	<b>200</b>	<b>900</b>
<b>Chinese</b>	<b>5,200</b>	<b>1,600</b>	<b>6,800</b>
<b>Other</b>	<b>18,800</b>	<b>4,400</b>	<b>23,200</b>
<b>Total</b>	<b>1,122,800</b>	<b>207,100</b>	<b>1,329,900</b>

**NB: Estimates for the UK based on weighted Labour Force Survey data 2002-3. Produced by the Institute of Employment Research, Warwick University, for the Royal Society**

Some communities have a healthy showing in SET areas, namely the Chinese and Indian communities. However, they are concentrated in one or two areas, especially the health and IT sectors.

Other communities are making strides which, as yet, are not large enough.

**Figure 3: Number of scientists in the UK who are non-British**

<b>Occupation</b>	<b>Estimated Employment</b>
<b>All British employed in SET occupations</b>	<b>1,239,400</b>
<b>All non-British in SET occupations</b>	<b>90,500</b>
<b>Of which:</b>	
<b>Science professionals</b>	<b>13,000</b>
<b>Engineering professionals</b>	<b>17,200</b>
<b>ICT professionals</b>	<b>39,000</b>
<b>Architects, Town planners and Surveyors</b>	<b>5,200</b>
<b>Technicians</b>	<b>12,200</b>
<b>Draughtspersons and Building Inspectors</b>	<b>3,500</b>

(Source: Pooled LFS, March 2002-August 2003 Figures to the nearest 100)

Overseas-educated SET professionals (90,000) who number almost a tenth of the total number of all the British SET occupation professionals (1,239,400).

Many successful students of either gender, begun their studies abroad and they would be used to seeing their relative communities being successful across many sectors, SET included so perhaps it is no surprise that they achieve or are likely to be successful. However, the spread of professions chosen is limited to three sectors as Figure 3 shows.

It is likely that there are overseas –educated SET professionals who have not been able to find employment because of British or European retraining demands or discrimination or English language issues. These professionals seem to be mainly concentrated in the ICT fields followed by general science professions, so a focus could be targeted at inclusion in a range of disciplines, particularly those that are buildings- or town planning-related.

Schemes to address inclusion issues, provide employment and to secure SET sector professionals are part of the solution. The success of such schemes, however, can be patchy, short-term and inconclusive about the merits of such an approach. However, the development of schemes e.g. such as those by The University of Central England (UCE) can widen participation for communities, enlightening them about the need for SET professionals and the scope SET careers can offer in terms of personal development and e.g. travel opportunities.

**Figure 4: Relationship between degree-level qualifications and SET occupation**

<b>Ethnicity</b>	<b>Degree</b>	<b>Of which: SET Degree</b>	<b>Of which: SET Occupation</b>
<b>White-British</b>	<b>11%</b>	<b>21%</b>	<b>31%</b>
<b>Black-Caribbean</b>	<b>7%</b>	<b>14%</b>	<b>27%</b>
<b>Black-African</b>	<b>20%</b>	<b>17%</b>	<b>29%</b>
<b>Indian</b>	<b>18%</b>	<b>22%</b>	<b>35%</b>
<b>Pakistani</b>	<b>10%</b>	<b>23%</b>	<b>33%</b>
<b>Bangladeshi</b>	<b>6%</b>	<b>17%</b>	<b>26%</b>
<b>Chinese</b>	<b>24%</b>	<b>26%</b>	<b>31%</b>
<b>Other</b>	<b>14%</b>	<b>19%</b>	<b>31%</b>

Source: Pooled LFS, March 2002-August 2003: Note: % refers to population 21 and over.

Figure 4 highlights how the Chinese study and then go into SET careers; the Bangladeshi and African Caribbean communities have the largest percentage of SET undergraduates who do not go into SET professions, a development that needs to be arrested.

**Figure 5: Ethnic Make-up of the student body, 2001-2**

**% of Student Body**

<b>Ethnicity</b>	<b>Student Body 2001-2</b>	<b>SET</b>	<b>Medicine</b>	<b>Other</b>	<b>% of population aged 18-25 years</b>
<b>White</b>	<b>1,326,615</b>	<b>81.61</b>	<b>83.71</b>	<b>88.87</b>	<b>88.31</b>
<b>Black-Caribbean</b>	<b>17,500</b>	<b>0.91</b>	<b>1.44</b>	<b>1.15</b>	<b>1.07</b>
<b>Black-African</b>	<b>17,500</b>	<b>2.33</b>	<b>3.72</b>	<b>1.54</b>	<b>1.14</b>
<b>Indian</b>	<b>30,900</b>	<b>5.48</b>	<b>4.24</b>	<b>2.64</b>	<b>2.46</b>
<b>Pakistani</b>	<b>52,000</b>	<b>3.27</b>	<b>1.80</b>	<b>1.34</b>	<b>2.13</b>
<b>Bangladeshi</b>	<b>27,710</b>	<b>.86</b>	<b>0.44</b>	<b>0.43</b>	<b>0.82</b>
<b>Chinese</b>	<b>7,970</b>	<b>1.50</b>	<b>0.79</b>	<b>.075</b>	<b>0.73</b>
<b>Other</b>	<b>54,025</b>	<b>4.05</b>	<b>3.87</b>	<b>3.28</b>	<b>3.34</b>
<b>Total</b>	<b>1,531,670</b>	<b>100.00</b>	<b>100.00</b>	<b>100.00</b>	<b>100.00</b>

Source: HESA Student data 2001-2

The above figures have been taken from *The Executive Summary of Science, Engineering and Technology and the UK's Ethnic Minority Population* and make sobering reading for all communities. This groundbreaking research brings into prominence the precise nature of SET activities across groups evidencing what may have previously been conjecture and guesswork.

Of great concern is the under-engagement of the Bangladeshi community, particularly women and within the African Caribbean community, black males.

It is not hard to be astonished by the above figures relating to BME groups. The lack of numbers going into SET professions needs to be acknowledged as a crisis.

The report's stark statistics demonstrate the reality of the general school-leaver picture; missing statistics worth gathering are those showing how many pupils, to include BME groups leave school without achieving a science qualification at 16 years and why.

Some students will have been permanently excluded and may never have returned to learning. Others will have moved house and been unable to find a place at a school of choice.

Pakistani, Bangladeshi and African Caribbean youngsters demonstrate the worst underperformance in science. Low attainment in English and maths is also consistent across the key stages where these groups are concerned, therefore it is little wonder that if ethnic minority pupils struggle with or are under-taught in the basic areas of English and maths, then under-attainment in science is an unhappy consequence of a their education.

The Chinese and Indian communities are over-represented in certain health-related science professions and the reasons for this are various.

It is likely that many of the BME communities' elders are relaxed about their children taking up professions that were important and carried status in the community back home. They

would encourage and be happy with these career choices as they were familiar with the work of a doctor or engineer, even if they themselves were poorly educated.

Historically, these communities, and other BME communities have been connected with the science-related professions, particularly within the health professions and would have family members in their countries of origin undertaking science-specific activities.

## What is happening internationally?

### Africa

The fifty plus countries forming the continent of Africa are working within severely limited resources, both human and physical, to ensure that science is a serious consideration for its many populations. The crushing weight of the problems of debt and resources has implications for activity. Countries are still bearing the legacy of colonialism, internecine struggles, unfair economic markets, years-old debt and political malpractices which strangle Africa's potential development. When failure of harvests, lack of labour markets and the HIV-Aids time bomb and low-life expectancy, it is food and the economy that consumes thoughts and not science. However, despite the disastrous picture, science education is deemed to be critical to the continent's development in the same way it is in Europe and America. There is the added advantage (this is the case in the developing world that):

- The sciences are seen as part of a structural, economic development process for countries.
- The subject is perceived as not necessarily as difficult but as interesting, challenging study and career for those with access to education
- Traditional science disciplines and careers are understood even by those in rural communities receiving little education. A doctor, engineer, agricultural expert or vet are key professionals essential to every day life and accorded therefore a high status and make the difference between life and death. A similar situation is found all over the developing world.

However, interesting examples of high-impact science engagement and communication are being established especially with regard to:

- **HIV –Aids**
- **Malaria – via plant science (artemisinin-based combination therapies)**
- **Nutrition**
- **Journals and online news disseminating information and communicating science**

The Africa Commission, Live 8 etc have all recently sought to put Africa back on the map. New Scientist (2<sup>nd</sup> July, p8) covers the scientific angle for a prosperous foundation and predicts a dash for SET advancement by Africa's various nations. Nigeria's IT infrastructure has seen cellphone use rise from 1 million to 14 million and 8 million people have internet access. The country is also embracing biotechnology. Africa have to try to stem the flow away from the continent of its SET graduates as more African scientists work abroad than in the whole of Africa!

See 'Science in Africa' Science and Public Affairs – a publication of the BA. June 2005, p20.

### Asia and the Middle East

A structural economic approach to science and technology has long been adopted by Japan, Korea, and India. The potential of China to make huge economic gains is affecting global markets. Manufacturing has ensured success in particularly the technical/IT fields. Labour is plentiful and affordable by the developed world. Some of the Asian countries have nuclear

capabilities and a successful science engagement and communication strategy as per the reasons above.

Good examples of science communication are:

- ICT in the wall programme aimed at children in India
- Urine for batteries – Singapore (<http://www.physorg.com/news5805.html>)

As scientists aim at designing smaller “biochips” that can test for diseases and give instant results, and, crucially, can be mass produced cheaply, the problem of finding a small, cheap power source for devices remains. However, Dr Ki Bang Lee, a research team at Singapore’s Institute of Bioengineering and Nanotechnology (IBN) have developed a paper battery that is small, cheap to make, using the fluid being tested (urine) as the power source for the testing device.

### **Caribbean Basin**

Agricultural and tourism products have sustained these developing countries. Trinidad and Venezuela have oil wells that support their economies well. Whilst not as science- or technology- oriented as the Asian and European economies, the Caribbean has an excellent track record of producing scientists or professionals in science-related fields, many of whom are working abroad.

Many females travelled to the US and UK to become doctors and nurses at a variety of levels in the UK in the 1960’s and ‘70’s. Today, women are gradually aspiring to the study of traditionally ‘male’ undergraduate disciplines such as physics and engineering for professional status. The University of the West Indies’ science faculty attests to this. Encouragement of science promotion and engagement from secondary school upward is encouraged and websites such as [www.golocaljamaica.com/](http://www.golocaljamaica.com/) show how this is being done. The popularising of science covers exhibitions in local post offices and environmental matters in conjunction with schools and centres amongst other themes.

Traditional economic areas such as tourism have meant the adoption and improvement of technology and systems for efficiency and to stave off competitors. Some islands have imported the skills of IT personnel from abroad to assist with this process. Agriculture, too, is under threat by the unfair market conditions and trade tariffs of the developed world. Crops can be decimated by weather patterns mean finding science-related ways of protecting this fragile aspect of these economies.

### **The US & Canada**

North America draws in many science-related professionals from across the world and is a melting pot of newly-arrived and established communities contributing to a body of scientific knowledge and development.

Regarding its long-time communities (African American, Native American, Hispanic) there are issues of under-representation. Native Americans have a high drop-out rate and there have been previous calls for schemes that reflect strong family ties linked to college success.

The African American community has a long history of providing science professionals through its historically black colleges and universities (HBCUs) in the States. BME families are used to generations of scientists in families, whereas the situation is reversed in the UK. However, Black Americans (12% of the population) still account for only about 3% of employed STEM professionals; Hispanic communities, women and the disabled fare no better statistically.

The indigenous native communities have suffered economically and discrimination against and decimation of communities has left its mark. For those communities where underachievement is high, schemes similar to those for other minority groups are a vital need.

The Hispanic and Asian community are also making good progress in SET study and work fields. Shehzaad Kaka is leading a team at the US National Institute of Standards and Technology in Boulder, Colorado and Hitachi's research laboratory in San Jose, California. They have experimented with nanoscale magnets with the possibility of producing a radio transmitter no bigger than a bacterium.

*Example from New Scientist, 17<sup>th</sup> Sept 2005: Dr Phillip Emeagwali – mathematician and engineer*

His work on supercomputers has won him many accolades. Philip Emeagwali's greatest achievement, that warranted him the most praise, was The Connection Machine. The Connection Machine utilizes 65,000 computers linked in parallel to form the fastest computer on Earth. Philip Emeagwali won the Gordon Bell Prize of 1989 for this work. The parallel computer was twice as fast as the previous year's computer

The various black and minority medical, technical and engineering institutions, journals, diversity programmes across SET sectors and within degree-awarding institutions indicate the advanced state of SET activity and communication in comparison to the UK and Europe. The National Institute of General Medical Sciences has a variety of recruitment approaches that look at everything from admissions to holiday programmes to contacts and journals. Some good examples of other science communication are the work of Dr Mae Jemison and other black astronauts as well as NASA's website

### **The United Kingdom and Europe**

The work of The African Caribbean Network for Science and Technology (ACNST) has spanned a decade with its mission being to engage both the BME and the science communication communities to work together and improve the science outcomes and knowledge for inclusion.

Its education purpose has the

**“singular objective to advance the educational achievements and career aspirations of Black youth within the fields of Science, Mathematics & Technology, by engendering the ethos that the pursuit of such qualifications and careers can be fun, empowering and achievable.”**

**[www.ishango.com](http://www.ishango.com)**

Role model poster campaigns, the Cosmic Africa project (a practical and visual astrophysics event for schools), reports and articles, training and strategic partnerships have contributed to a raised profile of SET in regard to BME communities.

The British Association for the Advancement of Science (BA) has cooperated on partnerships programmes with the ACNST and the Royal Society is advancing knowledge about SET and BME communities through its commissioned, comprehensive reports, role model guide and other SET events. NESTA's work on role models and the MORI report on attitudes to science in society (see references) have begun to address science inclusion issues.

Leicester Space Museum's Festival of Science of Culture has pulled in non- traditional visitors to its showcase featuring the work of BME inventors and scientists and African American astronauts. The first festival invited schools to bring displays of Black inventors and scientists as part of a competition and pupils from the winning school met the astronaut.

Soho House Museum, in Handsworth, Birmingham offers a mixture of events that reflects its local community (including Asian 'melas' or festivals and a science week for the local Vietnamese Community). It is part of Birmingham's museums and art galleries which has a

## A Guide to inclusion: working with Black and Minority Ethnic Groups on Science Communication activities

long-established profile in the BME communities. Thinktank, Birmingham's science museum has worked in partnership with the ACNST and is broadening participation with its community partnerships through DISC.

### **The British Museum**

The museum houses a vast collection which demonstrates science from BME communities. It and other galleries have a wealth of experience of arranging certain collections, events and programmes that attract the community. Costed programmes are available and can be run within communities.

Edinburgh University's science department under Dr Colin Pullman has a role model scheme involving many of its students, many of whom are from overseas. They work in remote Scottish communities and much of this work is aimed at children and newer community audiences. Dr Pullman was the winner of the Kohn Award for Science Engagement under The Royal Society in 2005.

Birmingham University Biosciences is carrying out research under Professor Gurdyal Besra to study the nature of the cell wall surrounding the TB bacteria with a view to gaining further knowledge and effectively tackling a disease that kills more people than AIDS or known infectious diseases.

**(Ub05 – University of Birmingham News, May 05).**

## Engaging the BME Adult Community in Science Communication Activity

### Doing what the research suggests...

The answer to engaging minorities, particularly underrepresented groups, lies in what research tells us, namely:

- Science teaching and learning requires revision. Schools and other education providers are struggling to find qualified personnel who can enrich and enliven students' experiences and aspirations but need to do so with immediate effect. A government policy development should be about the recruitment and retention of such individuals. Curricula must also reflect the practical nature and benefit of science and offer broader, more enjoyable activities to students.

The internet also with its multimedia authoring potential offers scientists and students alike forums for learning in an informal, non-school environment sites such as [www.planetscience.org.uk](http://www.planetscience.org.uk) are exploiting this approach.

- Where BME communities have few friends or family working within SET fields, **they need to see role models, attend relevant science communication activities** with their youngsters. They also need to seek advice about study and careers. Here, science communicators can make a difference offering exciting learning possibilities.
- Science **needs re-profiling or a 'makeover'** so that it not only engages potential minority SET students who become part of the labour market or entrepreneurs, but the benefits are shown to benefit wider society. Unusual ways of engaging BME communities are needed, which can form good practice models for all communities.
- Adult engagement with science can lead to an informed BME public who can **participate in ethical debates** about SET activity and consider the individual part they play e.g. looking after their health or considering the environment. BME groups may also feel that finally their own campaigning issues e.g. Sickle cell and Thalassaemia might receive some overdue consideration.

Science communicators who are willing to engage and include lack knowledge or resources of how to engage with the groups. They will have general concerns about communicating difficult issues in lay person's terms but might feel that concerns are amplified when groups do not speak English or are suspicious about the motivations of the SET organisation.

They will find that BME groups have the same concerns as anyone else but their voices go unheard or lack of inclusion renders them invisible.

DISC, through this guide will assist in providing informed support and knowledge to those science communicators who take inclusion seriously.

## **Science communicators and education providers**

A primary scheme for developing advanced science teachers would also help to alleviate poor attitudes to the subject. Teachers who are given training in how to enhance science learning (not necessarily science graduates although this would be an advantage) should be a developed scheme that meshes in with other achievement schemes such as 'gifted and talented', an 'Excellence in Cities' programme. Such teachers should be able to assess as early as KS1, students displaying skills, such as logic or construction.

Again, the DFES and science communicators can highlight the need for SET knowledge to families and give them clues as to how to spot children who may be displaying skills and what to do with and for them. Expanding opportunities to young people when they get older is an imperative.

It is sometimes the case that families require support to help their child particularly if they recognise that their children have strengths. Schools do not always have the capacity or resources to work with parents. It may be that specific science communicators such as museums offer events that support pupils' abilities and assist parents' efforts in conjunction with LEAs or science status schools and colleges.

These events can be run at community venues. They would also provide research or consultancy opportunities with traditionally excluded communities of various ages and genders for the science communicators.

### **Engaging communities: developing an 'away from school' notion of science learning:**

Practical science lessons in secondary schools benefit from visits out on extended field trips but cost and other factors limits these experiences. The role of science communicators may expand to arranging more external visits which can reinforce learning but without an institutionalised school-like ethos. Parents or other adults may also relish attending on field visits also thus the process becomes a family learning activity. The science, if explored well, can become more meaningful or apposite for when students are back in class. Such real-life contexts for SET learning experiences are cemented and retained. 'Away from school' also implies doing STEM activity in a non-sterile way that is subject to the rigours of the timetable and tests.

Away from school, science communicators can work with young people and twist learning away from a 'reductionist' model to more inventive approaches that are led by the young people. Out of their learning can come other skills such as presentation or expertise because they may have had to:

- Interview role models
- Present findings about a STEM issue
- Research their genetic heritage and share via a videoconference
- Set up and run meetings to debate ethical and moral issues
- Grow and show garden produce
- Collect news stories on SET issues and compare press coverage
- Produce a project that becomes an e-book for others
- Originate and test a hypothesis in order to enhance their research skills

### **Role Models are needed**

It is essential that role models are engaged to work with BME communities but there are considerations.

Role model recruitment and retention is guaranteed when schemes are qualitative and personal development includes leadership potential. As science undergraduates from minority communities emerge, this is critical for the following reasons:

- few SET leaders or managers come from these communities; in order for them to progress, leadership opportunities through role model activities would help to develop leadership skills and widen career opportunities.
- This then would help to increase the numbers of BME SET individuals in middle and higher management thereby equalising opportunities and democratising processes
- Such BME role model leaders can affect positively policy and practice in conjunction with colleagues within their organisations. They have an extra level of understanding that can benefit science communication organisations.
- Minority role models can assume leadership roles to not only affect internal policy but, just as importantly to influence external SET government policy.

Science communicators can play a role in the above by training, employing and promoting role models. Key work can have a focus on schools and colleges as well as public communication for SET understanding. Another key role for a science communicator or inclusive-minded agency is the databasing of willing role models who can communicate their subject area with passion to audiences. The growing divide between communities used to role model scientists within their families or through education and those communities who have neither role model family members nor come across them in everyday circumstances has a continued harmful effect and must be reversed.

### **Unusual types of engagement: television, natural disasters and toys:**

Successful engagement has been demonstrated through television programmes which emphasise e.g. the role of a forensic scientist or TV vet and is an approach that can be exploited. Natural disasters can highlight the need for SET professionals, supplying insights of what they can do to assist victims or interact with the environment. This would be significant for people considering study and careers.

Certain toys and games may influence children positively, particularly those that begin to encourage children to explore spatially, or examine engineering concepts.

An observation was made by an ethnic minority colleague during the purchase of a construction toy for his son from specialist providers. The shop was full of, unexpectedly to him, grown men, some of whom were grandfathers. He then had the realisation that these men enjoyed playing with such toys as youngsters and that enjoyment has continued. The enjoyment legacy is passed, baton-like, to succeeding generations as are the SET concepts and understandings. The same child, aged 7, wires up the entire PA system at his Black-led church. He now realises the SET potential of his child, aged 7, and the steps he and the school need to take to ensure success.

Another colleague, whose child has won a place at Oxford to study physics, subject to A' Level passes, grasped science ideas because of a genuine curiosity about the scientific information on the night sky featured on a set of 'Snoopy' cards. This was recognised by the parent who, in conjunction with school, occupied the child gainfully to promote a love of science learning.

For those communities disconnected from SET activity enjoyment, it is important that young people have the chance to play with such toys or activities to develop SET concepts and more importantly, enjoyment.

Indeed, it has been the general toy sector that has had an impact on educational curricula. Toys have been bought by schools and used to develop mathematical, programming and spatial skills especially in Key Stage 1 and 2 (pupils aged 5 to 11 years). Technology in the classroom, has led to changes in pedagogy and developments in learning style knowledge. This is of benefit when commenced early and it is an imperative that Initial Teacher Training Schemes, where women predominate, include science and race in education issues. It would make a great impact in schools with many BME groups, some of whom might not

place a high premium on such toys. Toy libraries providers or the profiling toys with SET potential may be activities for schools and science communicators.

### **Working with Communities:**

Before getting to work with communities, you need to know the communities and what their interests, concerns, agendas, key personnel, dedicated media and community centres are. Intelligence would need to be then garnered once trust had been established.

**Interests and agendas:** it was clear from speaking to the groups that there were several access points shown below:

- Specific community events/activity
- Black History Month
- Looking at the science achievements of BME group members and their contributions to science developments and theory
- Learning about science in a non-Eurocentric way
- College-based/schools-based activity aimed at underachieving groups
- Health-related activity especially for elders or involving specific conditions such as sickle cell anaemia.
- Sharing of generational folk science knowledge
- The career aspirations of their own children/young people
- What is going on in 'developing' countries
- Endorsing achievement through community celebrations

The many special events in the cultural calendar of BME groups lend themselves to science communication events, with Black History Month providing the greatest opportunity currently.

Some groups are interested to know about the aspects of learning about astronomy and the cosmos but from a non-Eurocentric point of view and share 'folk' science plant knowledge and illness cures from their respect countries. The elder communities are encyclopaedic in their knowledge here and much of this knowledge will be lost as communities begin lose cultural retentions so dear to them. A superb, affirming project would be a intergenerational sharing of this wisdom and the proven scientific applications.

Knowing more about the 'ET' part of SET might be a revelation to BME groups. Discussions with young people and BME adults uncovered limited thinking around engineering. This is backed up by The New Scientist (1/10/2005) which features a report on engineers. It states that they are the happiest UK professionals and have an equal ranking with doctors and lawyers in some European countries. However, in the UK and America, engineers are a lowly-viewed group. According to a survey carried out by the American Association of Engineering Societies, the public sees engineers as building and planning as opposed to "inventing, discovering researching and pioneering" like scientists.

Pay is another factor opening up disparities between types of engineer. Groups knew very little about the field other than they felt it was still a 'dirty' male-dominated profession. Directing BME groups to the EMA (ethnic minority achievement) online website ([www.emaonline.org.uk](http://www.emaonline.org.uk)) to see the black SET role models in engineering can assist in breaking these unfairly-held and misguided perceptions.

BME groups consulted were clear in their knowledge that science development and knowledge was, in the main, for the betterment of society.

As many BME individuals are from developing countries, they are particularly interested in discussing:

- Science advances for long standing problems in the developing world e.g. treatments for TB or malaria. They felt that as many of the health issues no longer had a deleterious affect on populations in the developed world, efforts were not being redoubled to assist poorer countries. Indeed, some of the groups spoken to

felt that this science which is still attempting to alleviate suffering after years should not be superseded by the type of science that does little to enhance lives.

- BME groups were also interested in aspects of SET work e.g. the cost of drugs and the behaviour of science companies and the role of the media as people said that they were often confused by the various 'scare' stories e.g. GM foods, bird 'flu' etc. They were clear that science communicators could help to evince the different aspects.
- Knowledge of BME scientists and inventors is also a popular request and communities would be expecting science communicators to have knowledge and resources in this area to share.
- Community awards seem to be a growing area for BME groups. Recognition of educational and business achievement are potential areas for science communicators. The sponsorship of an award would profile STEM.
- Individuals were also interested to know how their personal actions could make a difference with regard to their own lives on the environment e.g. by recycling or exercise and diet considerations.

Science communicators, therefore, have an initial framework of interests to use to develop programmes that attracts and therefore, includes BME groups.

## You have some ideas now. So what's next?

**Find the community centres:** make it your business to engage with BME business and centres.

Most groups commented on the need for the science community to go to them as opposed to the community visiting a museum or a university science event. The feeling of confidence from being on their own territory is one factor. However, these are frequented by users of several generations enabling science communicators to reach several groups at a time more easily which would not necessarily be the case than if they visit a museum. In some communities, it may be difficult for the women to travel or translation issues might arise, whereas this might not be the case at the local centre.

Centres are also the hub of communities for e.g. news, supplementary schools, functions and meetings. Managers are often the key people who are knowledgeable about the local networks or neighbourhood forums. Where centres are matters. A centre in a regeneration area may have plans and funds to develop education and employment strategies in partnerships with key institutions and agencies.

On some occasions, science or technology graduates have been uncovered working within BME groups, many of whom had studied abroad but their qualifications were deemed insufficient in the UK. These people may make ideal role models/mentors within the community. Working with centres as opposed to institutions such as schools might make it easier to target groups. Institutions may well deem the targeting of certain groups over another problematic, even where it is justifiable and plans or groups may have to be adjusted or diluted.

A visit to a community centre would also be deemed an honour by groups and be seen as a genuine offer of partnership and is well worth the effort.

From the DISC research, once groups also know of calendarised activity such as National SET - or *Design & Technology Week*, religious or cultural activity notwithstanding, they are keen to have further knowledge for their Saturday or after-school clubs.

An objective of the science communication groups should be to initially establish meaningful, honest dialogue with groups, wherever they are. There are many websites which hold

details of minority ethnic groups. Grapevines also provide rich seams of information. Be aware, however, that it can take time to set things up.

### **Building trust**

BME communities are deemed hard to reach. This is not surprising given the long-term neglect and isolation felt by some BME groups. If reaching these groups is a sudden but unsustainable one-off activity then science communication has little chance of being successful. Groups do not want to feel that they are a temporary stop-gap or experiment. Integrity and honesty is a must. Partnerships are much more likely to succeed when it is clear that a partnership is genuinely and sincerely established and the SET communication community are involved for the long haul.

Particularly important is the need for BME groups to know that the science community are not engaging with minority groups for 'ethnic' science purposes only but for all aspects of science communication. Inclusion should be a constant factor in all science communication. In fact, BME groups should be sought out for events that are not deemed 'minority interest' to ensure their representation.

Science communicators have work to undo regarding the way science has historically been used to demonstrate the inferiority in BME groups, particularly African heritage peoples.

Groups are aware that attitudes take time to change and will not be surprised at the following negative, stereotypical perceptions of black people.

Australian research scientists finding a new strain of cannabis plant have named it 'rasta' (New Scientist, 17.9.2005, p12). The name was the result of a competition. In Britain and even more so, in the United States, this would have provoked a huge outcry. Also, a company with a patent covering a breast cancer gene has obliged doctors to ask women if they are Ashkenazi Jews, as the latter has a 1 in 100 chance of carrying the gene (New Scientist, p7, 9 July 2005). This episode has prompted ethical questions about singling out an ethnic group and the financial gains for the company involved (for example in the Tuskegee Experiment)

Other recent tests focus on BME and white groups reactions when being shown black and white faces and occurrences in the brain when viewing these images.

Another New Scientist journal featured a study that also involved identifying faces from the African American community. African Americans were far better at identifying from memory their own faces and those of European Americans; the results for European Americans recognising faces from the African American community was described as 'fairly dismal'. Whilst one study is far from conclusive and the results are subject to a variety of factors, the authors thought everyday experience made a difference. Both races have experience looking at their own groups but African Americans and possibly even more so. Africans and African Caribbeans in the UK have exposure to the majority population, but Europeans are dismal at distinguishing African heritage faces as they have less contact with the community.

(Journal reference: Nature Neuroscience (vol 4, p, 849))

## **Getting started**

### **What are you going to do?**

When beginning to work with BME groups, it may be that the science communication has the following aims and objectives:

### **Building the notion of science literacy**

*Scientific literacy is knowledge and understanding of the scientific concepts and processes required for personal decision making, participation in civic and cultural affairs, and economic productivity*

(National Academy of Sciences, 1995).

This is a focus area in the United States and the Learning Point website (<http://www.learningpt.org/>) has suggested that this element of science communication not just be the preserve of schools. To them students who are scientifically literate:

- Have the capacity to pose and evaluate arguments based on rate evidence and to apply conclusions from such arguments appropriately.
- Have the knowledge and understanding of scientific concepts and processes required for participation in a Digital Age society.
- Can ask, find, or determine answers to questions derived from curiosity about everyday experiences.
- Have the ability to describe, explain, and predict natural phenomena.
- Are able to read with understanding articles about science in the popular press and to engage in social conversation about the validity of the conclusions through debate.
- Can identify scientific issues underlying national and local decisions and express positions that are scientifically and technologically informed.
- Are able to evaluate the quality of scientific information on the basis of its source and the methods used to generate it.

The above seems obvious but is perhaps a good starting place for the general as well as school population, argues this website. Activity around science literacy can preface school lessons or discussions and activities at science communication events.

Technology and science are tightly interwoven, and breakthroughs are occurring in both at astounding rates. However, the latter comment needs to be examined carefully; whilst research is going on, some breakthroughs are years away and the public need to understand this. Science literacy and communication can make this clear.

The site goes on to argue that:

'Many of the social and political issues that have come to the forefront in the past decade have a strong scientific component. Issues related to reproductive technologies, the environment, and energy, for example, require a scientifically literate population for wise decision making in the coming years. Yet the current scientific literacy of the American people is a bit suspect. In a survey of American adults conducted by the National Science Foundation, less than a quarter of the adults surveyed could define the word *molecule*, and only about a third could describe what it means to study something "scientifically" (National Science Board & National Science Foundation, 2002).

To address this issue, prominent national groups such as the National Research Council, the American Association for the Advancement of Science, and the National Council of Teachers of Mathematics have revolutionized thinking about science and mathematics education by setting standards that emphasize scientific inquiry, scientific process, problem-based learning, and the integration of science and mathematics (Linn, Kessel, Lee, Levenson, Spitulnik, & Slotta, 2000). These groups are calling for new approaches to science, numeracy (quantitative literacy), and the use of mathematics to investigate, explore, estimate, systematize, and visualize phenomena across the curriculum.'

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There are lessons here for the adult population who are not necessarily students but good science literacy that develops lay knowledge means they are informed about the fast-moving, scientific world.

Science literacy forms part of the popularising agenda and can be a key determinant in developing and sustaining an interest in SET across all age ranges.

It might be an initial source for debates or lectures for the communities. Science literacy could be part of a talk to parents and students who are deciding on their A Level science or degree choices. Whilst this can be at their schools or colleges organised through the careers service, delivery at community centres such as the local mosque or a Black-led church may have more of an impact.

### **Issue-based science communication**

This is an interesting idea for science communicators and the various communities as it can be simultaneously controversial and enlightening.

Minority communities are in need, just as the host community is, of information that can contribute to behaviour change. In some cases, they may be more in need if they are not, for instance, aware of the nutritional value of culturally-specific diets or the dangers of tobacco chewed with betel nut.

Equally, there may be issues that under scientific scrutiny need exploring BME communities are disproportionately overrepresented in the statistics e.g. mental health issues or the lack of organ donations from the BME communities. These issues need discussion and action but may be still regarded as taboo or 'off limits'. Recently, the Council of Black Led Churches in Birmingham called for action on the rise in sexually transmitted infections in the community. The point here is that the facts were presented by the health professionals but the calls for lifestyle changes are best coming from the BME communities themselves. Also, sometimes but not always, a BME role model might be the avenue for this aspect of science communication. Cultural issues are present and not necessarily known to SET communicators unless they share the same cultural heritage, are familiar with the issues and have the trust of BME organisations and communities.

Scientific malpractice in BME communities is an issue that can be problematic. Minorities are mindful that science has been used to degrade aspects of their existence, culturally and racially (for example in the Tuskegee experiment) and to look down on BME groups as scientifically inferior.

### **Science Communication for popularising science**

This is a key for certain BME groups for whom science and schooling is not popular.

It may be that a supplementary school, after-school or holiday clubs or mainstream school with high BME populations or community centre can host an event that promotes science in a fun but with a clear, comprehensive learning outcome. Timing of these popular events can make a difference to key learning events. For instance, popularising science events can be run prior to secondary pupils making subject choices at 14, or during revision times or as during career events. Again, a venue away from an institution may make a difference.

It is also important not to take the easy road and combine the science with music or sport approach (a stereotypical road for many African Caribbean youngsters). This approach can diminish the SET activity, as opposed to profiling it. The science content should be not diluted to a 'barely there' consistency in order to attract the community. Also for avoidance is making the science fun but then not examining the scientific concepts at work.

Some minority adult communities but not all, may not immediately take to fun 'practicals' but are happy to be lectured with questions later. Traditional thoughts remain about being education and learning being formal, i.e. educator lectures, class listens. However, 'hands on' practical activity as well as direct verbal factual information is welcome as the community realises that such an approach forms a model for education in this country and their children are learning this way.

Here, role model SET professionals would be very useful and particularly role models from the underachieving group e.g. Bangladeshi Muslim women or African Caribbean men. Role models can help to engage the community as well as explain SET theory, especially with English as An Additional Language (EAL) groups.

### **Campaigning**

This would be a useful way of engaging with community groups. There are plenty of campaigns that the BME communities would want to take forward (e.g. Sickle Cell Anaemia and Thalassaemia, Diabetes Type II). These conditions have affected minority communities for a long time but concerned voices have not been heard and consequently very little done to ameliorate the plight of those suffering. These have been thorny health science communication areas for the BME communities for decades but it is only now that the host community is beginning to develop Diabetes Type II, that the condition is newsworthy.

The science community has a duty to clarify science-related issues and rescue them from misrepresentation so that the campaigns are clear and effective.

SET communication/BME partnerships could assist one another by carrying out further research or campaigning via mainstream media to a wider community than usual. There are extensive opportunities to consult groups on their opinions and attitudes to science or experiences of discriminatory treatment. A quality campaign would mean that, for the first time for many BME communities, there is a profile at last with a chance to further developments. BME groups are not usually stuck for an opinion on issues.

However, whilst the BME community will want to make sure their traditional issues head their campaign agendas, there are other issues the BME communities cannot afford to ignore, especially if they have been traditionally deemed to affect the European community only (environmental issues, ethics of science, GM foods, drug developments, nanotechnologies).

Science communicators and BME groups can explore ongoing and newer developments and their impact on communities. That way, they can be included in campaigns that traditionally would not be representative.

Proceed with caution and be prepared for fierce debates and concerns that have been held for a long time and gone unheard.

**Promote and communicate science behind cultural practices** – Promoting the benefits of e.g. healthy cultural foodstuffs or of tai' chi or meditation scientifically would be welcome science communication. BME groups would envision this science communication as a way of validating traditional practices which in turn, affirms BME groups' cultural identity. Groups have known for hundreds of years about the benefits of e.g. plants and vegetables and they would be interested to know what further science research is underway on these provisions and the impact such research and findings can have on their countries of origin.

The elder community has greater knowledge of these beneficial cultural expressions but much is lost as youngsters born in the UK lose this knowledge; the cultural practice may disappear forever. Science communication events with BME communities would do well to focus on this aspect and gain knowledge at the same time.

### **Promoting careers**

Effective science communication can provide variety and creativity to the usual careers fair. An A-Z of careers including entrepreneurial science-related professions, can demonstrate the range of roles open to SET students. Role models in the community are vital to opening pupils' mind about what a scientist is and does in a way no careers service can. The latter can be used in schools as part of science and other lessons. Organisations used to working with various communities such as Setpoint or EBPs (education business partnerships) can support.

The important thing is to start small and gain the intelligence before commencing. Go for excellence, use networks and role models.

### **Getting an audience**

Decide which community you can or want to engage and how this can be managed (16-25, prisoners, elders, new mothers, young men, the Diabetic (type II) or the IT illiterate.

**Board membership** – join the board of local schools, supplementary schools and BME organisations. Your expertise will be valued if your group is in it for the long haul. It is helpful if you can offer expertise or assist with e.g. funding applications, legal, personnel or financial matters. Equally, science communicators can gain knowledge and insights into communities to share with colleagues. The above can add to the science communicator's own continuing professional development. Certain data sets collated and knowledge gained with the cooperation of BME groups in their localities can help to bolster funding applications. Become experts at working with BME groups. The time taken to do research, meet with, get to know, plan for, deliver and evaluate effectively activity would be highly appreciated. A science communicator should also make it apparent if they have a track record in this type of engagement as it makes a good advertisement that the community will take seriously.

**Communications** – find out which media is used by the many BME groups. Choose popular newspapers, newsletters, websites and radio programmes and/or stations (approach unlicensed stations with caution). Local BME community groups are willing to suggest local e-mail networks or 'movers and shakers' in the community who able to mobilise numbers and marshal resources.

Also, it is worthwhile going onto the communities' many mailing lists and/or attending activities that may have no science-related activity but it may be useful to mailshot, assess, consult, baseline, develop mailing lists. SET communication, marketing and recruitment opportunities abound this way.

Include BME group activities in your own newsletters, mailings or websites as part of the partnership arrangements in order to profile the work of both partners. The important element is that communication profiling is consistent, regularly updated, informative and subject to review. Also, images and information on websites or in literature that reflect the community along with their logos and branding denote a level of credibility. Opportunities for feedback information constitute informal action research about BME respondents to inform future planning and the effectiveness of communications used.

The most powerful communication network in BME communities however, is still 'word of mouth' as networks and communities rely on information being transferred this way as opposed to general non-BME media which would perhaps not always feature BME news.

**Black and Ethnic minority media.** This may include:

- informal networks, including e-groups. Key individuals in BME communities are hugely valuable resource whose tentacles have an extensive reach. Personnel at centres, gurdwaras, temples, mosques, are usual aware of useful sources. Asian and African Caribbean grocers or takeaways are usually excellent community sites to leave literature due to constant passing trade.

- Websites:

The Ethnic Media Group is the UK's leading publisher of weekly newspapers, magazines, websites and digital newspapers for Britain's African, Caribbean, Black British and Asian communities. In pioneering the development of Black and Asian Digital Newspapers, now instantly available worldwide in an exciting new newspaper experience, Ethnic Media Group have joined Black and Asian people around the world in an exciting new newspaper experience. Science communicators can access directly editors and journalists through the above site.

- A science corner in a BME newspaper such as that featured in the Times Education Supplement or regular competition would be a useful addition to a children's page in a BME community leaflet or website hyperlink.
- Community newspapers and magazines which mainly have a national coverage.
- Television and radio stations, local and national.

As with any media coverage, a good press release, contacts and persistence is vital and building relationships is important. The BME media may be more receptive to these stories than the general press because BME journalists are aware of need for such publicity. However, the circulation of some papers is insignificant when compared to a local or national paper that may be read by BME communities so an attempt to get stories into general press is crucial. However, the work needed to convince the general media to feature publicity for science events aimed at the community is great and necessary. Community members with a track record of using the media are useful first contacts.

Once you have researched the media, joined groups and boards, identified media sat down to plan and ascertain objectives and the business case for all stakeholders then venues and a recruit of personnel/audiences are the next consideration.

### **Organising events**

It is important to think about what the community or science communicator can afford to do but money ought not to be a major determinant of whether the event occurs or not.

Activities can be run (free) at places of worship, schools/colleges or adult education venues, prisons etc anywhere BME groups exist in numbers. A good example is provided by museums such as the Science Museum in London, which has an outreach to schools, reflecting curricula for primary and secondary school and a separate outreach facility to the community. Off-the-peg programmes can be arranged at a cost.

Adult learners are also catered for so it is usefully targeting the various sectors of the communities. Community groups who feel encouraged and empowered could, with the help of science communicators, apply for funds to purchase these programmes. It could also be that they can influence content so that it has appeal for particular BME groups and they are included in SET activities.

Organising events with youngsters can provide access to their parents and carers, thereby widening participation. There is also a chance to network and ask about potential venues in the community area and their suitability for offsite working. Don't forget places of worship. Places of worship have had a community focus for many decades as it was usually the only place for information, networking and advice as well as spiritual endeavours for communities new to the UK. These buildings are multipurpose, offering diverse spaces such as college extension facilities, employment resource rooms, IT suites, community rooms for hire etc. Some black-led churches reveal levels of sophistication regarding education, many educators and Role model SET professionals having had a church background and education that encourages high attainment.

### **Marketing to BME groups**

**Once contacts with groups and media have been established, try the following:**

- Advertise your personnel with packages that will aid the community. For instance, volunteers or special ambassadors can go along with resources or promises of discounted or free entrance at science-related events or provision.
- Offer sincere partnership packages to include expertise, knowledge of funding, continuing professional development (CPD) opportunities. Supplying skills and knowledge to communities can aid their own confidence regarding partnership with agencies and knowledge about SET. This way, activities have a chance of being

sustained through the development of individuals with potential leadership qualities who can continue to grow science communication activities.

- Why not engage BME scientists working outside their fields but still feel that they can make a contribution via a group exchange or web community?
- Build databases of role models and groups/organisations locally and nationally.
- Offer post out to researcher/honorariums to undergraduates/graduates/ A Level students to act as role models.
- It may be useful to offer BME groups by providing them with materials or events to trial.
- Offer work experience opportunities to BME students.
- Provide invitations to events held at your premises with special offers.
- Use existing BME organisations or groups for science delivery and communication as a springboard for new workshops and ideas. Very often these have premises and a ready-made audience who may relish new faces and approaches to working with the community.

### **Engaging or using community members' own skills as role models or speakers**

This is a valuable way of providing employment, capacity building from within science communication organisations. Here is an opportunity to enhance and add colour/culture to staffing for short or longer term programmes.

- Universities offer a rich seam of students from home and abroad of particularly research students who are not on taught, scheduled courses thus are at liberty to pick and offer support to science events to suit or by arrangement.
- This type of activity may be actively encouraged by higher education departments and students who know how CVs can be enhanced by undertaking such roles. Also, being young role models who may be close in age to school-aged youngsters can often mean that they relate well; the lack of chronological distance can make any dissimilarities disappear. Where role models share personal interests, for instance, in music or fashion trends, it breaks down in barriers and illusions regarding SET 'types'; their influence can be invaluable in encouraging young people and adults to take up careers.
- Role models are about making individuals become more aware of the role science plays in society and how/why the subject requires consideration. The Royal Society's Role Model good practice guide (Taking a Leading Role) cites that some research carried out by them showed role model intervention can make young people reconsider study and career choices. The guide is useful and thorough in its advice on using role models effectively. It covers many ideas from regarding their engagement and employment to scheme evaluation and corporate recognition.
- The trial scheme, Science Ambassadors Programme through the Setnet organisation also is about providing role models to support in schools. This framework for working with role models is an ideal, viable scheme for the recruitment of BME role models as part of its inclusion strategy.

## **Examples of science communication activities that have been successful:**

- Health, lifestyle and diet
- Children's health
- Agriculture/plant science
- Environment
- Technologies
- Careers
- Celebrating achievement occasions
- Melas
- Carnivals and festivals
- Campaigns
- BME History featuring scientists and inventors.

The following activities are science communication events that demonstrate creative approaches to engaging BME communities. It is apparent that funds, human resources have been committed and research, lifestyle examination and campaigning are considerations.

1. Bollywood songs were used to encourage Asian women to go for cancer checks in the UK in Birmingham. The community who normally shy away from cancer tests taboo wise which leaves women vulnerable. The music involved especially adapted Bollywood music.

(Eastern Eye, 26.12.2003; Asian Voice 3.1.2004)

2. The National Kidney Research Fund have appointed a manager to explore and highlight the issue of kidney and organ donation which came out of an academic paper written on behalf of the fund by Dr Elizabeth Lightstone. The launch of ABLE in Birmingham offered the BME community free blood pressure tests and advice regarding kidney health and disease at Boots Chemist in the Bull Ring Shopping Centre.

3. The Black Arts Alliance hosted a breast cancer coffee morning on behalf of the MacMillan Cancer Relief

The attendant issue, however, is that occasionally programmes like these are funded separately and for the short term in order to run. This may give an impression of attitudes to BME communities that reinforces their feelings that they are a temporary consideration and are not perhaps receiving equal or fair experiences.

## **Cultural Considerations**

### **Language**

The language of some of the communities is different in script, orientation as well as grammar and meaning. Some community script, such as Arabic is written and read right to left. Urdu is associated with Muslims of South Asia, while Hindi is the language of Indian Hindus. There are various forms of both the spoken and written forms of the language. The divergence between Hindi and Urdu is seen in the written form but spoken forms have similarities. Punjabi as the accepted language of the communities from the Punjab has differences in grammar, syntax but is intelligible to other South Asian speakers. Some languages such as Urdu share a heritage and can be understood by groups with different linguistic heritages but not always.

The many countries in Africa, despite the numerous dialects and indigenous language have populations who speak a high level of English, a legacy of the double oppression of colonialism. Somali groups write and read Somali using the letters of the English alphabet.

## A Guide to inclusion: working with Black and Minority Ethnic Groups on Science Communication activities

In general African Caribbean heritage communities in the UK are English speakers although the elder generation will be used to speaking an English, French or Dutch-based patois or creole.

It is important aware that non-verbal communications codes may be different for some communities.

British-born BME groups will have an understanding of these languages mainly spoken by their elders and many are bilingual.

As with any new language speaker, initially received understanding is often better than oral skills. Therefore, it is important for science communicators to establish whether translators are required. Often groups can provide their own translators from amongst the group or from a specific centre. Some BME groups discussed the attitudes they have faced or might have to face from science communicators. Other groups have mentioned being spoken to in patronising or arrogant tones, or being made to feel like a child being spoken to by an elder even if they can speak English. This is both insulting and demeaning especially to community elders. The science communication would do well to avoid these situations; pre-planning and preparation would avoid these occurrences. It is important not to shout or overstress words as it gives the community the impression that they are considered hard of hearing or unable to understand.

Organisations with the resources and communities can have paper-based course materials or visuals translated into community languages for newly-arrived or other EAL communities, which is a great support.

Listening and constructive dialogue is vital and BME communities value those SET communicators who do this well.

Asian communities in Britain and their community languages

Country	Language	Script
<b>India:</b>		
Punjab →	Punjabi/Hindi →	Punjabi
Central/Southern Gujerat	Gujerati/Hindi	Gujarati
National → Language	Hindi →	Hindi
Official → Languages	Hindi/English	
<b>Pakistan:</b>		
Pakistan Punjab	Punjabi/Urdu →	Punjabi/Urdu
Mirpur →	Punjabi/Mirpur	Punjabi/Urdu
<b><u>N.W. Frontier:</u></b>		
<b>National → Language</b>	Dialect/Urdu	Urdu
<b>Official → Language</b>	Pashto/Urdu	
	Urdu	Urdu
	Urdu/English	
<b><u>Bangladesh:</u></b>	Bengali (Sylhet dialect)	Bengali

There are many 'welcome' posters in a variety of community languages obtainable for variety of websites and catalogues. A few words of welcome in a represented language make a difference if placed on a door to an event or on a presentation. Learning a few words as part of a presentation is highly commendable but prevention of embarrassment is far more important, so do not do the latter if not comfortable.

**Some Language Definitions**

- Dialect – a tongue or lingua
- Patois – tongue, idiom or vernacular
- Home language – language used at home or in the community
- EAL – English as an Additional Language

## Religious events and festivals

A calendar featuring some festivals and religious occasions is shown below. These occasions may also provide science communication marketing and role model recruitment possibilities. The *Shap* Calendar of religious activity for schools and others' use was an invaluable planning tool. It was produced as the result of a conference for those interested in the development of world religions that was held near the village of Shap in the Lake District in 1969. Sadly, it is no longer produced on paper but a downloadable version is available. ([www.shap.org/calendar.html](http://www.shap.org/calendar.html))

<b>Faith</b>	<b>Christianity</b> ↓	<b>Islam</b> ↓	<b>Hinduism</b> ↓	<b>Judaism</b> ↓	<b>Buddhism</b> ↓	<b>Sikhism</b> ↓	<b>Rastafarian</b>
<b>Heritage of followers</b>	Various communities	Middle East, Caribbean, African, South East and Far Asian	India	Spain, Middle East, various Westerners	South East Asia	South East Asia	Caribbean/Africa
<b>Holy days</b>							
<ul style="list-style-type: none"> <li>• January</li> <li>• February</li> <li>• March</li> <li>• April</li> <li>• May</li> <li>• June</li> <li>• July</li> <li>• August</li> <li>• September</li> <li>• October</li> <li>• November</li> <li>• December</li> </ul>	<p>Lent</p> <p>Easter</p> <p>Christmas</p>	<p>Eid-UI-Adha</p> <p>The prophet's birthday 20.8.570CE</p> <p>Ramadan Eid ul Fitr</p>	<p>Makar Sankrant</p> <p>Vasanta Panchami Saraswati Puja Mahashivra ti Varsha Pratipada</p> <p>Ratha Yatra Raksha bandan</p> <p>Ganesh-Chaturchi</p>	<p>Purim</p> <p>Passover</p> <p>Shavuot</p> <p>Rosh Hashana Yom kippur Sukkot</p>	<p>Shinran</p> <p>Vaisakha</p> <p>Asala</p> <p>Kathina day</p> <p>Bodhi day</p>	<p>Birthday Of Guru Gobind Singh Vaisakhi Vaisakhi :</p> <p>doesn't move around the Western calendar and has always been celebrated on 13 or 14 April. For the first 5 years of this millennium it has been on April 13.</p> <p>Martyrdom of Guru Arjan</p> <p>Divali Birthday of Guru Nanak</p>	<p>Birthday of Haile Selassie I</p> <p>Ethiopian New Year's Day</p> <p>Crowning of Haile Selassie</p>

## Some BME faith beliefs and ideas

It may be that the work with BME groups is through their religious communities. This does not necessarily mean the activity must have a religious theme but it may mean that arrangements are subject to religious codes.

This extremely complex area, however, has organisational and faith-based implications for science communicators. Certain BME faith communities, e.g. Black-led and Rastafarian groups worship between Friday and Saturday sunset, leaving Sundays and weekdays for work/activity. Diets are governed in some cases by biblical law. Certain foods are not eaten or should be prepared in a certain way.

Also, some groups do not believe in evolution theory or have issues with biological developments that allow organ donations or blood transfusions so these would not be subjects for science communication activity unless it is part of a deliberate presentation request or debate. Err on the side of caution by ascertaining whether strict observances need to be made or subjects avoided. The Science and Religion Forum looks at some of these matters through its website and events.

The African Caribbean communities are mainly Christian attending a variety of denominational places of worship including black-led churches which observe traditional Christian holy days (Jehovah Witnesses do not observe Christmas). African communities are from various faith backgrounds including Islamic. There are also cultural factors which affect religious practice e.g. African and middle-eastern Islam may differ in perspectives and practices. Groups' knowledge about their own communities' religious and cultural activity provides the best guide for science communicators.

There are only two Muslim festivals set down in Islamic law: Eid-ul-Fitr and Eid-ul-Adha (*Eid* or *Id* is a word meaning festival).

**Eid ul Fitr** (1 Shawwal). This marks the end of Ramadan, the month of fasting, and is a festival of great celebration. In Islamic countries it is a public holiday. Schools in urban community areas in the UK will know not to expect Muslim pupils during both Eid festivals.

Any science communication is to be avoided during Ramadan, a time of fasting for penance and spiritual enlightenment. The timing for Ramadan is governed by the lunar cycle hence its differing position in the western calendar. However, interesting science issues come out of Ramadan: a useful website (shown below) looks at this spiritual time and some of the issues arising from it as can be seen from the weblinks shown below. The sites analyse the effects fasting can have, e.g. post-Ramadan overeating (in the article, "From Feast to Fasting").

Friday prayers can deplete science communication audiences also. Daily prayers (5 times a day, facing Makkah) may also be carried out by attendees who may need a space to congregate so this is to be borne in mind when planning any activity.

**Eid ul Adha** (10 Dhul-Hijja). This festival marks the end of the Hajj or holy pilgrimage, which is one of the 5 pillars central to the Islamic faith. However it is celebrated by all Muslims. Again, activity around this time may be best avoided as schools and community centres would be empty.

Muslim communities welcome science activities particularly those that can take place in their communities' faith building which includes mosques.

Hinduism is the world's third most popular religion, with around 900 million followers. About 80% of the population of India regard themselves as Hindus.

Hinduism is the third most popular religion in Britain with over 500,000 followers. The depth and complexity of this centuries-old religion makes it an interesting one.

Hinduism is not a term which identifies a single set of beliefs or ways of worship. Hinduism is the practices of a variety of different religious groups which come out of India. Hinduism

developed from the religious practices of those who lived near the River Indus in modern day Pakistan.

The main festival is Divali, which can last anything between 2 days and 2 weeks and is based on the lunar cycle; hence it is not a fixed point in the western calendar. Usually, it falls in the latter part of the year.

Hindu Temples are gathering and eating places for the public. The Shree Hindu Temple in Tyseley, Birmingham has its own employment support and courses in IT and basic skills are run for all members of the community demonstrating the versatility and welcoming nature of places of worship. They organised a science communication event (arranged by the 50+ Hindu Association with South Birmingham PCT). Free health advice and workshops around body mass, menopause, diabetes mental health stroke, diet and arthritis was on offer. Transport and a crèche and the making of videos encouraged the attendance of the community.

Diets are not particularly strict although the cow is deemed sacred and many Hindus are vegetarian; it is also the practice for priests to abstain from alcohol and meat. Again, dialogue is key when planning activity.

Sikhism was born in the Punjab area of South Asia, which now falls into the present day states of India and Pakistan. The main religions of the area at the time were Hinduism and Islam. Sikh temples are renowned gathering and eating places for any member of the public.

Most of Britain's 500,000 Sikhs have their origins in immigration either from the Punjab in Northwest India in the 1950s and 60s, or from East Africa slightly later.

Gurpurbs are festivals that are associated with the lives of the Gurus. They are occasions which are celebrated enthusiastically by Sikhs.

The most important Gurpurbs to avoid are:

- **The birthday of Guru Nanak**, founder of Sikhism (November)
- **The birthday of Guru Gobind Singh**, founder of the Khalsa (January)
- **The martyrdom of Guru Arjan** (June)
- **The martyrdom of Guru Tegh Bahadur** (November/December)

**Divali**, the Festival of Light, comes at the end of October or early November.

It is a festival that Sikhs and Hindus both celebrate so science activity is best avoided at this time.

**Hola Mahalla** coincides with the Hindu festival of colours, **Holi**. It is celebrated around March 17.

#### **Other groups:**

Some Rastafarian groups have a four year lunar cycle named after the four evangelists and the birthday of Emperor Haile Selassie (23 July) is to be avoided. Catering would also need to be specialised for these groups (vegetarian or vegan).

The celebration of Kwanzaa (26 Dec – 1 January) is an Afrocentric, spiritual celebration as the antithesis to a commercial, westernised Christmas.

Fruit and natural products are given as gifts as a healthy alternative.

#### **Other faith factors:**

Many more people who need transplants die before even making it onto the waiting list for organs.

The major religions in the UK support both organ donation and transplantation.

Other faith groups have varying attitudes. Christian Scientists do not have a specific stance on organ donation but amongst Jehovah's Witnesses organ donation and transplantation are rare and not considered acceptable. Members of the Shinto faith oppose taking organs from people who have died.

**Faiths that support organ donation:**

- **Buddhism**
- **Christianity**
- **Hinduism**
- **Islam**
- **Judaism**
- **Sikhism**

## **Gender: BME women and science communication**

The House of Commons Trade and Industry written evidence notes the lack of women in SET acknowledges how critical this situation is, given the demand for SET skills. The HM Treasury predicts that 300,000 new SET graduates will be required over the next 10 years. The increased demand, accompanied by an ageing demographic means that productivity, competitive position and innovation will be severely compromised as SET graduates leak into other professions.

In paragraph 7.2 and 7.3 comments refer to women in SET and the factors that mitigate against their participation.

This research role, given to Baroness Greenfield, established the following problematic factors:

- Few visible role models and mentors
- Traditional expectations of family etc
- Unequal pay
- Institutionalised sexism
- Intangible cultural factors that exclude women from the corridors of power
- Lack of transparency regarding pay and promotion
- Stereotyping
- Poor careers advice

Baroness Greenfield goes on to mention BME groups, women and SET rightly highlighting the dearth of BME groups in the SET field and key developments that should strategically take this agenda forward.

Some BME women have the double circumstance of gender discrimination within and external to their cultural and religious groups. Some groups are circumspect about gender issues whilst others are relaxed. When organising science communication events, some BME communities might prefer gender-specific activity. If this is the case, it may be worth ascertaining whether this would extend to science communication personnel leading activity. For instance, female role models or professionals might be preferred. Some communities are tight-knit with much activity taking place at a hub or important centre at its heart. Visits outside of these areas may not be feasible without transport and if women are at home with children, activity would be best during school hours and close to home.

Communities are happy with arrangements for their youngsters to attend science communication activity in mixed gender groups in schools and off site but again conversations to qualify the precise arrangements and requirements are required. Chaperones or minibus hire may be necessary.

There is also a need to consider the underachievement in science of males from several community backgrounds. Bangladeshi, Pakistani and African Caribbean males are under-

attaining in education and therefore employment possibilities are often limited. The factors for this underachievement have been referred to elsewhere. However, the severity of this situation calls for direct gender - and race- specific attention and intervention. Science communicators, schools, the community and policy makers need to find the courage to take on this crisis. Any successes will form best practice that will be transferable to other communities e.g. white underachieving boys and other sectors.

One gender-based science communication activity is The JIVE (Joining Policy, Joining Practice) initiative is the lead body for the Department for Trade and Industry (DTI) Contract for the delivery of the UK Resource Centre for Women in Science Engineering and Technology (UKRC). JIVE is funded by ESF and will contract with an organisation in the North West Region of England to host the North West Regional Hub of the Jive Development partnership. This organisation will have a demonstrable commitment to promoting the participation and progression of women and girls in SET and help to ending gender segregation. See: [www.setwomenresource.org.ukk](http://www.setwomenresource.org.ukk)

With regard to gender when organising SET activities, take care to consult groups about this. In some cases, Muslim women will want female SET communicators. Letters/leaflets stipulating that this is possible may have to be mailed out. Conversely, there may be no issue of both genders being present. It is necessary to check thoroughly.

## Diet and Catering

Well-cooked food is a serious business for minority communities and this is no less the case for community functions and activity. When planning events aimed at BME communities it is usually sufficient to lay on a mixture of meat and vegetarian dishes. The relationship to food is very strong in certain groups and it is deemed a sign of civility to ensure quality, hot, sustaining food is available. Indeed, some would be offended by cold, limp sandwiches. Sharing food is seen as an honouring practice.

Organisers of science communication activity with BME groups will note that if people have left their homes to attend an event (particularly a fee-based event) the least that can be expected is quality, usually hot food. It is usually the first thing mentioned on an evaluation form. Sourcing and serving minority foods would be seen as integrity-based effort at inclusion from the science community. It provides a dietary incentive for the groups to return to future events. Below is a general table indicating acceptable or welcome catering at events. The likelihood is that arrangements for catering can be made via the community who have the knowledge and contacts.

<b>Faith or cultural group</b>	<b>Acceptable Food/Drink</b>	<b>Prohibited Foodstuffs</b>
Sikh	Vegetarian	meat
Hindu	Vegetarian	Beef and associated products
Muslim	Meat/vegetarian	Pork and associated products
Christian	Most meat is acceptable.	Some crustaceans not allowed.
Rastafarian	Vegetarian/vegan	Meat/crustaceans

## Venues

Some of the groups commented that they would expect the science communicators to leave their centres and 'comfort zones' to visit groups in their locality be it parks, centres or places of worship. This does not excuse the BME groups from visiting museums or other places of science communication but the gesture would seem to be one that denotes a sincere effort to engage.

The following are venues suggested by groups:

- Places of worship
- Community centres
- Local amenities such as parks
- Carnival or special celebration venues

Health and safety are the main considerations when working in unfamiliar venues. Establishing whether space is available for break –out times, the venue is warm and ventilated and contains presentation technology are usual factors when working off-site and visits will establish suitability. Science communicators must negotiate their physical resources requirements necessary to a quality delivery but it may be that equipment has to be hired in if centres do not own such equipment.

### Producing and using materials:

Materials whether for publicity, information and feedback would do well to reflect the communities in Britain positively as a first selling point. There is a dearth of materials that reflect the community positively in science-related material. Beware of falling into stereotypical representations of various communities such as the attitudinal black youngster with back-to-front baseball cap and a pose or the demure Asian female. BME communities are fighting the propagation of these erroneous, limiting views. Very few uplifting, non-traditional images of BME communities feature in school text books and non-fiction science – related texts or journals. It is this and other small-scale omissions that, taken together, exacerbate the problems regarding the lack of inclusion in science. This would not be the case for music promotion material or media which over-relies on BME imagery.

Science communicators can begin to address this element via websites, articles and journals. PR materials, flyers etc can all be enhanced to include BME groups and this should go across all publications and materials as opposed to only those targeted at BME communities.

Permission would need to be sought as usual for photographs of youngsters in school. Some BME groups are against photographs being taken therefore science communicators must seek to establish what visual materials they will be able to use. Check any wording internally and externally with groups who have the knowledge to know what would make an impact.

### Evaluation factors

Formative evaluation can go before an activity establishing whether it is feasible and worth pursuing. If a science communication activity impacts the thinking and choices of the community, some way of capturing that summative evidence provides measures of success that appeals to funders and other stakeholders. It then has more likely that such activity will be sustained through mainstreaming.

There are fun and formal formats which will be dependent on the audience present. Coloured sticky notes and flipchart feedback can provide feedback if put up around rooms. Voting systems using presentation technologies are an interactive and interesting way of carrying out evaluation. Audience members have key pads and vote against questions on a screen.

A computer calculation can very quickly provide feedback to the audience before they leave and make them think about other people's reactions against their own.

Traditional paper methods make for a longer feedback time but the quicker this can be done and presented in a report to audiences or other stakeholders, the better. It pays to be fairly forensic when assessing outcomes of work against aims; evaluation can reveal which aspects of marketing were the most valuable or what pupils have learned over a programme. The more people (who were involved in the activity) responding to the evaluation, the better the perspectives and angles.

This 'small-scale' action research is also a way of maintaining contact with people after events about future activities or focus as well as justification for further work with BME communities.

## Managing Expectations

- Managing expectations is key whether organising your own events or something more specifically for the BME community groups,
- A full house may not be an immediate occurrence; it will take time.
- Work with whom you can work with. Not everyone will be compliant, willing or able. Be careful not to over-romanticize working with the BME – who will not necessarily magically work with SET providers.
- Offer incentives but make sure people know their responsibilities. Listening and dialogue are key.
- Research well and carry out risk assessments on activity.
- Capture quality information and monitor during evaluation.
- Groups may be sometimes slow in arriving or pre-registering. This is not to be interpreted as a sign of rudeness. Also, during events, individuals may come and go or chat/comment out loud. Again, these are responses not unusual to communities but do not expect that this is always the case. The more established BME communities are becoming very British!