CRISM conference
June 24, 2014 (present only today!)

A Catalogue of (High-Energy) Observations of Galactic Supernova Remnants

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and PhDc Heather Matheson and Jennifer West

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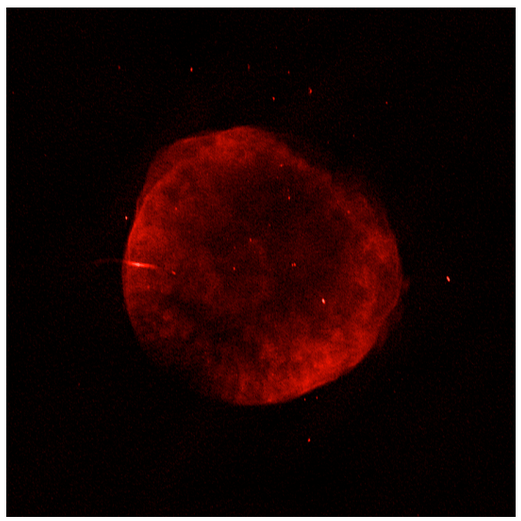
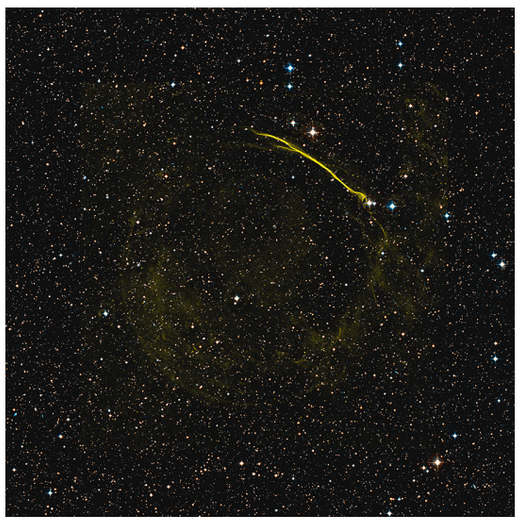
SNR broad-band emission

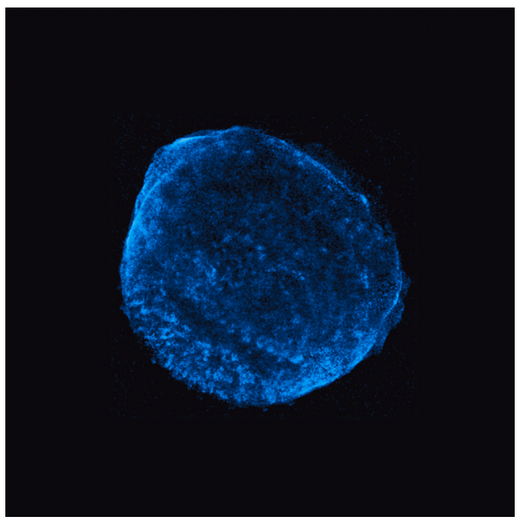
SN 1006



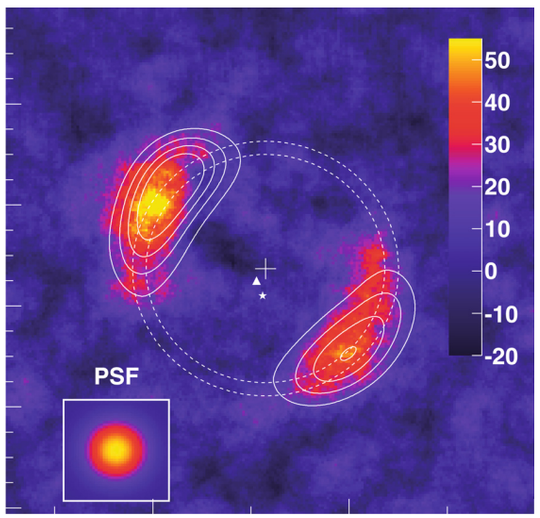
radio



optical



X



gamma

synchrotron in B field

Balmer lines forbidden lines

atomic lines of heavy elements + synchrotron

Inverse Compton ? pion decay ?

GeV e-

blast wave

hot ejecta + TeV e-

> TeV e- ? > TeV p ?

Rationale and objectives

Ferrand & Safi-Harb 2012

- focus on high-energies (X,gamma)

Dave Green's catalogue: identification and typing from radio emission
SNRcat: particle acceleration from broadband X-ray and γ-ray emission

- provide a unified view of all SNRs

Some observatories offer dedicated resources
SNRcat: all observations from the major relevant observatories are presented together

Some other websites present all observations in a specific energy domain
SNRcat: complete and broad-band view of all Galactic SNRs

- be up-to-date

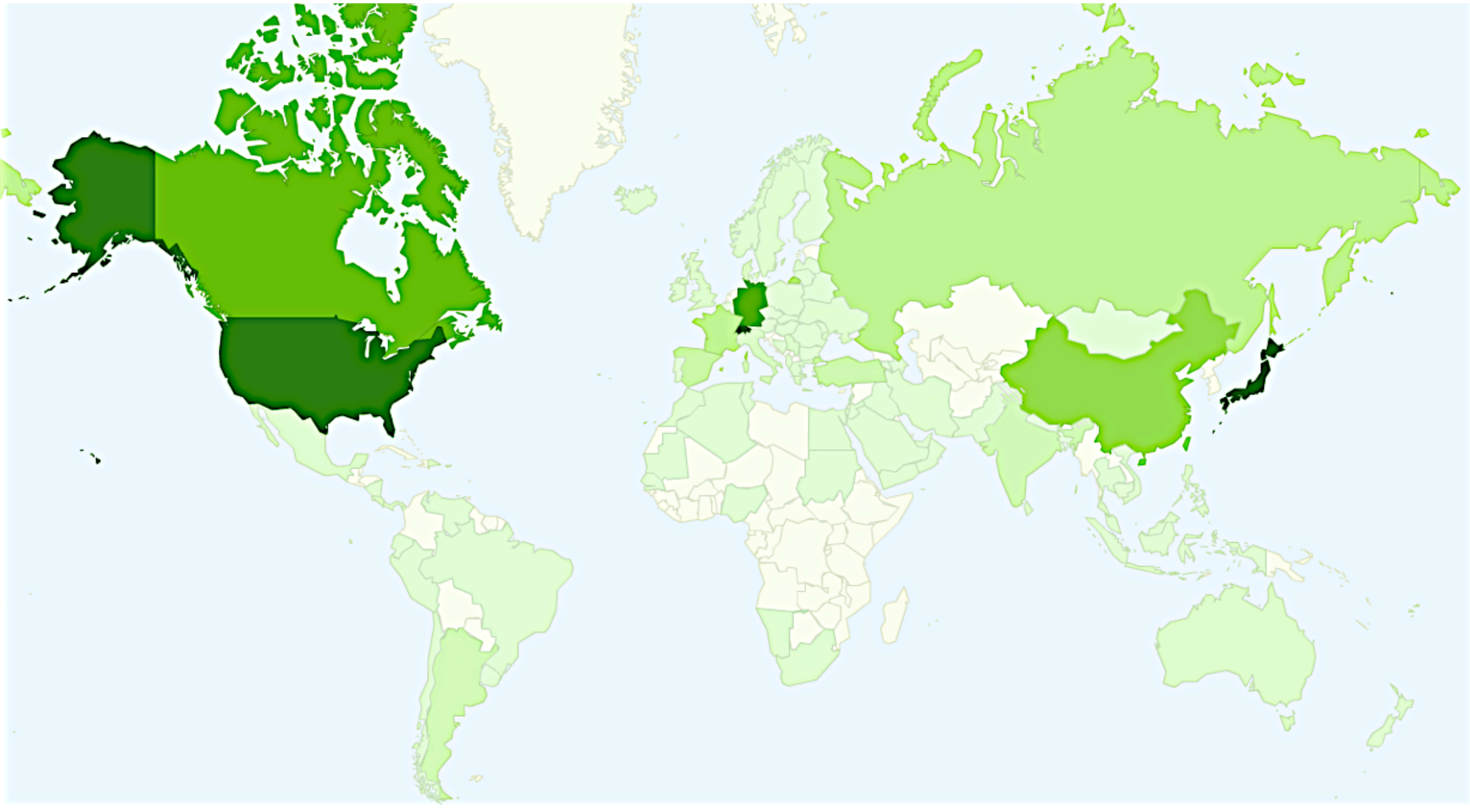
Green's catalogue: snapshot at a given time (last update in 2009)
SNRcat: weekly/daily updates, to keep pace with the surge in X-ray and γ-ray obs

- be easy to manipulate

SNRcat: stored in a relational database + publicly accessible on the web

A service to the community

www.physics.umanitoba.ca/snr/SNRcat



first 2 years statistics (2012/02 – 2014/01)
> 36,000 accesses from > 3,600 unique IPs (robots excluded)
98% of these IP addresses can be localised at country level

Some statistics

• 317 records of a supernova remnant (SNR)
(with more age and distance estimates)

. 108 contain a neutron star (NS) or candidate, 90 identified as a pulsar (PSR)
. 6 AXPs + 2 soft γ-ray repeaters (SGRs) + 2 high-B = 10 magnetars candidates
. 15 central compact objects (CCOs) or candidates
. pulsar wind nebula (PWN) detected or suggested in 86 cases (not a subset of the SNRs hosting a NS: only 65 SNRs are associated with both)
. interaction of the shell with a molecular cloud (MC) reported in 65 cases

• 14 records of the sighting of a supernova (SN)

referred to by 14 SNRs records
(non-bijective: some SN have multiple candidates, others have none)

• 1268 records of high-energy observations made with 39 observatories
(added several legacy instruments + some new instruments)

NB: 307 of these are actually non-detections
NB: the emission might not be coming from the SNR

• 1737 references as ADS bibcodes plus 100s of other URLs

Omissions? Ideas? your feedback is welcome!

Extension: Pulsar Wind Nebulae

by Heather Matheson

← G21.5-0.9 revealed with Chandra in X-rays

Many isolated PWNs: where are the shells?

COMING SOON

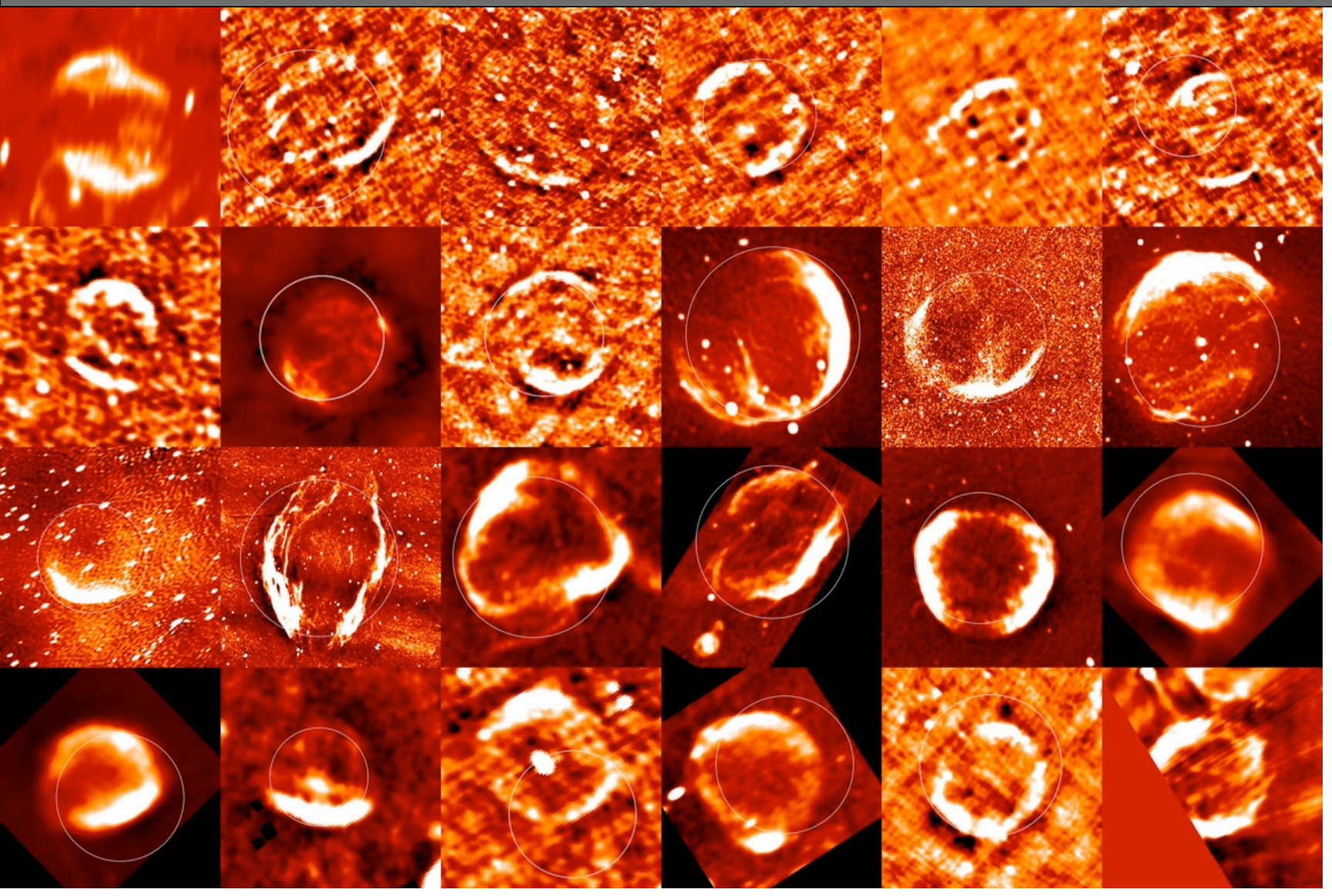
a dedicated catalogue of PWNe

96+ objects currently listed (still sorting out candidates...)
- multi-wavelength view (from radio to γ-rays)
- detailed X-ray properties (photon index, flux, column density, etc)

fully searchable and sortable

Extension: Bilateral SNRs

by Jennifer West



← a sample of 24 bilateral radio shells (synchrotron emission)

Link with the Galactic field?

COMING SOON

dedicated catalogue of bilateral SNRs

with qualitative and/or quantitative description of the morphology of the radio emission (and of the polarization when available)

Longer term perspectives

- Instruments coverage

to be updated regularly following new results, in particular
from instruments having started operations (NuSTAR and H.E.S.S. II),
satellites about to be launched (Astro-H, eROSITA, ASTROSAT in 2015),
as well as planned next-generation observatories (CTA).

H.E.S.S. found new SNR J1731-347 = G353.6-0.7 [H.E.S.S. Collaboration 2011]

CTA should be able to detect ~80 TeV SNRs [Acero et al 2013]

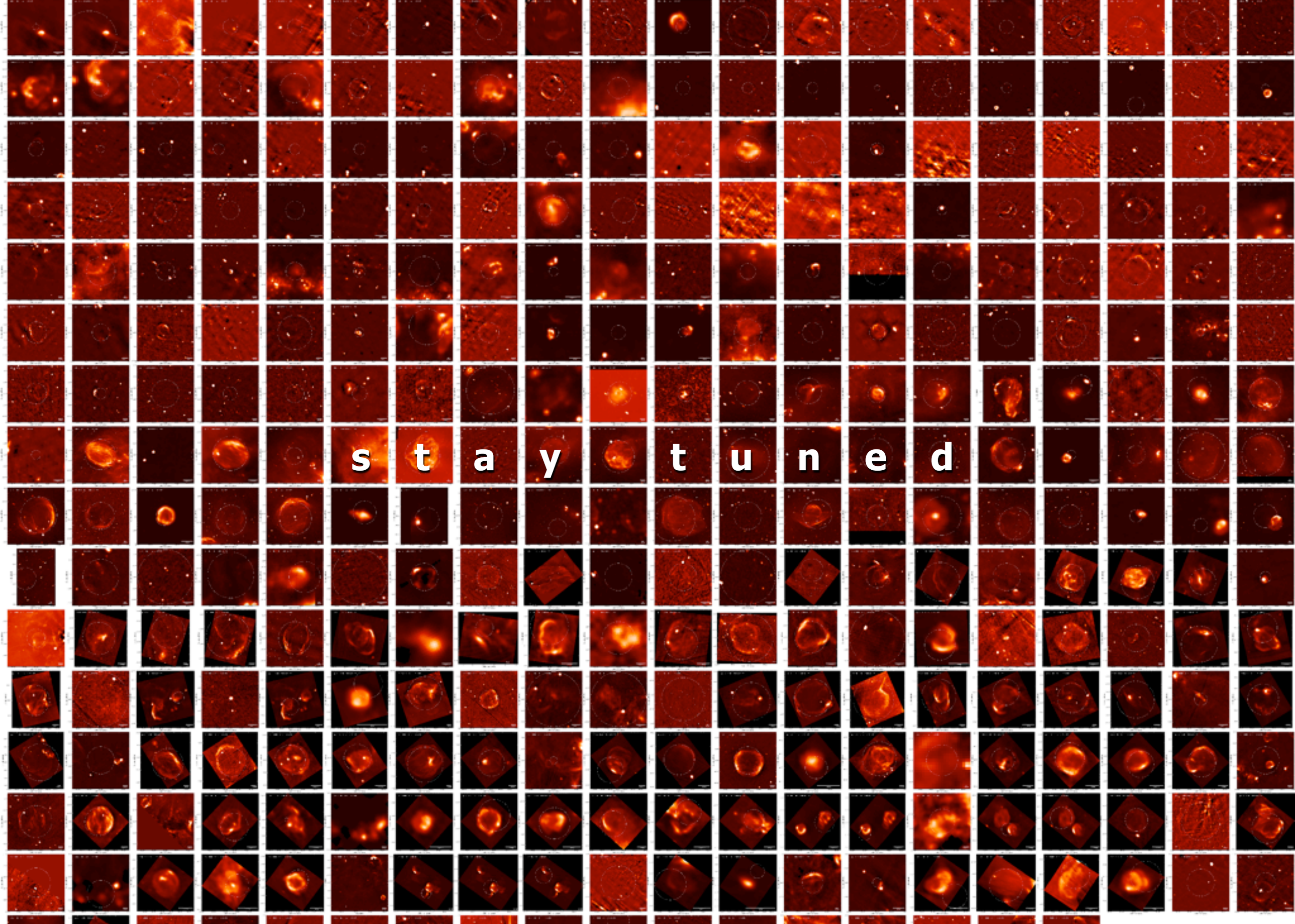
- Extragalactic coverage

can be extended to LMC and SMC

- Wavelength coverage

eventually get a full multi-wavelength view of all SNRs,
with all regions of the electromagnetic spectrum (IR, optical, UV)

(interested?)



montage courtesy
Jennifer West